
SECTION 220000 – BASIC MECHANICAL REQUIREMENTS – PLUMBING

Latest Update 05-03-2023 See Underlined Text for Edits.

(Engineer shall edit specifications and blue text in header to meet project requirements. This includes but is not limited to updating Equipment and/or Material Model Numbers indicated in the specifications and adding any additional specifications that may be required by the project. Also turn off all “Underlines”.)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section and all other sections of Division 22.

1.2 SUMMARY

- A. This Section includes the requirements for the following: **<Edit for particular project>**:

- 1. Codes, organizations, standards, and abbreviations
- 2. Responsibility
- 3. Site Visit
- 4. Outages
- 5. Submittals
- 6. Variances
- 7. Performance requirements
- 8. Material and equipment
- 9. Coordination, sequencing and scheduling
- 10. Demolition
- 11. Fire safe materials
- 12. UL requirements
- 13. Warranty / Guarantee
- 14. Listed manufacturers
- 15. Approved equal equipment layouts
- 16. Coordination drawings
- 17. Construction record documents.
- 18. Operation and maintenance manuals
- 19. Concrete housekeeping pads
- 20. Grout
- 21. Combination motor starters, VFD, and controllers – Plumbing equipment
- 22. General requirements - Execution
- 23. Existing Plumbing Systems
- 24. Equipment roughins
- 25. Mechanical installation - Plumbing
- 26. Cutting and patching
- 27. Cutting, welding and burning
- 28. Painting and finishing
- 29. Concrete housekeeping pads

30. Erection of metal supports and anchorage
31. Demolition
32. Grouting
33. Penetration of water proof construction
34. Excavation and backfilling
35. Cleaning and Finishes
36. Lintels
37. Electrical requirements
38. Provisions for access
39. Operation of equipment
40. Temporary service and equipment use
41. Demonstration and instructions
42. Lubrication
43. Wall and floor penetrations
44. Equipment provided under another division and by others
45. Construction record drawings
46. Closeout procedures
47. Clean up
48. Project punchout

1.3 CODES, ORGANIZATIONS, STANDARDS AND ABBRIVIATIONS

- A. The following list of codes, organizations, standards and abbreviations are included within Division 22 Specification Sections and are provided as a reference.
- B. Codes: All material and equipment provided and installed as part of these construction documents shall be in compliance with the latest edition of the following codes as adapted by the State of Maryland for the following codes:
 1. IBC: International Building Code
 2. IMC: International Mechanical Code
 3. IECC: International Energy Conservation Code
 4. NEC: National Electrical Code
 5. NFPA: National Fire Protection Association
 6. International Plumbing Code (IPC)
- C. Organizations and Standards: The list of organizations and standards are as follows:
 1. ADA: American National Standards Institute
 2. AGA: American Gas Association
 3. ANSI: American National Standards Institute
 4. ASHRAE: American Society of Heating Refrigeration and Air Conditioning Engineers
 5. ASME: American Society of Mechanical Engineers
 6. ASSE: American Society of Safety Engineers
 7. ASTM: American Society for Testing and Materials

8. AWS: American Welding Society
9. AWWA: American Water Works Association
10. CDA: Copper Development Association Inc.
11. CFR; Code of Federal Regulations
12. CGA: Compressed Gas Association
13. CISPI: Cast Iron Soil Pipe Institute
14. CS: Commercial Standard
15. CSA: Canadian Standards Association
16. CSU: Coppin State University
17. EJMA: Expansion Joint Manufacturers Association
18. EPA: Environmental Protection Agency
19. FDA: Food and Drug Administration
20. FSA: Fuel Sealing Association
21. IAPMO: International Association of Plumbing and Mechanical Officials
22. IBC: International Building Code
23. IBR: Institute of Boiler and Radiator Manufacturers
24. ICC: International Code Council
25. ICC-ES: International Conference on Computational & Experimental Engineering and Sciences
26. IEEE: Institute of Electrical and Electronics Engineers
27. ITT: International Telephone & Telegraph Corporation
28. LED: Light Emitting Diode
29. MFMA: Metal Framing Manufacturers Association
30. MIL: Military Standard
31. MOSHA: Maryland Occupational Safety and Health Administration
32. MSS: Manufacturers Standardization Society
33. MSS SP: Manufacturers Standardization Society Standard Practice
34. NEMA: National Electrical Manufacturers Association
35. NEMA MG: National Electrical Manufacturers Association Motors & Generators
36. NFPA: National Fire Protection Association
37. NICET: National Institute for Certification in Engineering Technologies
38. NSF: National Sanitation Foundation
39. NRTL: Nationally Recognized Testing Laboratory
40. OSHA: Occupational Safety and Health Administration
41. OSHPD: Office of Statewide Health Planning and Development
42. PDI: Plumbing and Drainage Institute
43. SE: Safety Engineering
44. SEI: Software Engineering Institute
45. SSPC: Society for Protective Coatings
46. TU: Towson University
47. UB: University of Baltimore
48. UL: Underwriters' Laboratories
49. UM: University of Maryland
50. UMB: University of Maryland, Baltimore
51. UMB-A/E: University of Maryland, Baltimore – Architect/Engineer
52. UMB-FM: University of Maryland, Baltimore – Facilities Management

