

# **CITY OF MADISON FIRE DEPARTMENT (MFD)**

## **FIRE PROTECTION SYSTEM PLANS**

Fire Protection Systems includes the following:

- Alternate Fire Suppression Systems
- Atrium Fire Protection Systems
- Automatic Fire Sprinkler Systems
- Fire Alarm Systems
- Private Fire Service Mains and Fire Hydrant Systems
- Standpipe and Hose Systems

There are specific submittal requirements for each type of fire protection system. The requirements vary depending on the type of fire protection system proposed for installation. This document is subdivided by the type of fire protection system using the corresponding NFPA standard. The submitter must know what type of fire protection system is being installed to determine what must be submitted for examination and approval. The following Plan Submittal Checklist for Fire Protection System Plans has been provided to assist you in preparing your complete fire protection system plan submittal.

MFD follows the 20 or less sprinkler threshold rules as specified in s. Comm 61.34, Wis. Adm. Code, regarding sprinkler construction documents. Plans are not required, however, a permit from MFD is required for remodel projects in existing buildings involving the alteration or addition of 20 or less sprinklers.

### **PLAN SUBMITTAL CHECKLIST FOR FIRE PROTECTION SYSTEM PLANS**

The following pages contain detailed lists of information required on fire protection system plans submitted for approval. They are listed by the standard or code that governs that particular type of system. The lists are the minimum amount of information required. Additional information may be needed in order for the construction documents to convey a clear representation of the designer's intent.

**The following is a list of general requirements for all fire protection system plans submitted:**

1. Permit applications for plan approval must include a minimum 3-copies of the working plans, applicable calculations, and product cutsheets. The plan review fee must also be included at the time of permit application.
2. The plans submitted for approval shall be the working plans for the system installation and drawn to scale, the preferred scale for floor plans is 1/8-inch equals one-foot.
3. All plans shall include the name of the owner and the address of the building.
4. Floor plans shall be included showing the location and size of all rooms, doors, windows, walls, partitions, firewalls, and other pertinent information.
5. Plans shall include sections and details necessary to clarify the building construction, ceiling heights and system design.
6. Detailed manufacturer's cutsheets for all materials and devices essential to successful system operation.
7. Where significant changes occur to the project that require deviation from the approved plans; revised plans shall be submitted for approval prior to installation of the revision.
8. Additionally, for fully sprinklered buildings include:
  - a. A Plot Plan showing the location of the building with respect to the property lines and lot lines. The plot plan shall indicate adjoining streets and alleys, as well as other buildings on the same property. The plot plan shall also include all fire protection yard piping, connection to water supply and the location of fire hydrants.
  - b. Elevation Plans of the building and system risers shall be provided, including the exterior grade line.

## **NFPA 11 - LOW-EXPANSION FOAM**

1. Physical details of the hazard: including the location, arrangement and hazardous materials involved.
2. Water requirements.
3. The type of foam concentrate used.
4. The consumption rates of the foam concentrate.
5. The required solution application rate and discharge time.
6. The method of foam proportioning.
7. Pipe and fittings.
8. The method of system control including schematic wiring diagrams if required.
9. Supplemental protection if provided.
10. Calculations specifying required amount of concentrate.
11. Hydraulic calculations.
12. Identify and state capacity of all equipment and devices.
13. Location of all piping, detection devices, operating devices, generators, discharge outlets and auxiliary equipment.
14. Complete working plans and detailed data (specifications) describing pumps, drivers, controllers, power supply, fittings, suction and discharge connections and suction conditions, shall be submitted for approval.

## **NFPA 11A - MEDIUM- AND HIGH-EXPANSION FOAM**

1. The system working plans and specifications shall be part of the submittal.
2. A detailed description of specific materials involved.
3. The location and arrangement of the hazard.
4. The required amounts of foam concentrate.
5. Water requirements.
6. Hydraulic calculations.
7. The location and function of detection devices, operating devices, auxiliary equipment, including standby power, and electrical circuitry, if used.
8. The size and location of foam generators.
9. The foam requirements shall be detailed on the plans.

