PART 2: PLUMBING SYSTEM DESIGN

Amended 09-19-2022, See underlined text

1. SCOPE:

1.1. This part outlines the minimum requirements for the design procedures for plumbing systems, for new buildings, and repair and alteration projects for existing buildings on the UMB campus. See UMB Master Specifications, Division 22 Plumbing for more detailed information for material and equipment.

2. BUILDING DISTRIBUTION SYSTEMS:

1.1. **General:** Building distribution systems include storm water systems, A/C condensate systems, sanitary systems, acid waste systems, domestic cold and hot water systems, laboratory cold and hot water systems, natural gas systems, laboratory compressed air and vacuum systems, laboratory specialty gas systems such as CO2, nitrous oxide, and oxygen and RO/DI water systems.

3. GENERAL DESIGN CONSIDERATIONS FOR SEWER AND WATER SYSTEMS:

3.1. **Building Sewer Systems:** Provide separate sanitary and storm systems on the site and throughout the building.

3.2. **Building Water Service:** Provide separate water services for the domestic water and fire protection systems. Installation of water source shall comply with the City of Baltimore Procedures and Standards, in addition to the requirements of these Design Standards.

a. For large campus buildings, two sources of water from different mains are desirable, as determined by UMB.

b. Service lines must enter the building in an accessible location, and must never enter fuel rooms, storage rooms, switchgear rooms, or transformer vaults. Provide a water strainer at service entrance for the domestic water system as required to improve the incoming water quality.

c. **Building Automation System Flow Meter:** Include an IP based reportable flow meter in the main domestic cold water service inside the building to measure the total GPM flow rate and transmit the recorded flow to the building automation system (BAS). For additional metering requirements see Chapter 3 MD: HVAC Design of these Design Standards and coordinate with UMB.

d. **Water Meter Requirements:** The building water supply shall include an exterior meter vault. The location and construction shall be in compliance with the Baltimore City Standards. The meter vault shall house two (2) water meters, one meter shall serve the building's domestic water service and the other meter shall serve the building's fire protection service. For additional requirements for the building's fire protection service see Chapter 3 MD: Fire Protection Design of these Design Standards.

4. SANITARY SYSTEM:

4.1. General: UMB requires that all sanitary waste and vent distribution piping above grade within the building shall be cast iron no hub material as specified in the UMB master specifications. For sanitary waste piping below grade UMB requires cast iron bell and spigot material as specified in the UMB master specifications. Special waste shall be as defined herein.

4.2. Floor Drains:

a. General: Floor drains shall be installed in mechanical equipment rooms, kitchens and dishwashing areas, animal holding rooms, BSL-3 and ABSL-3 rooms, toilet rooms, rooms containing back flow preventers, garages, and similar areas. Coordinate types of floor drains with floor finish material.

b. Location: Floor drains shall be located near the equipment served to minimize surface water flow and to avoid crossing path of travel with surface flow or low drain piping. Number and locations of floor drains shall be provided to avoid standing water.

c. Connection to Drainage Systems: All floor drains, except those, exclusively collecting storm water, shall drain to the Sanitary System.

d. Trap Primers: Floor drains connected to the sanitary system shall be provided with trap priming systems. In rooms such as toilet rooms where there is a single drain the trap can be primed through a local trap priming valve or through a connection from a flush valve. Where multiple floor drains are located in a large room the floor drains shall be primed by an automatic priming system including a timer, distribution manifold, single water and power connection mounted in a panel.

e. Venting of Floor Drains: Of special note is the procedure for venting floor drains, floor sinks and other floor level fixtures. Although governed by the applicable section in the Plumbing Code, UMB will not accept designs which include horizontal vent piping below the floor level rim of the fixture. A vent which rises off the horizontal sanitary line from the floor drain and turns horizontal or slightly inclined below the floor slab will not be acceptable. Circuit venting or combination drain and venting shall be used if necessary to avoid this condition.