- 53. UMB-PM: University of Maryland, Baltimore – Project Manager
- 54. UMBC: University of Maryland, Baltimore County
- 55. USP - NF: The United States Pharmacopeia and The National Formulary

D. Abbreviations: The list of abbreviations are as follows:

- 1. AEC: Architecture, Engineering and Construction
- 2. ASJ: All Service Jacket
- 3. AWF: All Weather Finish
- 4. AWG: American Wire Gauge
- 5. CAD: Computer Aided Design
- 6. CD-ROM: Compact Disk – Read Only Material
- 7. CM: Construction Manager
- 8. CWP: Cold Working Pressure
- 9. °C: Degree Celsius
- 10. °F: Degree Fahrenheit
- 11. Dwg: Drawing
- 12. DOC: Document
- 13. Dwg: Drawing
- 14. EPDM: Ethylene Propylene Diene Terpolymer Rubber
- 15. FNPT: Female National Pipe Thread
- 16. FSK: Foil-Scrim-Kraft
- 17. FT: Foot, Feet
- 18. GC: Glass Cloth
- 19. g/L: Gram per Liter
- 20. GPH: Gallons per Hour
- 21. HCFC: Hydrochlorofluorocarbons
- 22. HNBR: Hydrogenated Nitrile Butadiene Rubber
- 23. HP: Horse Power
- 24. HVAC: Heating Ventilation and Air Conditioning
- 25. Hz: Hertz
- 26. ID: Inside Diameter
- 27. IEQ: Indoor Environmental Quality
- 28. IN: Inches
- 29. kPa: Kilopascal
- 30. Lb/ft: Pound-Foot
- 31. LED: Light Emitting Diode
- 32. LF: Linear Feet
- 33. LLDPE: Linear Low Density Polyethylene Resins
- 34. MAX: Maximum
- 35. MER: Mechanical Equipment Room
- 36. MIN: Minimum
- 37. mPa: Megapascal
- 38. N/A: Not Applicable
- 39. NBR: Acrylonitrile-Butadiene, Buna-N, or Nitrile Rubber
- 40. NOM: Nominal

- 41. NON: Not In
- 42. NPS: Nominal Pipe Size
- 43. NPT: National Pipe Thread
- 44. NRS: Nonrising Stem
- 45. OD: Outside Diameter
- 46. OS&Y: Outside Screw and Yoke
- 47. OXY: Oxygen
- 48. Pdf: Portable Document Format
- 49. PE: Polyethylene
- 50. PSI: Pounds per Square Inch
- 51. PSIG: Pounds per Square Inch Gage
- 52. PVC: Polyvinyl Chloride
- 53. RO/DI: Reverse Osmosis/Distilled Water
- 54. RS: Rising Stem
- 55. SWP: Steam Working Pressure
- 56. UV: Ultraviolet
- 57. V: Volt
- 58. VAC: Vacuum
- 59. VOC: Volatile organic compounds

1.4 RESPONSIBILITY

- A. The Construction Manager/General Contractor (CM/GC) shall be responsible for all work included in Division 22. The delegation of work to the contractors shall not relieve him of this responsibility. Contractors who perform work under this Division shall be responsible to the CM/GC.

1.5 SITE VISIT

- A. Prior to preparing the bid, the mechanical plumbing subcontractor shall visit the site and become familiar with all existing conditions. Make all necessary investigations as to locations of utilities and all other matters which can affect the work. No additional compensation will be made to the contractor as a result of his failure to familiarize himself with the existing conditions under which the work must be performed.