## **NFPA 12 - CARBON DIOXIDE EXTINGUISHING SYSTEMS**

1. The working plans shall be drawn to an indicated scale or be suitably dimensioned.
2. Key plan showing location of the system.
3. Point of compass.
4. Materials involved in the protected hazards.
5. Location of the hazards.
6. Enclosure or limits and isolation of the hazards.
7. Surrounding area that could affect the protected hazards.
8. Information and calculations on the amount of carbon dioxide.
9. Location and flow rate of each nozzle including equivalent orifice area.
10. Location, size and equivalent lengths of pipe, fittings and hose.
11. Location and size of the carbon dioxide storage facility.
12. Location and function of detection devices, operating devices, auxiliary equipment and electrical circuitry.

## **NFPA 13, 13D & 13R - INSTALLATION OF SPRINKLER SYSTEMS**

1. A current waterflow test.
2. An adequately sized air compressor if required.
3. Remote area location.
4. Explanation and code reference for any adjustments in the design criteria.
5. Relief valve or expansion tank shown for gridded systems.
6. Method for testing alarms.
7. Working plans shall be drawn to an indicated scale, on sheets of uniform size, with a plan of each floor, and shall show those items from the following list that pertain to the design of the system:
  - (1) Name of owner and occupant.
  - (2) Location, including street address.

- (3) Point of compass.
  - (4) Full height cross section, or schematic diagram, including structural member information if required for clarity and including ceiling construction and method of protection for nonmetallic piping.
  - (5) Location of partitions.
  - (6) Location of fire walls.
  - (7) Occupancy class of each area or room.
  - (8) Location and size of concealed spaces, closets, attics, and bathrooms.
  - (9) Any small enclosures in which no sprinklers are to be installed.
  - (10) Size of city main in street and whether dead end or circulating; if dead end, direction and distance to nearest circulating main; and city main test results and system elevation relative to test hydrant.
  - (11) Other sources of water supply, with pressure or elevation.
  - (12) Make, type, model, and nominal K-factor of sprinklers.
  - (13) Temperature rating and location of high-temperature sprinklers.
  - (14) Total area protected by each system on each floor.
  - (15) Number of sprinklers on each riser per floor.
  - (16) Total number of sprinklers on each dry pipe system, preaction system, combined dry pipe-preaction system, or deluge system.
  - (17) Approximate capacity in gallons of each dry pipe system.
  - (18) Pipe type and schedule of wall thickness.
  - (19) Nominal pipe size and cutting lengths of pipe (or center-to-center dimensions). Where typical branch lines prevail, it shall be necessary to size only one typical line.
  - (20) Location and size of riser nipples.
  - (21) Type of fittings and joints and location of all welds and bends. The contractor shall specify on drawing any sections to be shop welded and the type of fittings or formations to be used.
  - (22) Type and locations of hangers, sleeves, braces, and methods of securing sprinklers when applicable.
  - (23) All control valves, check valves, drain pipes, and test connections.
  - (24) Make, type, model, and size of alarm or dry pipe valve.
  - (25) Make, type, model, and size of preaction or deluge valve.
  - (26) Kind and location of alarm bells.
  - (27) Size and location of standpipe risers, hose outlets, hand hose, monitor nozzles, and related equipment.
  - (28) Private fire service main sizes, lengths, locations, weights, materials, point of connection to city main; the sizes, types and locations of valves, valve indicators, regulators, meters, and valve pits; and the depth that the top of the pipe is laid below grade.
  - (29) Piping provisions for flushing.
  - (30) Where the equipment is to be installed as an addition to an existing system, enough of the existing system indicated on the plans to make all conditions clear.
  - (31) For hydraulically designed systems, the information on the hydraulic data nameplate.
  - (32) A graphic representation of the scale used on all plans.
  - (33) Name and address of contractor.
  - (34) Hydraulic reference points shown on the plan that corresponds with comparable reference points on the hydraulic calculation sheets.
  - (35) The minimum rate of water application (density), the design area of water application, in-rack sprinkler demand, and the water required for hose streams both inside and outside.
  - (36) The total quantity of water and the pressure required noted at a common reference point for each system.
  - (37) Relative elevations of sprinklers, junction points, and supply or reference points.
  - (38) If room design method is used, all unprotected wall openings throughout the floor protected.
  - (39) Calculation of loads for sizing and details of sway bracing.
  - (40) The setting for pressure-reducing valves.
  - (41) Information about backflow preventers (manufacturer, size, type, flow chart).
  - (42) Information about antifreeze solution used (type and amount).
  - (43) Size and location of hydrants, showing size and number of outlets and if outlets are to be equipped with independent gate valves. Whether hose houses and equipment are to be provided, and by whom, shall be indicated. Static and residual hydrants that were used in flow tests shall be shown.
  - (44) Size, location, and piping arrangement of fire department connections.
- 8. Water supply capacity information. The following information shall be included:**
- (1) Location and elevation of static and residual test gauge with relation to the riser reference point.
  - (2) Flow location.
  - (3) Static pressure, psi.
  - (4) Residual pressure, psi.
  - (5) Flow, in gpm.
  - (6) Date.
  - (7) Time.