4.3. Cleanouts:

a. As a minimum requirement provide cleanouts in the sanitary system as required by the State Plumbing Code. In addition to the requirements of the Plumbing Code cleanouts shall be provided at the ends of horizontal waste piping located in pipe chases that serve wall mounted plumbing fixtures in toilet rooms. Locate the cleanouts for the horizontal piping in a vertical position at a height above the grab bar. Access doors in the wall or partitions will be required at these cleanout locations.

b. In finished spaces, the cleanout access cover shall be coordinated with UMB. Do not install cleanout fittings in floors of toilet rooms. Avoid locating cleanouts in main finished public spaces if possible. Adjust the routing of horizontal piping to avoid this condition.

c. Care shall be exercised to position cleanouts in accessible locations.

4.4. Sewage Ejectors:

a. Do not use sewage ejectors if other methods can be employed to allow gravity flow. If feasible, locate toilet facilities on upper floors. If ejectors are required, only lower floor facilities shall drain to them; upper floor facilities shall drain by gravity to the main sewer.

4.5. Special Wastes:

a. Separate drainage and vent systems for acid wastes shall be of corrosion-resistant material as specified in UMB master specifications, or as directed by UMB A/E staff. Where an acid waste piping system is appropriate; design a separate piping system to the point of exit from the building. At this point, combine with the general building sanitary system and discharge to the city's sanitary system. Do not indicate or specify the use of a neutralization system for acid waste systems.

4.6. Fixture Venting:

a. As described for floor drains, horizontal vent piping below the flood level rim of fixtures will not be acceptable to UMB. For island sinks, horizontal vent piping below the counter top will not be permitted.

4.7. Fixture Layout:

a. Fixtures shall be located so as to avoid back-to-back installation to eliminate cross fittings in the sanitary piping. Cross fittings shall not be used.

4.8. System Diagram: Provide a complete diagram for each waste and vent system. See Chapter 2 in the UMB Procedure Manual for A/E Professional Services for requirements.

5. STORM WATER SYSTEM:

5.1. General: UMB requires that all storm water distribution piping above grade within the building shall be cast iron no hub material as specified in the UMB master specifications. For storm water piping below grade UMB requires cast iron bell and spigot material as specified in the UMB master specifications. For garage structures specify that all above grade storm water piping, fittings, cleanouts and hangers must be galvanized.

5.2. Roof Drains:

a. **Types:** Coordinate with type of roofing system specified. Drain bodies and grates installed in parking garage structures must be galvanized.

b. **Locations:** Coordinate locations with architectural requirements and as per the Plumbing Code. Sizing should be based on maximum anticipated rate of rainfall permitted by the Plumbing Code.

c. **Secondary Drainage Systems:** Provide a secondary roof drainage system, sized for a one hundred (100) year, fifteen (15) minute storm duration as required by the plumbing code. When roof areas include parapet walls design scupper drains to discharge the excess water through the parapet wall. When roof areas do not include parapet walls design secondary roof drains to discharge the excess water down the face of the exterior wall.

5.3. Cleanouts:

a. Provide cleanouts in the storm water system as required by the Plumbing Code.

b. Refer to the paragraphs on cleanouts in the sanitary system section for additional requirements.

5.4. Sump Pumps:

a. Sump pumps shall not be used where gravity drainage methods can be employed.

b. Where sump pumps are necessary, provide a duplex sump pump arrangement with a pit employed below the floor; size each pump for full flow. Only drainage systems that can not be drained by gravity shall be drained to a sump pump. Submersible pumps or high and dry pumps are to be considered. Coordinate with electrical engineer to provide emergency power for sump pumps.

c. All new projects with hydraulic elevators are required by the State of Maryland DLLRS to have sump pumps with oil separators on the discharge of the sump pumps.

5.5. Steam Condensate:

a. As further described in Chapter 3 MD: HVAC System Design of these Design Standards, the residual heat from steam condensate shall be recovered prior to discharging into the storm water system.