1.6 OUTAGES

- A. For all work requiring an outage, the mechanical/plumbing contractor shall submit an outage request to the UMB Project Manager, using the UMB Standard Request for Outage Form which is available through the UMB Design and Construction Web Site at <https://www.umaryland.edu/designandconstruction/design-and-construction-documents/umb-standard-project-forms---current-editions/>
- B. The existing plumbing system shall remain operational unless turned off by University personnel during the construction of the project.

- C. Unless otherwise specified, outages of any services required for the performance of this contract and affecting areas other than the immediate work area shall be scheduled at least ten business days (10) days in advance with the UMB Design and Construction Department. Outages shall be performed during normal duty hours. If necessary some outage work may be performed outside normal hours if approved by UMB.
- D. All plumbing outages which will interfere with the normal use of the building in any manner shall be done at such times as shall be mutually agreed upon by the contractor and the UMB Design and Construction Department.
- E. The plumbing contractor shall include in his price the cost of all premium time required for outages and other work which interferes with the normal use of the building, which will be performed, in most cases, during other than normal work time and at the convenience of the University.
- F. The operation of plumbing valves or switches; required to achieve an outage must be operated by University personnel only. Unauthorized operation of HVAC valves, power switches, by contractors and their personnel will result in extremely serious consequences for which the contractor will be held accountable.

1.7 SUBMITTALS

- A. General: For general requirements see Architectural Specification Division 01 Section "Submittal Procedures".
- B. Provide submittals for all material, equipment and/or supports as specified in Division 22 and where indicated on the drawings and details. For material and product data submission requirements see Division 22 Specification Sections. At a minimum the following submittals shall be provided as required by the project unless otherwise noted:
<Edit for project>
 - 1. Pipe, fittings and accessories for each system.
 - 2. Valves, strainers and unions for each system.
 - 3. Insulation.
 - 4. Hangers and supports.
 - 5. Plumbing fixtures and trim.
 - 6. Safety fixtures and equipment.
 - 7. Laboratory gas outlets.
 - 8. Identification labels and tags.
 - 9. Floor drains.
 - 10. Roof drains.
 - 11. Hot water heating equipment.
 - 12. Laboratory vacuum system.
 - 13. Laboratory compressed air system.
 - 14. RO/DI equipment.
 - 15. Trap priming system.

16. Backflow preventers.
17. Plumbing pumps.
18. Pipe and equipment roof curbs and supports.
19. Coordination drawings.
20. Warranties and maintenance instructions shall be included in the O & M Manual only. Do not include this data in the Product Submittals.
21. <Add additional items or delete items per project requirements>

C. Submittal File Format: File formats for each submittal shall be electronically as follows:

1. Product Data: “pdf” file format.
2. Shop Drawings: “pdf” file format.
3. Coordinated Drawings: “pdf” or “dwg” file formats.
4. Schedules: “xl” file format.

1.8 VARIANCES

A. Where variances occur between the drawings and specifications or within either document itself, the item or arrangement of better quality, greater quantity or higher cost shall be included in the contract price. The Engineer shall decide on the item and manner in which the work shall be provided.

1.9 PERFORMANCE REQUIREMENTS

- A. Contract drawings are generally diagrammatic and do not indicate all offsets, fittings, transitions, access panels and other specialties required. Furnish and install all items as may be required to fit the work to the conditions encountered.
- B. Arrange plumbing piping, equipment and other work generally as shown on the contract drawings, providing proper clearances and access.
- C. Where departures are proposed because of field conditions or other causes, prepare and submit detailed shop drawing submittal for approval in accordance with Submittals specified below.
- D. The Architect may make reasonable changes in location of equipment piping and ductwork up to the time of rough-in or fabrication.

1.10 MATERIALS AND EQUIPMENT

- A. The contract drawings and system performances have been designed on the basis of using the particular manufacturer’s products specified or scheduled on the contract drawings.
- B. Products of other manufacturer’s listed in the specification shall be permitted provided as follows:

1. Products meet all of the requirements of the specifications.
 2. Make, without additional cost to the Owner, all adjustments for deviations, such that the final installation is complete and functions as the basis of design product is intended.
- C. Products with dimensions or other characteristics different from the basis of design product that render their use impractical or cause functional fit, access, or connection problems, shall not be acceptable.