- (8) Test conducted by or information supplied by.
- (9) Other sources of water supply, with pressure or elevation.

## HYDRAULIC CALCULATION CHECKLIST:

### Summary Sheet:

1. Date.
2. Location.
3. Name of owner and occupant.
4. Name & address of project.
5. Description of hazard.
6. Name & address of contractor.
7. Design area, ft<sup>2</sup>.
8. Minimum rate of water application, gpm/ft<sup>2</sup>.
9. Area per sprinkler, ft<sup>2</sup>.
10. Total water & pressure requirements as calculated.
11. Hose allowances added.
12. Rack sprinkler allowance added.
13. Water curtain allowance added.
14. Limitations (dimensions, flow, and pressure) on extended coverage or other listed special sprinklers.

### Detailed Work Sheets:

1. Sheet number.
2. Sprinkler description and discharge constant (*K*).
3. Hydraulic reference points.
4. Flow in gpm.
5. Pipe size.
6. Pipe lengths, center-to-center of fittings.
7. Equivalent feet or friction loss for fittings, dry pipe valve, preaction valve, deluge valve, backflow preventer, etc.
8. Friction loss in psi/ft of pipe.
9. Total friction loss between reference points.
10. In-rack sprinkler demand balanced to ceiling demand.
11. Elevation head in psi between reference points.
12. Required pressure in psi at each reference point.
13. Velocity pressure and normal pressure if included in calculations.
14. Notes to indicate starting points or reference to other sheets or to clarify data shown.
15. Flow diagram included with grid calculations.
16. Equivalent K factors for drops, sprigs, etc.
17. Correct C factor for system & pipe type.
18. Calculations for grids indicate system was peaked.
19. Calculations include all piping to the water supply source used.
20. Correct minimum operating pressure for all sprinklers.
21. Where residential sprinklers are used, a 4-sprinkler calculation and a 1-sprinkler calculation must be submitted.
22. Calculations & plans use appropriate hydraulic symbols.
23. Graph sheet. The graph sheet shall be plotted on semi-logarithmic graph paper (Q<sup>1.85</sup>).

### SPECIFICATIONS: Manufacturer's cutsheets: NFPA 13:8-1.1.2

1. Sprinklers
2. Cross connection control device
3. Dry pipe valve
4. Preaction valve
5. Deluge valve
6. Alarm check valve
7. Fire pump
8. Fire pump controller
9. Pressure tank
10. Pressure reducing valve
11. Foam equipment
12. Detection equipment for preaction & deluge system
13. All materials and devices essential to successful system operation; e.g. piping, fittings, FDC, valves, supervisory devices, etc.