5.6. A/C Condensate: Condensate from air conditioning equipment shall be discharged into the buildings storm water system. Where A/C condensate drains cannot be gravity drained into the storm water system, the condensate shall be discharged into sump pit and pumped into the storm water system.

5.7. Insulation:

a. Horizontal interior rain leaders and drain bodies shall be insulated to preclude condensation and associated damage.

b. Drains that have chilled water condensate must be insulated to eliminate sweating.

5.8. System Diagram: Provide a complete diagram for the storm water system. See Chapter 2 in the UMB Procedure Manual for A/E Professional Services for requirements.

6. WATER SUPPLY SYSTEM:

6.1. General: UMB requires all domestic cold and hot water distribution piping above grade within the building to be cooper pipe tube and fittings as specified in the UMB master specifications.

6.2. Building Water Services:

a. Pressure piping for domestic water and fire protection services shall not be permitted under building floor slabs that are installed on grade. Any deviation from this standard must be submitted to the UMB Project Manager for review and approval.

b. When designing the domestic water piping system attention should be given to ensure piping is not located over electrical equipment such as panels, motor control centers and other such electrical devices.

c. When automatic faucets are included in the design the engineer shall provide a central tempered water system which includes a thermostatic mixing valve and check valves in the incoming cold and hot water supplies. System design must be coordinated with UMB.

6.3. Water Pressures Requirements:

a. **Municipal Water Pressure and Flow:** Coordinate with Baltimore City Water Department for determination of water pressure and flow. Typically, it is UMB's experience that the street level water pressure from the city system is 55 psi or less.

b. **Minimum Water Pressure:** The minimum water pressure required, for uses other than fire protection; on a typical floor of a building is 30 psi, or more if required for specific equipment. On the Roof Level provide 50 psi water pressure for maintenance to service roof mounted mechanical equipment.

c. **Booster Pump System:** If street pressures are not adequate to maintain pressures indicated above, provide a booster pump, a pneumatic system, a constant pressure, or a maintained pressure pumping system with staged pumping units to provide pressure control and redundancy. Provide an analysis and comparison of initial, operating, and maintenance costs in the design development submission with a recommendation for system

selection. This system shall be designed to serve only portions of the water supply system where street pressure is inadequate.

d. For fire, sprinkler and standpipe systems, see Chapter 3 MD: Fire Protection Design of these Design Standards.

6.4. Domestic Water Piping System:

a. **General:** Do not place water piping in exterior walls, floor fills, structural slabs, above ornamental suspended ceilings, transformer vaults, or over switchboards, except for fire sprinkler system piping. Avoid extended runs of water piping in unheated garages or soffits, as heat-tape applications can result in substantial energy use.

b. **Backflow Protection:** Provide backflow protection for water piping systems. Protect water distribution systems against backflow (flow of water or other liquids into distributing pipes from a source(s) other than the intended sources), including HVAC make-up water systems. Refer to the current Baltimore City Requirements and the following:

1) Provide a second, backup backflow protection in bypass piping for the main building service and on critical need systems.
2) Provide backflow protection at connections to all equipment.
3) Provide separate, serviceable, accessible check valves on both hot and cold water connections to all tempering valves, shower mixing valves, single spout service sink faucets, photo processing equipment, fixtures with single lever faucets and all other fixtures where directed by UMB.
4) When sizing the distribution system and determining pressure requirements, the engineer shall take into account the pressure drop through backflow preventers and water meters.
5) The locations of all backflow preventers shall be shown on the construction drawings. Since backflow preventers require periodic inspection, maintenance and testing, they should be located in appropriate, accessible locations.
6) Backflow preventers shall not be mounted higher than forty eight (48) inches above the floor.
7) Location above ceilings is not acceptable.
8) Drains from the backflow preventers shall be piped directly to a floor drain. The floor drain and drain piping must be sized to accommodate the pressure and flow rate of the RPBLP as identified by the manufacturer.