1.11 COORDINATION, SEQUENCING AND SCHEDULING

- A. Coordination: Coordinate plumbing systems, equipment, and materials installation with other building components.
- B. Utilities: Coordinate connection of plumbing systems with exterior underground services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- C. Chases: Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- D. Sleeves: Coordinate the installation of required supporting devices and set sleeves in poured in place concrete and other structural components as they are constructed.
- E. Sequencing: Sequence, coordinate, and integrate installations of plumbing material and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
- F. Electrical Services: Coordinate connection of electrical services.
- G. Access: Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Architectural Specification Section "Access Doors."
- H. Scheduling: Schedule and coordinate the delivery of material and equipment with other trades to avoid delivery conflicts.

1.12 DEMOLITION

- A. Plumbing Demolition: Cut, remove and legally dispose of selected plumbing equipment, components, and materials as indicated, including but not limited to removal of plumbing piping, plumbing equipment, plumbing fixtures and trim, and other plumbing items made obsolete by the new work.

1.13 FIRE SAFE MATERIALS

- A. Unless otherwise indicated, materials shall conform to UL, NFPA or ASTM standards for fire safety with smoke and fire hazard rating not exceeding flame spread of twenty five (25) and smoke development of fifty (50).

1.14 UNDERWRITER’S LABORATORY (UL) REQUIREMENTS

- A. All equipment containing electrical components and provided as part of the mechanical specifications shall bear the Underwriter’s Laboratory (UL) label, as a complete packaged system.
 - 1. Equipment not provided with a UL label shall be tested in the field, certified and provided with a UL label at the installer’s expense.
 - 2. Field testing shall be performed by a testing agency approved by the authority having jurisdiction.

1.15 WARRANTY/GUARANTEE

- A. All materials, equipment, etc. provided by the general contractor and/or his subcontractors shall be warranted and guaranteed to be free from defects in workmanship and materials for a period of two (2) years from the date of substantial completion and acceptance of work by UMB. Any defects in workmanship, materials, or performance which appear within the guarantee period shall be corrected by the contractor without cost to the owner, within a reasonable time, to be specified by UMB. In default thereof, owner may have such work done and charge the cost of same to the contractor. In addition to the above statement the Warranty/Guarantee Period shall include also all labor cost related to all warranty work. For compressorized equipment include an additional three (3) year Warranty/Guarantee Period.

PART 2 - PRODUCTS

2.1 LISTED MANUFACTURERS:

- A. Listed Manufacturers: The manufacturers indicated in Part 2 represent the basis for design and identify the minimum level of quality for materials and equipment, specified in this Division, that are acceptable to UMB. Unless “or equal” is included as an option, substitutions are not allowed, except under the following condition. During bid phase, contractors may submit material and equipment by non-listed manufacturers provided said submittals meet the requirements of these specifications. All submitted materials and equipment are subject to approval by the A/E and UMB. Reference: Division 1 Substitution Section.

2.2 APPROVED EQUAL EQUIPMENT LAYOUTS

- B. Approved Equal Equipment Layouts: The equipment layouts and the related mechanical and electrical service connections, access space and supports indicated on the construction documents represent equipment provided by the specified basis of design

manufacturer and model number. When the successful bidder chooses to provide “or approved equal” equipment by one (1) of the other listed manufacturers in the specifications, the bidder shall be responsible for providing all adjustments and modifications to the services necessary to make connections to the equipment, the bidder shall be responsible for installing the equipment such that all required clear access space is maintained, and the bidder shall be responsible for providing all adjustments and modifications to the equipment mounting and supports. All adjustments and modifications shall be provided by the bidder and appropriate subcontractors at no additional cost to the project.