### NFPA 13: Table 1-5 Hydraulic Symbols

Symbol or Abbreviation	Item
<i>p</i>	Pressure in psi
gpm	U.S. gallons per minute
<i>q</i>	Flow increment in gpm to be added at a specific location
<i>Q</i>	Summation of flow in gpm at a specific location
<i>P<sub>t</sub></i>	Total pressure in psi at a point in a pipe
<i>P<sub>f</sub></i>	Pressure loss due to friction between points indicated in location column
<i>P<sub>e</sub></i>	Pressure due to elevation difference between indicated points. This can be a plus value or a minus value. If minus, the (-) shall be used; if plus, no sign need be indicated.
<i>P<sub>v</sub></i>	Velocity pressure in psi at a point in a pipe
<i>P<sub>n</sub></i>	Normal pressure in psi at a point in a pipe
E	90° ell
EE	45° ell
Lt.E	Long-turn elbow
Cr	Cross
T	Tee-flow turned 90°
GV	Gate valve
BV	Butterfly valve
Del V	Deluge valve
ALV	Alarm valve
DPV	Dry pipe valve
CV	Swing check valve
WCV	Wafer check valve
St	Strainer
psi	Pounds per square inch
<i>v</i>	Velocity of water in pipe in feet per second

### NFPA 14 - STANDPIPE AND HOSE SYSTEMS

1. Working plans with all applicable items.
2. Class of standpipe on plans.
3. Type of standpipe (wet, dry, etc).
4. Location of waterflow alarms.
5. Location of piping.
6. Correctly located fire department connection.
7. Hose connections located.
8. Correct number of standpipes.
9. Correct interconnection of multiple standpipes.
10. Correct pipe sizing.
11. Minimum pressures.
12. Pressure regulating devices provided for outlets with high pressures.
13. Minimum flow rates achieved.
14. Drain and test riser appropriately sized.
15. Correct number of fire department connections.
16. A complete set of hydraulic calculations.
17. Plans to show an approved water supply capable of supplying the system demand.
18. Current water supply information.
19. For high-rise buildings, plans of the temporary standpipe with the FDC location shown.

### NFPA 15 - WATER SPRAY FIXED SYSTEMS FOR FIRE PROTECTION

#### 1. Working plans.

Working plans, including elevations, shall be drawn to an indicated scale, show all essential details, and include the following pertinent data as a minimum:

- (a) The dates of initial submission and revisions.
- (b) The name of the owner and occupant.
- (c) The name and address of the contractor and layout technician.
- (d) The location, including the street address.
- (e) The point of the compass.

- (f) The full height cross section.
- (g) The structural features.
- (h) The relative elevations of nozzles, junction points, and supply or reference points.
- (i) Full information concerning water supplies, including pumps, underground mains, earthquake protection, etc., and flow test results.
- (j) The make, type, size, location, position, and direction of spray nozzles.
- (k) The make, type, model, and size of the system actuation valve, control valve, or special system valve. The method of control valve supervision shall be indicated on the plans.
- (l) The type and location of alarm devices to be provided. The type and location of the control panel.
- (m) The number of each size and type of spray nozzles on each system.
- (n) The type of pipe and schedule of wall thickness, lengths of pipe, and whether center to center or cutting lengths are shown.
- (o) The size and type of all fittings. The dimensions and locations of shop welded sections.
- (p) The sensing devices for detection including the type, arrangement, and location.
- (q) The hydraulic reference points shown on the plan shall correspond with comparable reference points on the hydraulic calculation sheets.
- (r) The calculated system demand at a reference point.
- (s) The total designed water demand with the number of systems designed to operate simultaneously at a reference point, preferably the source of supply, including hose streams and other fire protection equipment.
- (t) The density requirements and hazard surface calculation, where applicable.
- (u) The design objective of the system.
- (v) The make, type, and location of hangers, supports, sleeves, sway bracing, and inserts.
- (w) All control and check valves, strainers, drain pipes, and test pipes.
- (x) A graphic representation of the scale used on all plans.
- (y) The weight or class, lining, and size of underground pipe and the depth that the top of the pipe is to be laid below grade.
- (z) Provisions for flushing underground pipe.
- (aa) Accurate and complete layout of the hazard to be protected.

## 2. **Hydraulic calculations:**

Hydraulic calculations shall be prepared on forms that include a summary sheet, detailed worksheet, and a graph sheet.