c. **Pressure-Reducing Valves:** Pressure-reducing valves (PRV) shall be installed on domestic / laboratory water mains or branches where pressure in excess of 70 psi is expected. Provide a valved bypass, one pipe size smaller than the main size, around the pressure-reducing valves with isolation valves for removal of the PRV. Specifications shall state the initial pressure, required flow, and final pressure. The pressure reducing valves shall be located in accessible mechanical spaces only, and not above ceilings.

d. **Exterior Wall Hydrants**: Provide wall mounted frost-proof exterior wall hydrants above grade for lawn hoses so that any part of the building site may be reached with one hundred (100) feet of hose without having the hose cross building entrances. Provide shut-off valve on piping serving each wall hydrant. Pitch piping from shut-off valves to drain through hydrant.

e. **Roof Level Wall Hydrant:** Provide wall mounted frost-proof exterior wall hydrant(s) for servicing mechanical equipment above the Roof Level. Provide shut-off valve on piping serving each wall hydrant. Pitch piping from shut-off valves to drain through hydrant. See paragraph 6.3 for water pressure requirements.

f. **Interior Hose Bibs:** Provide hose bibs in janitor closets, mechanical equipment rooms, and animal holding rooms for maintenance and housekeeping. The water service for the hose bibs in mechanical rooms must be independent from the HVAC make up water systems.

g. **Vacuum Breakers:** Vacuum breakers shall be included on cold and/or hot water branch piping serving fume hoods, biological safety cabinets, and hose bibs. Where vacuum breakers are installed in partitions, provide a recessed wall cabinet with an access door. All vacuum breakers shall be accessible.

h. **Janitor Closets:** Provide a cold water connection with shut off valve and a reduced pressure backflow preventer for a university supplied chemical dispersion unit for housekeeping. See UMB Standard Detail.

i. **System Diagram:** Provide a complete diagram for each water system. See Chapter 2 in the UMB Procedure Manual for A/E Professional Services for requirements.

j. **Domestic Hot Water:**

1) For general plumbing and laboratory plumbing use, equipment shall be automatically controlled and shall have sufficient capacity to deliver 120^0F water to single-temperature faucets at the point of use.

2) Fuel or energy selected for water heating shall be determined by availability and cost. The type selected may be steam, gas, electricity, or solar, but is subject to UMB's review and approval.

3) Heater size should be in agreement with the latest ASHRAE Handbook.

4) The design engineer shall utilize all available heat energy from steam condensate, and flash steam to preheat domestic water. Provisions shall be made to temper the supply hot water temperature to 120^0F as necessary.

5) Provide a separate domestic water heating system to supply high-temperature water to kitchen equipment, glass wash, and special use areas.

6) Separate recirculating domestic hot water systems shall be designed for general plumbing and laboratory plumbing, with hot water produced from separate generators.

7) For high rise buildings provide separate water heaters, recirculation pumps, and distribution systems for municipal water pressure service and boosted water pressure services. Create separate pressure zones for domestic/laboratory hot water distribution.

k. Provide water hammer arrestors as needed where water hammer is anticipated. Show the locations of all arrestors on the drawings and locate them in accessible areas. Provide access doors.

l. Piping Limitations:

1) Domestic water shall not be used as a condensing fluid. This restriction applies to refrigeration units of any size. Exception: When the design scope or UMB requires water cooled refrigerant equipment such as A/C units for supplemental cooling or for walk-in cold boxes, provide an emergency connection to the domestic water system and a drain outlet piped to a floor drain as directed by UMB facilities management staff. The emergency supply and drain shall be a manual operation by UMB personnel.