2.3 COORDINATION DRAWINGS <Delete if size of project does not warrant.>

- A. General: When required participate in the preparation of the coordinated drawing effort for the project. See Specification Division 01 for general requirements.
- B. Coordination Drawings: In addition to the requirements of the Specification Division 01 prepare the plumbing part for the coordination drawing effort. Work with the other trades to ensure the material and equipment installed as part on the plumbing system will not be in conflict with the installation of material and equipment by the other trade contractors. Unless otherwise indicated the coordination drawings, including plans, sections, and elevations shall be prepared at a scale of not less than 1/4 inch = 1 foot - 0 inches. At a minimum, prepare coordination drawings for all mechanical rooms, electrical rooms and substation rooms.
- C. File Format: Coordination drawings shall be in a layered structure form as CAD Files or PDF Files for each floor with searchable text as follows:
 - 1. File Structure: The “pdf” or “dwg” files shall have separate layered structure for:
 - a. Building Elements: Indicate each building element on separate layers, such as:
 - 1) Walls.
 - 2) Reflected ceiling plan.
 - 3) Room numbers.
 - b. Systems and Sub Systems: Indicate each system or sub system as warranted by congestion or complexity on separate layers such as:
 - 1) Examples of Systems:
 - a) Domestic Water System.
 - b) Laboratory Water System.
 - c) Sanitary Waste System.
 - 2) Examples of Sub Systems:
 - a) Domestic Cold Water System.

- b) Laboratory Hot Water System.
 - c) Laboratory Waste System.
2. The layered electronic files shall allow building elements, building systems and sub systems to be viewed in isolation or in combinations that are user selectable when the drawing files are being displayed.
- D. Coordination Effort: This coordination effort shall include detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the work, including (but not necessarily limited to) the following:
- 1. Indicate the proposed locations of plumbing system piping, valves, equipment, and materials. Include the following:
 - a. Clearances for servicing and maintaining equipment, including, the space for equipment disassembly required for periodic maintenance.
 - b. Exterior wall and foundation penetrations.
 - c. Sizes and location of required concrete pads and bases.
 - d. Size and location of pipe hangers and other components for pipe supports.
 - e. All plumbing system roughins for equipment and fixtures.
 - f. Access doors.
 - 2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
 - 3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations. Show all wall mounted access doors for mechanical devices.
 - 4. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, cable trays, sprinklers, access doors and other ceiling mounted items.

2.4 CONSTRUCTION RECORD DOCUMENTS

- A. The mechanical/plumbing contractor shall maintain a set of construction record documents during the construction period in accordance with Specification Division 01 Section “Project Closeout”.

2.5 PROJECT OPERATION AND MAINTENANCE MANUAL – ELECTRONIC FILES

- A. Project O & M Manual File: The project OM Manual shall include one (1) electronic copy of each approved submittal and any manufacturer’s maintenance manuals, and all warranty certificates included in this Division. Also include the address, phone number and contact person for each supplier. Using the UMB Standard O&M Manual Template

referenced in Division 01 Closeout Procedures insert the submittal files include both a book mark and tree structure for accessing each submittal file in the manual.

2.6 CONCRETE HOUSEKEEPING PADS

- A. Provide concrete required for housekeeping pads under Division 23 unless otherwise noted.
- B. Concrete shall be 3,500 psi twenty-eight (28) day compressive strength concrete and reinforcement bars as specified in the architectural specifications.

2.7 GROUT

- A. Grout shall be non-shrink, high strength type, free of iron or chlorides and suitable for use in contact with all metals, without caps or other protective finishes complying with ASTM C 1107, Grade B and the following:
 - 1. Characteristics: Post hardening, volume adjusting, dry, hydraulic cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5,000 psi (34.50MPa), twenty eight (28) day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

2.8 COMBINATION MOTOR STARTERS, VFD'S AND CONTROLLERS – PLUMBING EQUIPMENT

- A. Combination motor starters, VFD's and/or controllers shall be provided for all motors serving plumbing equipment as follows:
 - 1. Skid Mounted Equipment: Combination motor starters, VFD's and/or controllers shall be provided by the equipment manufacturer as part of Division 22.
 - 2. Non Skid Mounted Equipment: Combination motor starters, VFD's and/or controllers shall be provided as part of Division 26.

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS – EXECUTION

- A. All construction work that creates excessive noise will not be permitted during normal business hours. See Division 01 Specification Section 01045 “Cutting and Patching” for requirements.

3.2 EXISTING PLUMBING SYSTEMS <Delete if not Required>

- A. Building: In no case shall the buildings plumbing systems be placed out of service for any period of time unless it is in an emergency condition as directed by the University.

- B. Project Area: The parts of the plumbing systems serving the project area can be placed out of service for the construction period. When the construction is completed the plumbing system serving the project area shall be placed back in service.

3.3 EQUIPMENT ROUGH IN AND FINAL CONNECTIONS

- A. Locations: Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Rough in Requirements: Refer to equipment specifications included in the architectural, mechanical, and electrical specifications for equipment rough in requirements. Provide final connections for each piece of equipment.
- C. Owner Furnished Equipment: Refer to owner supplies equipment specifications and/or cut sheets for equipment rough in requirements. Provide final connections for each piece of owner supplied equipment.

