PART 4: FIRE PROTECTION SYSTEM DESIGN

Amended 9-19-2022, See underlined text

1. SCOPE:

1.1. This part outlines the minimum requirements for the design procedures for fire protection systems, for new buildings, and repair and alteration projects for existing buildings on the UMB campus. See UMB Master Specifications, Division 23 HVAC for more detailed information for material, equipment, and installation requirements.

2. GENERAL REQUIREMENTS:

2.1. All UMB buildings shall be protected with a sprinkler system which covers 100% of the floor area, and which meets the requirements of the State of Maryland Fire Protection Code and applicable NFPA Codes and Standards. Most fire protection requirements imposed by the State of Maryland are adopted by reference to national codes and standards developed by associations such as the National Fire Protection Association (NFPA), American Society for Testing and Materials (ASTM) American National Standards Institute (ANSI), and the International Building Code (IBC) with modifications. These codes and standards are considered requirements for the State of Maryland to the extent they are referenced, except where exceptions are noted. Special situations may require a different type of automatic fire protection system for localized areas, as listed herein. Coordinate with UMB Fire Marshal for selection of alternative systems.

2.2. **Building Codes:** Construction, repairs and alterations shall be in compliance with state adopted nationally recognized model fire and building codes and standards. The referenced edition of these codes/standards shall be used.

2.3. **Systems and Codes:** Types of fire protection systems and applicable codes:

- **a.** Carbon Dioxide Extinguishing Systems – NFPA 12.
- **b.** Halon 1301 Extinguishing Systems – NFPA 12A.
- **c.** Sprinkler Systems - NFPA 13.
- **d.** Sprinkler Systems in Low-Rise Residential Occupancies - NFPA 13R.
- **e.** Standpipe and Hose Systems – NFPA 14.
- **f.** Water Spray Fixed Systems – NFPA 15.
- **g.** Foam-Water Sprinkler and Foam-Water Spray Systems – NFPA 16.
- **h.** Dry Chemical Extinguishing Systems – NFPA 17.
- **i.** Wet Chemical Extinguishing Systems – NFPA 17A.
- **j.** Wetting Agents – NFPA 18.
- **k.** Fire Pumps – NFPA 20.
- **l.** Private Fire Service Mains – NFPA 24

2.4. When required by the building design and/or applicable codes, UMB buildings shall be provided with a smoke evacuation system and/or stair pressurization systems, as required by NFPA 101 Life Safety Code.

2.5. Coordinate all system components with UMB, and the University Fire Marshal.

2.6. For protection of potable water systems see Chapter 3 MD: Plumbing System Design of these Design Standards.

2.7. All sprinkler system designs shall be based on the UMB fire protection specifications. The "Occupancy Classification" shall be presented for discussion with UMB as such buildings or building portions are designed. The UMB Fire Marshal shall have final approval on identification of building occupancies.

2.8. The engineer shall perform necessary hydraulic calculations to determine water supply pipe sizes, pressures, and pressure drops to the most hydraulically remote area. For minor renovations, the UMB Fire Marshal may waive hydraulic calculations on a case-by-case basis. If the hydraulic calculations requirement is waived the design shall be based on the existing building pipe schedule. The engineer needs to provide direction if the design will be based on the existing building pipe schedule or hydraulic calculations are required.

2.9. The intent of the A/E Design is to provide enough information on the contract document so that the contractor can accurately bid the project based on the plans and specifications.

2.10. The following information shall be provided on separate fire protection drawings:

a. For a combination standpipe and sprinkler system, the document shall contain applicable items from the list below:

(1) Flow test data. The A/E shall make arrangements for a flow test to be performed during the design.

(2) Sizing of fire service to building.

(3) Location of backflow preventer.

(4) Sizing of fire pump, if required.

(5) Fire pump room layout.

(6) Type of fire/jockey pump controller.

(7) Sizing of standpipe.

(8) Location of floor control valves.

(9) Pressure rating of piping and valves.

(10) Location of tamper and flow switches.

(11) Return bends required at typical drop to pendent sprinkler heads.

(12) Location of fire department connection, alarm check valve, fire pump test header, all system drains and fire department hose valves.

(13) Location of building supply mains and standpipe risers (with sizes).

(14) Provision for forward-flow test of backflow preventer.

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

2.11. The engineer shall specify the following contractor requirements:

a. Contractor Responsibilities:

(1) Flow test data, independent of A/E flow test.

(2) Provide a complete and operable system in accordance with NFPA codes and local regulations.

(3) Provide working drawings in accordance with NFPA codes.

(4) Complete sprinkler piping and head layout downstream of the fire entrance riser and/or floor control devices at each floor.

(5) Coordinate routing of piping with other disciplines and building structure.

2.12. The engineer shall incorporate the UMB fire protection specification into the project construction documents. This UMB specification shall be edited and formatted by the engineer to suit the project requirements.

3. WATER SUPPLY REQUIREMENTS:

3.1. Types of Water Supplies: The water supply system shall provide ample water to meet the needs according to NFPA. There are two (2) types of fire protection demands as follows:

a. Hose stream allowance.

b. Automatic sprinkler systems.