6.5. Valves:

a. Locations and types of valves must be shown on drawings, be accessible, and be identified with suitable markers. The use of gate valves for plumbing and HVAC systems are not acceptable to UMB. See UMB master specifications for acceptable valve types.

b. Install valves on cold water, hot water, and hot water return circulating mains so that sections of mains may be shut off without disturbing the services to other parts of the building. At a minimum provide isolation valves to isolate the distribution piping serving each floor from the main building risers. In addition, a valve shall be provided on the main supply at its entrance to the building and on inlets and outlets of mechanical equipment requiring water connections. During both new construction and renovation design, particular care shall be taken to ensure that there are no dead end piping runs.

c. Install a shut-off valve close to the main on each branch connection off the main serving more than one fixture. Provide valves at the base of risers when served from below, or the top of risers when served from above.

d. Install a valve on the supply to each toilet room where the riser supplies more than one toilet room, and on the connection to each wall hydrant.

Provide drain valves with hose ends at the low points of systems, in all trapped portions of piping systems, and at the base of risers.

e. Provide valved and capped connections per floor in the water distribution system for future expansion. Coordinate with UMB for number, size, and locations of future connections.

f. Piping system designs must include locations of low point drain valves on floor plans, sections, elevations, diagrams, details, etc.

6.6. Fire Protection System:

a. Plumbing systems shall be coordinated with the requirements of fire protection systems, which may include automatic sprinkler systems, fire pumps, fire standpipes, fire hydrants, mains, water tanks, or fire department connections.

b. Extreme care shall be taken to ensure that potable water for the domestic system is maintained. The design shall require safety precautions, such as backflow preventers and other safety devices, to protect the domestic water system when cross-connections are made with other systems.

c. For fire protection requirements, see Chapter 3 MD: Fire Protection Design of these Design Standards.

d. **System Diagram:** Provide a complete diagram for the fire protection system. See Chapter 2 in the UMB Procedure Manual for A/E Professional Services for requirements.

6.7. Emergency Showers and Eye Wash Stations:

a. Provide emergency showers and eye wash stations as required by Laboratory Design Guides, program requirements, applicable Code Requirements, and good design practice. All emergency showers and eye wash stations shall be supplied from the domestic cold water system. See Chapter 3 AD of these Design Standards for additional requirements.

7. NATURAL GAS SYSTEMS:

7.1. General:

a. Natural gas piping systems shall be designed to meet the requirements of NFPA 54, latest edition.

b. Provide gas booster system where required to maintain adequate pressure at point of use. Coordination with Baltimore Gas Electric Co. (BGE) to determine gas availability and pressure shall be performed by the A/E.

7.2. Ventilation:

a. Ventilate gas meter rooms and places containing major gas-supplied equipment, such as gas-fired boilers, gas-engine emergency generators, or other equipment using large quantities of gas, to ensure removal of leaking gas.

7.3. Natural Gas Piping Systems:

a. Provide a natural gas piping distribution system to all gas fired equipment. Provide valves for isolation from other gas systems.

c. Provide a natural gas piping distribution system to all research laboratories. Include valves for isolation from other gas systems. Provide a natural gas zone valve in a wall mounted box for each laboratory space requiring natural gas piping to bench top outlets. Include the UMB detail in the CD's. Coordinate the valve box location with the architect and electrical engineer.

b. The piping system material and isolation valves shall be as specified in the UMB master specifications.

7.4. System Diagram: Provide a complete diagram for the natural gas system. See Chapter 2 in the UMB Procedure Manual for A/E Professional Services for requirements.

8. LABORATORY SPECIALTY GAS SYSTEMS:

8.1. Laboratory specialty gas systems include compressed air, vacuum, co2, nitrogen, nitrous oxide, and oxygen systems and related piping distribution systems as required by the project program.

8.2. Laboratory compressed air and vacuum systems; shall be provided with multiple compressors and pumps for increased reliability, lead/lag starting controls, and arranged with complete isolation mechanically and electrically for servicing of one unit without interruption of operation of the other unit. Specify unit controller to sequence pumps and shall be interfaced with the BAS. Individual pumps without a master controller are not acceptable.