3.4 MECHANICAL INSTALLATIONS - PLUMBING

- A. Verify all dimensions by field measurements.
- B. Where plumbing systems, materials and equipment are intended for overhead installation, and where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible. Notify UMB - PM prior to installation of plumbing system components when headroom is less than 7'-6" and/or where existing system components will be below the new finished ceiling height. Notification shall be through the "RFI" process.
- C. Install plumbing systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, identify the conflict and submit an "RFI" for each conflict to the Architect.
- D. Install plumbing systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.
- E. Install plumbing equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- F. Install access panel or doors where material and/or equipment requiring service will be concealed behind finished surfaces. Access panels and doors are specified in the architectural specifications.

- G. Install plumbing systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
- H. The contractor shall confirm that all pressure vessels are installed in full compliance with the requirements of the State Inspector's Office for Boilers and Pressure Vessels. Refer to "Closeout Procedures" in this Section for additional requirements.

3.5 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 01 Specification Section "Cutting and Patching" In addition to the requirements specified in Specification Division 01, the following requirements apply:
 - 1. Patch Materials: Patch finished surfaces and building components using new materials specified for the original installation and using experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
- B. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, ductwork, plumbing fixtures and trim, and other mechanical items made obsolete by the new work.

3.6 CUTTING, WELDING, BURNING

- A. Before the contractor and/or any sub-contractor commences any cutting, welding, burning or other type of hot work at UMB, the contractor shall contact the UMB Fire Marshal's Office on the First Floor of the Pine Street Station located @ 214 N. Pine Street, or by phone @ 1-410-706-3494 to obtain a hot work permit. Office Hours are Monday – Friday.
- B. The hot work permit copy shall remain on the job site at the hot work location until such work is completed at which time the permit shall be returned to the UMB Fire Marshal.

3.7 PAINTING <Add painting section if project requires field painting>

- A. Refer to Architectural Specification Section "Painting" for field painting requirements.
- B. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
- C. Do not paint manufacturer's labels or tags.

3.8 CONCRETE HOUSEKEEPING PADS

- A. General: Construct concrete housekeeping pads to support mechanical equipment were indicated and as detailed on the drawings and as specified herein. Engage the services of

the Structural or General Contractor, and pay for them, to provide the concrete housekeeping pads. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations.

- B. Housekeeping Pads: Set all floor-mounted equipment on four (4) inch high concrete housekeeping pads, unless otherwise shown or specified.
 - 1. Housekeeping Pads: Pads shall be a minimum of four (4) inches wider and longer than vibration isolation base or structural base of equipment being set on pad.

3.9 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1 "Structural Welding Code--Steel."

3.10 DEMOLITION <Delete if project does not include removal work>

- A. Disconnect, demolish, and remove work specified as part of the plumbing specifications and as indicated. Remove pipes back to the active pipe to remain and cap.
- B. Where pipe, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.
- D. Abandoned Work: Cut and remove buried pipe abandoned in place, two (2) inches (50 mm) beyond the face of adjacent construction. Cap and patch surface to match existing finish.
- E. Removal: Remove indicated equipment from the Project site.
- F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.11 GROUTING

- A. Install nonmetallic nonshrink grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms for placement of grout, as required.
- D. Avoid air entrapment when placing grout.

- E. Place grout to completely fill equipment bases.
- F. Place grout on concrete bases to provide a smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's printed instructions.

3.12 PENETRATION OF WATERPROOF CONSTRUCTION

- A. Coordinate the work to minimize penetration of waterproof construction, including roofs, exterior walls and interior waterproof construction.
- B. Furnish and install drains, curbs, vent assemblies, sleeves, flashing, etc. specifically designed for application to the particular construction. Install system in accordance with the roofing manufacturer's instructions.

3.13 EXCAVATION AND BACKFILLING

- A. General: Perform all necessary excavation and backfilling necessary for the installation of underground plumbing services as part of Division 22 in accordance with the architectural specifications.

3.14 CLEANING AND FINISHES

- A. Clean surfaces prior to application of insulation, adhesives, coating, and paint.
- B. Provide factory applied finish where specified.
- C. Protect all finishes, and restore all finishes to their original condition if damaged as a result of work installed as part of the mechanical specifications.
- D. Remove all construction marking and writing from exposed equipment, piping and building surfaces.