3.2. Fire Department Connection: Only one (1) fire department connection shall be provided for any building that has a sprinkler system or standpipe system. In new construction, standpipe and sprinkler systems shall be interconnected so that each fire department connection will serve all fire protection needs simultaneously. Where the building faces on more than one street, additional fire department connections may be required. Coordinate with the UMB Fire Marshal during design.

3.3. Deficient Water Pressure: If the available water supply lacks the required water pressure to meet the system design, a fire booster pump shall be provided.

3.4. Hydrants and Mains: When necessary to provide fire hydrants, valves, or underground fire mains, the material, installation and location shall meet the requirements of NFPA 24, and Baltimore City Department of Public Works.

3.5. Fire and Booster Pumps: Fire pumps, booster pumps and their related electrical controllers shall meet the requirements of NFPA 20 and NFPA 70. The engineer shall include in the fire pump design a fire pump test header to facilitate fire pump flow tests. The discharge for the test header shall be piped to discharge outside near grade.

3.6. Public Water Main Connections: Connections to public water mains shall be sized to provide the required water demand for the fire protection system. During the design process the engineer shall verify through appropriate analysis, calculations, and consultation with the appropriate Baltimore City Departments and the UMB Fire Marshal, the adequacy of the existing water supply mains to provide the necessary flow rates. See Chapter 3 MD: Plumbing System Design of these Design Standards for water meter requirements.

3.7. **Sprinkler System Devices:** Required sprinklers shall be connected to a vertical fire riser system in accordance with NFPA 13. The sprinkler system connection shall be equipped with a water flow alarm connected to the building fire alarm system. An inspectors test shall be constructed as one self-contained unit, and valve tamper devices shall be provided. Valve tamper devices shall transmit a supervisory signal to the building fire alarm system.

3.8. **Fire Department Hose Connections:** Provide two and one half (2-1/2) inch fire department hose connections at each floor level off the fire main riser. Provide a two and one half (2-1/2) inch to one and one half (1-1/2) inch reducer with an easily removed cap on each two and one half (2-1/2) inch Fire Department hose connection. These threads shall also be compatible to the Baltimore City Fire Department hose.

4. AUTOMATIC SPRINKLER PROTECTION:

4.1. Coverage:

a. Automatic sprinkler systems shall be provided for the entire project area.

b. Automatic sprinkler systems shall be installed in accordance with NFPA 13 and UMB master specifications.

c. Wherever partial coverage sprinkler systems are required by the program scope, the sprinklered area shall be separated from the unprotected areas by fire rated construction materials. Coordinate this requirement with the architect.

4.2. Systems:

a. All sprinkler system installations shall be of the wet type, except:

(1) Where sprinkler protection is required in unconditioned areas, such as loading docks or attic spaces, the A/E team shall specify a dry pipe or pre-action sprinkler system and all necessary components for these types of areas. Dry pipe or pre-action type sprinkler systems shall include a nitrogen generator and air compressor either located in a cabinet or floor mounted.

4.3. Sprinklers:

a. **Quick Response Sprinklers:** Quick response commercial type sprinklers shall be used in all new sprinkler systems and in renovation areas where modifications to existing sprinkler systems are required.

b. **High Temperature Sprinklers:** High temperature commercial type sprinklers shall be used in areas where sterilizers, glass washers and/or cage washers are installed.

4.4. Special Considerations:

a. In areas of the building where local control of the sprinkler system is required, provide a shut off valve with a tamper switch in the sprinkler piping serving the area. This valve and tamper switch must be accessible. Examples of areas requiring local control are:

(1) Computer Main Frame Rooms.

(2) Library Book Stacks.

(3) Rare Book Rooms.

(4) Elevator Shafts.

(5) High valuable areas.

b. The local control valve may be located above the ceiling or installed in a recessed wall cabinet, as directed by UMB and/or the UMB Fire Marshal. The local valve shall always be located outside of the room or area served.

5. SMOKE CONTROL SYSTEMS:

5.1. Smoke control systems shall be completely engineered systems in accordance with accepted engineering practice and in compliance with Section 9.3 of the NFPA 101 - Life Safety Code. Where allowable and economically feasible, these systems shall utilize the existing or new HVAC components as appropriate. Where the engineered smoke control system includes smoke evacuation or exhaust, provisions shall be made for positive introduction of outside make-up air. These systems shall not rely on window or door openings for make-up air. Approval of the design shall be subject to review and acceptance by UMB and the UMB Fire Marshal. Provisions shall be included for initial acceptance and periodic testing and demonstration of performance of the systems, including appropriate documentation of all pertinent performance criteria.

5.2. Provide an on-off-auto switch for the smoke control system on a smoke control panel, installed adjacent to the fire alarm control panel.

6. STAIR PRESSURIZATION SYSTEMS:

6.1. Stair pressurization systems shall be completely engineered systems in accordance with accepted engineering practice and in compliance with Section 9.3 of the NFPA 101- Life Safety Code. These systems shall be designed to be completely independent of all other HVAC Systems. These systems shall not be provided with any heating, cooling or filtering equipment or coils. Approval of the design shall be subject to review and acceptance by UMB the UMB Fire Marshal. Provisions shall be included for initial acceptance and periodic testing and demonstration of performance of the system, including appropriate documentation of all pertinent performance criteria.

END OF CHAPTER 3 MD - PART 4
END OF MECHANICAL DESIGN STANDARDS