8.3. When directed by UMB or as required by the project program laboratory compressed air systems shall be designed to supply 120 psi compressed to laboratory spaces special equipment requiring air pressure between 85 and 120 psi. Provide pressure reducing valves in the system to serve laboratory areas where air pressure requirements are less than 85 psi. Design of separate compressed air systems may be considered and should be reviewed with UMB at the Design Development Phase.

8.4. All vacuum and compressed air systems and other specialized laboratory gas systems such as nitrogen, and nitrous oxide shall be designed to meet the requirements of NFPA 99, latest edition. System alarms shall be interfaced with the BAS along with a local alarm.

8.5. Where the project program or user requirements indicate the use of portable cylinders, the A/E shall design a manifold distribution system. The design shall

include space and accessories for bottle holding racks, isolation valves, and refilling provisions. Coordinate with the A/E team for all design requirements.

8.6. Laboratory Specialty Gas Piping Systems:

a. The piping system material and isolation valves shall be as specified in the UMB master specifications.

b. Design laboratory specialty gas piping distribution systems for all laboratory spaces, fume hoods, biological safety cabinets, and countertop outlets as defined in the project program or as directed by UMB. For each distribution system include, isolation valves for each laboratory space, floor level branch piping and at the base of each riser.

8.7. System Diagrams: Provide a complete diagram for each laboratory specialty gas system. See Chapter 2 in the UMB Procedure Manual for A/E Professional Services for requirements.

9. REVERSE OSMOSIS/DEIONIZED (RO/DI) WATER SYSTEMS:

9.1. Provide either a central RO/DI water system or a point of use RO/DI water system to meet the needs of the project. Coordinate with UMB to determine the RO/DI loads for the project. Where existing RO/DI system is present with sufficient capacity for expansion, consider connecting to the existing system in lieu of designing a new RO/DI system.

9.2. When the project requires a central RO/DI water system (minimum one (1) meg Ohm quality water) this system shall be designed as a parallel recirculating type system complete with all necessary storage tanks, process equipment, piping controls, safety devices, etc. The system design shall also include provisions for both floor and individual laboratory isolation.

9.3. Coordinate all system components with UMB.

9.4. The central RO/DI system shall be located in a mechanical room on the penthouse level or the uppermost floor of the building. Make provisions for sanitizing sections of the system without affecting other parts of the building.

9.5. RO/DI Piping System:

a. The piping system material and isolation valves shall be as specified in the UMB master specifications.

b. Design an RO/DI pipe distribution system to all laboratory spaces, fume hoods, biological safety cabinets, and countertop outlets as defined in the project program or as directed by UMB. Include isolation valves for each laboratory space, floor level branch piping and at the base of each riser.

c. System Diagram: Provide a complete diagram for the RO/DI system. See Chapter 2 in the UMB Procedure Manual for A/E Professional Services for requirements.

10. LABORATORY PLUMBING DESIGN FOR NEW AND/OR RENOVATION PROJECTS:

10.1. Design Intent: The intent of the laboratory plumbing design is to standardize the use of materials, equipment, and systems for all new laboratory installations and all laboratory renovation projects. The A/E shall discuss with UMB the selection of all material and equipment prior to proceeding with the design.

10.2. General Laboratory Requirements: Standard laboratory requirements shall include but not be limited to the following:

a. Plumbing Services: Plumbing services shall include acid waste and vent, cold hot and hot water return, natural gas, air, vacuum, RO/DI and bottled gas services for all laboratory fixtures and equipment.

b. Plumbing Fixtures: Plumbing fixtures shall include laboratory 18 gauge polished stainless steel 10-1/2 inches deep drop in type sinks with sound deadening undercoat, except sinks in epoxy tops shall be epoxy composition, either integral or dropped-in as directed. Outlets for water, gas, air, vacuum and bottled gases shall be either deck mounted or wall mounted as directed by UMB.

c. Emergency Eye Wash and Shower: Include one (1) emergency hand held eye wash assembly, in each laboratory, located on the left side of a laboratory sink. Locate emergency showers so that the travel time from any laboratory does not exceed the travel time required by applicable codes or laboratory design standards. Emergency shower locations do not require floor drains, and they shall not be provided except as otherwise directed by UMB.

d. RO/DI Faucets and Connections: In each laboratory provide a non re-circulating gooseneck faucet with an integral vacuum breaker at each sink. Also provide a RO/DI valved connection for a local polishing unit adjacent to a sink.

e. Natural Gas Service: In laboratories requiring natural gas service for two (2) or more outlets provide a gas zone valve mounted in a recessed wall mounted zone valve box assembly located in the corridor adjacent the entrance to each laboratory.