3.15 LINTELS

- A. Lintels shall be provided for openings in masonry, brick, concrete, etc. walls to accommodate work of this division.
 - 1. Lintels shall be provided under this division when not being provided under other divisions. Lintels shall be approved by the Architect.

3.16 ELECTRICAL REQUIREMENTS

- A. Unless otherwise indicated, furnish and install control and interlock wiring for the equipment furnished under this division. In general, power wiring and motor starting equipment will be provided as specified in the electrical specifications.
 - 1. Where the electrical requirements of the equipment furnished differ from the provisions made in the electrical specifications, make the necessary allowances as part of the mechanical specifications.
 - 2. Where no electrical provisions are included in the electrical specifications, include all necessary electrical work as part of the mechanical specifications.
- B. All electrical work performed as part of the mechanical specifications shall be provided in accordance with the electrical specifications.

3.17 PROVISIONS FOR ACCESS

- A. Furnish and install adequate access to all plumbing components. The following list shall be used as a guide only:
 - 1. Equipment
 - 2. Valves
 - 3. Cleanouts
 - 4. Traps
 - 5. Low point drains
- B. Access shall be adequate as determined by the Architect.
- C. Refer to contract drawings where access panels have been specifically located.
- D. Where access is by means of lift out ceiling tiles or panels mark each access panel using small color coded or numbered tabs. Provide an index chart for identification. Place markers in corner of tile.

3.18 OPERATION OF EQUIPMENT

- A. Clean all systems and equipment prior to initial operation for testing and balancing.
- B. Do not operate equipment unless all proper safety devices or controls are operational.
- C. Provide all maintenance and service for equipment which is operated during construction.
- D. Where specified and otherwise required, provide the services of a manufacturer's factory trained service organization to start the equipment.

3.19 TEMPORARY SERVICE AND EQUIPMENT USE

- A. Temporary Service: Unless temporary services are required as part of the project, do not use plumbing systems for temporary services during construction unless authorized in writing by the Architect and/or UMB.
- B. Equipment Use: Where such authorization is granted, temporary use of new and or existing equipment shall not limit or otherwise affect warranties or guarantees covering new equipment. Where equipment is used by the contractor the contractor shall perform all required preventive maintenance on the equipment during the construction period. Upon completion of work, clean and restore all new and/or existing equipment to new condition and replace all filters as necessary.

3.20 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of equipment and systems to Owner's personnel a minimum two (2) weeks prior to date of final inspection.
 - 1. For equipment requiring seasonal operation, perform instructions for other seasons at the same time.
 - 2. Training period shall be performed within one (1), two (2) week period.
- B. Use operation and maintenance manuals and video as basis of instruction. Review contents of manual and video with personnel in detail to explain all aspects of operation and maintenance.
- C. Demonstrate the following:
 - 1. Start up.
 - 2. Operation.
 - 3. Control.
 - 4. Adjustment.
 - 5. Trouble shooting.
 - 6. Servicing.
 - 7. Maintenance.
 - 8. Shutdown.
- D. Provide at least forty (40) hours straight time instruction to the operating personnel.
 - 1. This instruction period shall consist of not less than five (5) eight (8) hour days.
 - 2. Time of instruction shall be designated by the Owner.
 - 3. This instruction shall be in addition to instructional requirements of specific equipment specified elsewhere in the mechanical specifications.

3.21 LUBRICATION

- A. All bearings, motors and all equipment requiring lubrication shall be provided with accessible fittings.

- B. Before turning over the equipment to the Owner, the Installer shall provide the following:
1. Fully lubricate each item of equipment.
 2. Provide one (1) year's supply of lubricant for each type of lubricant.
 3. Provide complete written lubricating instructions, together with diagram locating the points requiring lubrication.
- C. Motors and equipment shall be provided with grease lubricated roller or ball bearings with Alemite or equal extended grease fittings and drain plugs.

3.22 WALL AND FLOOR PENETRATIONS

- A. All penetrations of partitions, walls and floors by ducts, piping or conduit under Specification Division 22 shall be sealed and caulked. Provide UL listed fire stopping systems at penetrations through fire walls as specified in the architectural specifications.