### **Summary Sheet:**

The summary sheet shall contain the following information where applicable:

- (a) The date;
- (b) The location;
- (c) The name of the owner and occupant;
- (d) The building or plant number;
- (e) The description of the hazard;
- (f) The name and address of the contractor and calculator;
- (g) The name of authority having jurisdiction;
- (h) The design purpose;
- (i) The rates of the water application (density) and applied areas in  $\text{gpm}/\text{ft}^2$ ;
- (j) The total system water requirements as calculated, including allowance for hose streams;
- (k) The total designed water demand with number of systems designed to operate simultaneously at a reference point, preferably the source of supply, including hose streams and other fire protection equipment; and
- (l) Water supply information.

## 3. **Detailed Worksheets:**

Detailed worksheets or computer printout sheets shall contain the following information:

- (a) The sheet number, date, job number, and identification of calculations covered;
- (b) The description of discharge constant (K) (or provide the discharge curve or tabulation) for each nozzle type;
- (c) The hydraulic reference points;
- (d) The flow in gpm;
- (e) The pipe size in inches;
- (f) The pipe lengths, center to center of fittings (or cut lengths) in ft;
- (g) The equivalent pipe lengths for fittings and devices in ft.;
- (h) The friction loss in psi between reference points;
- (i) The total friction loss in psi between reference points;
- (j) The elevation head in psi between reference points;
- (k) The required pressure in psi at each reference point;
- (l) The velocity pressure and normal pressure if included in calculations;
- (m) Notes to indicate starting points, reference to other sheets, or to clarify data shown;
- (n) The combined K factor calculations for nozzles on drops, armovers, or sprigs where calculations do not begin at a nozzle; and

- (o) When extending existing equipment, hydraulic calculations are to be furnished indicating the previous design, volume, and pressure at points of connection, and adequate additional calculations to indicate effect on existing systems.

**4. Graph Sheet:**

The graph sheet shall be plotted on semi-logarithmic graph paper (Q<sup>1.85</sup>). Water supply curves and system requirements, plus hose demand if required, shall be plotted to present a graphic summary of the complete hydraulic calculation

**5. Water Supply:**

The following information shall be included on the plans and calculations:

- (a) The location and elevation of static and residual test gauge, with relation to the system actuation valve reference point;
- (b) The flow location;
- (c) The static pressure, psi;
- (d) The residual pressure, psi;
- (e) The flow, gpm;
- (f) The date;
- (g) The time;
- (h) The source of water flow test information; and
- (i) Other sources of water supply, with pressure or elevation.

### **NFPA 16 - INSTALLATION OF FOAM-WATER SPRINKLER AND FOAM-WATER SPRAY SYSTEMS**

- 1. Working plans that indicate the quantity of foam concentrate to be stored including the quantity in reserve, the concentrate designation and the minimum anticipated temperature of the concentrate at the point of proportioning.
- 2. List the specific tests to be conducted.
- 3. The type of foam concentrate used.
- 4. The method of foam proportioning.
- 5. Pump submittal.
- 6. The method of system control including schematic wiring diagrams if required.
- 7. The location of draft curtains, detection zones and drainage area separations if the impact the performance of the foam-water system.
- 8. The location and description of hazards to be protected.
- 9. Hydraulic calculations.
- 10. The required discharge density.

### **NFPA 17 - DRY CHEMICAL EXTINGUISHING SYSTEMS**

- 1. Working plans shall be submitted for all engineered and pre-engineered systems.
- 2. Manufacturer's equipment specifications shall be submitted for all engineered systems.
- 3. Engineered systems shall be drawn to an indicated scale or be suitable dimensioned.
- 4. Plans shall contain sufficient detail to evaluate the hazard and to evaluate the effectiveness of the system.
- 5. Details shall be provided on the materials involved, the location and arrangement and the exposure to the hazard.
- 6. Plans shall show the size, length and arrangement of connected piping, or piping and hose.
- 7. A description and the location of all nozzles shall be shown.
- 8. Calculations and flow rates for the nozzles shall be shown.
- 9. Information indicating the location and function of detection devices, operating devices, auxiliary equipment and electrical circuitry, if used.
- 10. All apparatus and devices shall be clearly noted on the plans.