10.3. Special Laboratory Requirements: Special laboratory requirements shall include but not be limited to the following:

a. Low Flow Chemical Fume Hoods: In laboratories with low flow chemical fume hoods provide plumbing services for laboratory gases and a cup sink.

b. Biological Safety Level Cabinets: In laboratories with biological safety cabinets provide a vacuum service to each hood.

c. Tissue Culture Laboratories: In tissue culture laboratories provide a dedicated bottled gas manifold piping distribution system to supply carbon

dioxide for each incubator. The manifold shall be suitable for multiple cylinders.

d. **Biological Safety Level 2 (BSL-2) Laboratories:** In BSL-2 laboratories provide a hand sink, either stainless steel or porcelain, and an eyewash station located near the exit door. Vacuum lines should be protected with High Efficiency Particulate Air (HEPA) filters, or their equivalent. Filters must be replaced as needed. Liquid disinfectant traps may be required.

e. **Biological Safety Level 3 (BSL-3) Laboratories:** A/E design team must coordinate the designs for biological safety level 3 areas with UMB.

f. **Animal Biological Safety Level 3 (ABSL-3) Laboratories:** A/E design team must coordinate the designs for animal biological safety level 3 areas with UMB.

g. **Surgery Laboratories:** In laboratories used for survival and/or non - survival surgery in addition to standard laboratory requirements provide a stainless steel scrub sink with wrist blade handles on the faucet and wall mounted gas, air and vacuum outlets.

h. **Animal Holding Rooms:** In rooms used to hold animals provide hose bibs and floor drains.

i. **Prosthetic Dental Laboratories:** In prosthetic dental laboratories provide special sinks with plaster and/or metal traps as directed.

j. **Dark Rooms:** In dark rooms provide dark room sinks and trays as directed by UMB.

11. PLUMBING FIXTURES:

11.1 Provide the quantity and type of plumbing fixtures that complies with the State Plumbing Code, ADA, and University requirements and/or meets the needs of the project being designed.

11.2 **Fixture Elevations:** Each trap for plumbing fixtures and floor drains shall be installed so that the trap invert is not less than three (3) feet above the top of the City sewer or main private sewer into which it discharges.

11.3 At or before the 50% CD submission, the engineer shall review with UMB the proposed specifications and selections for all plumbing fixtures to be included in the design.

11.4 Tank type water closets shall not be specified.

11.5 Push-button type metering faucets shall not be specified.

11.6 Plumbing fixtures used for the handicapped shall meet the requirements of ADA for handicapped accessibility.

11.7 Where required by the University, provide automatic faucets for each lavatory and automatic flush valves on each water closet and urinal. The automatic faucets and flush valves shall be battery powered type. See UMB Specifications. This design shall be coordinated with UMB.

12. DRINKING WATER DISPENSERS:

12.1 General: Provide one (1) drinking water dispenser adjacent to or near multi-stall toilet rooms, but not in entrance lobbies, or where hazardous materials are stored.

12.2 Type of Dispensers: Drinking water dispensers shall be standard packaged self-contained refrigerated drinking water dispensers such as electric water coolers or combination water cooler and bottle filling stations. Coordinate dispenser type with UMB D&C.

12.3 Drinking Water: Drinking water shall be chilled and supplied at 55^0F from the drinking water dispensers.

END OF CHAPTER 3 MD - PART 2