3.23 EQUIPMENT PROVIDED UNDER ANOTHER DIVISION AND BY OTHERS

- A. The Installer of products under Division 22 shall make all system connections required to equipment furnished and installed under another division and by others.
- B. It shall be the responsibility of the Installer to obtain all necessary data from the equipment supplied under other Divisions.

3.24 CONSTRUCTION RECORD DRAWINGS

- A. As the work progresses, the contractor shall record on one (1) set of prints, the installed locations, sizes, and depths of pipes, services, equipment, etc. which may differ from the approved contract drawings.
- B. Upon completion of the plumbing system installations, the plumbing contractor shall deliver to the construction manager one (1) complete set of the plumbing system marked-up blueprints of the plumbing contract drawings.
1. The mark-ups shall be legibly marked in red pencil to show all changes and departures of the installation as compared with the original design.
- C. At a minimum include the following installed conditions:
1. Location of all shut off valves, drain valves, and balancing valves with assigned valve tag numbers.
 2. Show the location of concealed material and/or equipment requiring service such as strainers, traps, hot water heaters, and/or expansion compensators.
 3. Actual entering/leaving invert elevations for domestic water, sanitary, storm water, and natural gas services for the building.
 4. Where building services are located below floor slabs show the actual low point invert elevation and the high point invert elevation for gravity piping systems.

3.25 CLOSEOUT PROCEDURES

- A. Operating and Maintenance Instructions: Submit a complete package at least [one (1), two (2)] months prior to substantial completion. Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items: **<Coordinate with UMB and Edit Time for Project >**
1. Maintenance manuals, including a customized list of preventive maintenance items and annual schedule for maintenance.
 2. Record documents.
 3. Complete inventory of spare parts and materials.
 4. Tools.
 5. Lubricants.
 6. Fuels.
 7. Identification systems.
 8. Control sequences.
 9. Hazards.
 10. Cleaning.
 11. Warranties and bonds.
 12. Maintenance agreements and similar continuing commitments.
- B. As part of instruction for operating equipment, demonstrate the following procedures:
1. Start up.
 2. Shut down.
 3. Emergency operations.
 4. Noise and vibration adjustments.
 5. Safety procedures.
 6. Economy and efficiency adjustments.
 7. Effective energy utilization.
- C. Pressure Vessel Inspections by the State of Maryland: For the purpose of obtaining and having UMB buildings insured by any commercial insurance carrier, the contractor shall arrange for the inspection of all pressure vessels installed during construction. The contractor shall contact the Office of Boiler and Pressure Vessel Inspections of the Department of Labor, Licensing and Regulations (DLLR), State of Maryland, and arrange for the inspections. The DLLR shall be notified at least thirty (30) days prior to installation. After such inspections are carried out by the State Inspector's office, Certificates of Compliance will be issued to the contractor of record to be turned over to the Owner's representative for compliance with current insurance regulations as part of the Project Documents. Examples of pressure vessels include boilers, heat exchangers, converters, expansion tanks, water heaters, hot water generators and storage tanks. Chillers are excluded and are covered under ASHRAE Guidelines.

3.26 CLEAN UP

- A. Excessive debris and dirt, such as occurs from cutting through masonry or plaster walls shall be cleaned up from the equipment and removed immediately after the work of cutting through the walls.
- B. Debris shall be removed from UMB property.
- C. Ceiling panels shall be replaced as soon as work is finished in the area, and shall be kept free of dirty finger prints. Where work is being done in corridors used by patients and ceiling panels shall be replaced at the close of the day's work even if work is at the particular location is incomplete.
- D. All areas shall be left broom-clean at the end of the work period.
- E. Remove all mechanical clipping, wiring, nuts, bolts, etc. left on top of ceilings and ceiling tiles.

3.27 PROJECT PUNCH OUT

- A. Architect/Engineer will perform punch out reviews and will provide the Contractor with a list of punch list items to be completed before contract close out. Each and every punch list item shall be initialed and dated by the Contractor when the work is complete. The Architect/ Engineer will not perform any punch list verification until all items have been completed, initialed, dated and the list returned to the Architect/Engineer. If any items have been initialed as being completed by the Contractor and the Architect/Engineer determines that the work is not complete, the Architect/Engineer shall be reimbursed by the Contractor at his regular hourly rate for any and all items requiring revisiting of the site by the Architect/Engineer. Reimbursement shall be made by deducting the Architect/Engineer fee from the Contractor's final payment.

END OF SECTION 220000