### **NFPA 17A - WET CHEMICAL EXTINGUISHING SYSTEMS**

- 1. The applicable sections of the manufacturer's current installation and maintenance manual specific to the proposed installation shall be submitted.
- 2. Working plans shall be submitted for all engineered and pre-engineered systems.
- 3. Manufacturer's equipment specifications shall be submitted for all engineered systems.
- 4. Engineered systems shall be drawn to an indicated scale or be suitable dimensioned.
- 5. Plans shall contain sufficient detail to evaluate the hazard and to evaluate the effectiveness of the system.
- 6. Details shall be provided on the materials involved, the location and arrangement and the exposure to the hazard.
- 7. Plans shall show the size, length and arrangement of connected piping, or piping and hose.
- 8. A description and the location of all nozzles shall be shown.

9. Calculations and flow rates for the nozzles shall be shown.
10. Information shall be submitted pertaining to the location and function of detection devices, operating devices, auxiliary equipment and electrical circuitry, if used.
11. All apparatus and devices shall be clearly noted on the plans.

## **NFPA 20 - STATIONARY PUMPS FOR FIRE PROTECTION**

### **Working Plans:**

A complete plan and detailed data describing pump, driver, controller, power supply, fittings, suction and discharge connections, and water supply conditions shall be prepared and submitted for approval, including the following information:

1. Correct fire rating for pump room.
2. Rated pump capacity.
3. All equipment clearly noted.
4. Relief valve if required.
5. Bypass piping if required.
6. A method for testing the fire pump.
7. Pump shaft rotation.
8. Jockey pump and associated valves and piping.
9. Backflow preventer properly piped.
10. Fire pump submittal & certified shop test curve.
11. Fire pump & jockey pump controller locations.
12. Fire pump & jockey pump controller piping.
13. Power supply arrangement shall be shown.

## **NFPA 22 - WATER TANKS FOR PRIVATE FIRE PROTECTION**

1. The capacity and elevation of the tank.
2. The tank location.
3. The material the tank is constructed from.
4. Information on the tank foundation if applicable.
5. The tank dead load.
6. The tank live load.
7. The wind load on the tank if applicable.
8. The tank specification submittal.
9. The air pressure and water level of pressure tanks.
10. The method of freeze protection if applicable.
11. Air compressor information for pressure tanks.
12. The method for tank filling.
13. Working plans of the tank, piping & valves.

## **NFPA 24 - PRIVATE FIRE SERVICE MAINS AND THEIR APPURTENANCES**

**Working plans:** Working plans of private fire service mains and fire hydrant systems shall include Plot Plans drawn to Architects or Engineers scale and shall include all of the following:

1. The size and location of all water supplies.
2. The size and location of all new pipe.
3. The type and class of new pipe.
4. The depth of bury of pipe.
5. The size, type and location of valves.
6. The size, type and location of meters and backflow preventers.
7. The size and location of hydrants, showing size and number of outlets.
8. The location of hose houses, if any & information regarding the equipment stored therein.
9. The location of sprinkler and standpipe risers and monitor nozzles supplied by the system.
10. The location and type of fire department connections, if any, with details of installation.
11. The location, size, construction and valves within any pits shall be shown.
12. The method of restraining pipe & fittings shall be shown.

13. Hydraulic calculations for fire hydrant systems.

### **NFPA 30 - FLAMMABLE AND COMBUSTIBLE LIQUIDS STORAGE ROOMS**

1. The class of flammable and or combustible liquid involved.
2. The storage arrangement being used.
3. The type of containers being used.
4. The size of container being used.
5. The storage height.
6. The building height.
7. The table used to determine the protection criteria.
8. The ceiling sprinkler spacing.

### **NFPA 30B - MANUFACTURE AND STORAGE OF AEROSOL PRODUCTS**

1. The classification of the aerosol product.
2. The storage arrangement being used.
3. The storage height.
4. The building height.
5. The clearance between storage and sprinkler deflector.
6. The table used to determine the protection criteria.

### **NFPA 72 - NATIONAL FIRE ALARM CODE**

1. Working plans with complete building floor plans showing at least the following:
2. Type of building construction & occupancy.
3. Type of fire alarm system to be provided.
4. Type of fire alarm-initiating devices, etc.
5. Intended area of coverage.
6. The location of all alarm equipment, appliances & wiring riser diagrams.
7. Other applicable codes, standards and other design criteria to which the system is required to comply with is indicated on the plans.
8. Fire department response point(s) & annunciator location shall be shown.
9. Complete list of detection, evacuation signaling and annunciator zones.
10. Locations of alarm-initiating and notification appliances with specified candela shown on the plans.
11. Calculations; for example, secondary power supply & voltage drop.
12. Complete list of fire safety control functions.
13. Complete sequence of operations, detailing all inputs & outputs.
14. Alarm control and trouble signaling equipment.
15. Power connection, the location of the circuit disconnecting means.
16. Conductor type and sizes.
17. The interface of fire safety control functions.

### **NFPA 750 - WATER MIST FIRE PROTECTION SYSTEMS**

1. Working plans shall show those items from NFPA 750 that pertain to the design of the submitted system.
2. Hydraulic calculations.
3. Pneumatic calculations.
4. Detection, actuation and control systems documentation.

## NFPA 2001 - CLEAN AGENT FIRE EXTINGUISHING SYSTEMS

### 1. Working plans.

Working plans shall be drawn to an indicated scale and shall show the following items that pertain to the design of the system:

- (a) Name of owner and occupant.
  - (b) Location, including street address.
  - (c) Point of compass and symbol legend.
  - (d) Location and construction of protected enclosure walls and partitions.
  - (e) Location of fire walls.
  - (f) Enclosure cross section, full height or schematic diagram, including location and construction of building floor/ceiling assemblies above and below, raised access floor and suspended ceiling.
  - (g) Agent being used.
  - (h) Design extinguishing or inerting concentration.
  - (i) Description of occupancies and hazards being protected, designating whether or not the enclosure is normally occupied.
  - (j) Description of exposures surrounding the enclosure.
  - (k) Description of the agent storage containers used including internal volume, storage pressure, and nominal capacity expressed in units of agent mass or volume at standard conditions of temperature and pressure.
  - (l) Description of nozzle(s) used including size, orifice port configuration, and equivalent orifice area.
  - (m) Description of pipe and fittings used including material specifications, grade, and pressure rating.
  - (n) Description of wire or cable used including classification, gauge [American Wire Gauge (AWG)], shielding, number of strands in conductor, conductor material, and color coding schedule. Segregation requirements of various system conductors shall be clearly indicated. The required method of making wire terminations shall be detailed.
  - (o) Description of the method of detector mounting.
  - (p) Equipment schedule or bill of materials for each piece of equipment or device showing device name, manufacturer, model or part number, quantity, and description.
  - (q) Plan view of protected area showing enclosure partitions (full and partial height); agent distribution system including agent storage containers, piping, and nozzles; type of pipe hangers and rigid pipe supports; detection, alarm, and control system including all devices and schematic of wiring interconnection between them; end-of-line device locations; location of controlled devices such as dampers and shutters; and location of instructional signage.
  - (r) Isometric view of agent distribution system showing the length and diameter of each pipe segment; node reference numbers relating to the flow calculations; fittings including reducers and strainers; and orientation of tees, nozzles including size, orifice port configuration, flow rate, and equivalent orifice area.
  - (s) Scale drawing showing the layout of the annunciator panel graphics if required by the authority having jurisdiction.
  - (t) Details of each unique rigid pipe support configuration showing method of securement to the pipe and to the building structure.
  - (u) Details of the method of container securement showing method of securement to the container and to the building structure.
  - (v) Complete step-by-step description of the system sequence of operations including functioning of abort and maintenance switches, delay timers, and emergency power shutdown.
  - (w) Point-to-point wiring schematic diagrams showing all circuit connections to the system control panel and graphic annunciator panel.
  - (x) Point-to-point wiring schematic diagrams showing all circuit connections to external or add-on relays.
  - (y) Complete calculations to determine enclosure volume, quantity of clean agent, and size of backup batteries and method used to determine number and location of audible and visual indicating devices, and number and location of detectors.
  - (z) Details of any special features.
2. Flow calculations shall be submitted.
  3. Detection, actuation and control systems documentation.

(MFD Rev. 08-14-02)