

21 00 00 – Fire Suppression Systems

DIVISION 21 – Fire Suppression



PART 1 GENERAL REQUIREMENTS

- A. The Fire Suppression System(s) Design, Installation, and Materials shall be provided in accordance with the Minnesota Fire Code (MFC), latest applicable edition of the National Fire Protection Association (NFPA) Standards, City of St. Paul and the Saint Paul Public Schools Technical Design and Construction Standards.
- B. As a minimum, the Architect/Engineering (A/E) Consultant shall prepare performance based fire suppression plan and specification documents for bidding. Fire suppression documents shall be prepared by or under the direct supervision of, and shall bear the signature of, a Professional Engineer licensed in the State of Minnesota. Fire suppression documents prepared by the A/E Consultant shall include, but are not limited to the following:
 - 1. Fire suppression plans and specifications identifying new and/or existing conditions as required for each project, water service locations and sizes; main riser/valve assemblies; fire department connection and exterior alarm locations; standpipe locations and sizes where required; floor plans with room designations and reflected ceiling plans. Other information to be provided shall include system design and occupancy hazard criteria; hydrant flow test data; any special system or design considerations; fire pump data where applicable; product and material requirements; project submittal requirements. All fire suppression specifications shall be prepared in accordance with the Construction Specifications Institute (CSI) recommended sections format for Division 21-Fire Suppression.
 - 2. The A/E Consultant shall obtain hydrant-flow test data from the City of St. Paul for each project and building site. The A/E shall arrange for a new hydrant flow test with the City for any information older than five (5) years. The City will generally provide this service at no cost. Include information in project specifications.
- C. Upon completion of all installations, the A/E shall prepare a system zone/area map for the Owner's records based on as-built documents furnished by the Installing Contractor. The map shall identify all system area zones, wet pipe vs. dry pipe or other specialty type systems. Include location of all isolation control valves, sub-zone control valves and flow alarms if applicable, air compressors and include all low-point auxiliary drain valves for wet or dry systems.
- D. System Installer Qualifications for Performance Based Fire Suppression Plans and Specifications:
 - 1. The Installer's responsibilities include providing professional design services needed to assume final design responsibility, field verification/routing, fabricating, and the installation of the fire-suppression systems. Base hydraulic calculations on results of the fire hydrant flow test. The Fire Suppression Contractor shall have installed systems of similar complexity on a minimum of two other projects.
 - 2. Installers shall submit detailed dimensioned Shop Drawings indicating all pertinent information in accordance with NFPA 13, along with hydraulic calculations, neatly bound and organized. Shop drawings shall be submitted to the A/E and Local Authorities Having Jurisdiction (AHJ) for review. Shop Drawings shall also be certified by a registered Engineer or NICET Level III Fire Protection Designer. **Shop Drawings that do not indicate the information as required by NFPA 13, or have proper certification, will be rejected by the Engineer.**

3. The Contractor shall submit as-built documents and all other project closeout information specified before final payment will be made.
- E. Hydraulically calculated systems shall include a minimum 5 psi margin of safety for each system calculated. Hydraulic calculation plates shall be attached on or near each main fire riser/valve assembly for each system calculated.
 - F. Underground fire service water mains provided for new buildings shall be a minimum of 6" in size and shall be dedicated for fire service use. Where existing services are in place, the A/E shall verify the size and include information in bid documents. A combined fire and domestic water service may be installed with prior approval of the Owner, Engineer and local AHJ and when installed and calculated in accordance with MFC requirements.
 - G. Fire service water mains, valves, meters and backflow prevention shall be installed in accordance with the Saint Paul Regional Water Services and NFPA 24 requirements.
 - H. Fire department connections shall typically be located near the main entrance/address side of the building. Other locations may be acceptable with prior approval of the Owner, Engineer and local AHJ. Maintain proper clearance and visibility in front of and a minimum of two feet on either side of the fire department connection. Fixed barriers or other obstructions to the fire department connection such as plantings and shrubs are not acceptable. The fire department connection shall typically be located between 36"-48" above finished grade. The exterior fire alarm/strobe shall be mounted over the fire department connection at a minimum height of 8 feet above grade.
 - I. Sprinkler heads shall not be installed in elevator shafts, elevator pits, or elevator machine rooms in accordance with the MFC and where the elevator car meets the requirements of ASME A17.1 "Safety Code for Elevators and Escalators".
 - J. Sprinkler systems in Chemistry Labs, Wrestling, and Gymnastics rooms shall be designed and installed to provide a minimum 0.20 density gpm/sq. ft. and meet an Ordinary Hazard Group 2 occupancy rating.
 - K. Sprinkler protection at the ceiling directly above swimming pools may be omitted if the area is used exclusively for swimming purposes and when sprinklers are provided around the perimeter walking and spectator areas of the pool and in adjacent rooms. All sprinkler heads in pool areas and pool water/chemical treatment rooms shall have a corrosion-resistant coating.
 - L. Sprinkler heads in vestibules of 225 sf or less may be omitted in accordance with the MFC and where all other conditions described in the MFC are met. Where sprinklers are required in vestibules, the vestibule shall be properly insulated and heated. The use of listed dry-type sidewall sprinkler heads shall be considered where freezing conditions are of concern.
 - M. Main drain/test connections installed on the main system riser and inspectors test connections shall be piped to the exterior. Other locations are not acceptable without prior approval of the Owner and Engineer. Provide a concrete splash block or others measures at pipe discharge to prevent soil erosion where applicable.
 - N. A minimum 3" floor drain shall be provided within proximity of all fire riser/valve assemblies and near fire pumps. Coordinate work with Division 22-Plumbing.
 - O. Avoid installing valves above suspended ceilings or other concealed locations. Where valves are concealed they shall be accessible, clearly marked and identified. Provide access panels where valves are located above hard-lid type ceilings. Coordinate access panel requirements with Division 08-Openings (Access Doors) and Division 09-Finishes.

- P. Sprinkler Head and Piping Installations:
1. Sprinkler heads shall be installed within 1" of center of 2'x2' suspended ceiling tiles or 1" of quadrant points in 2'x4' ceiling tiles. 1" braided flexible stainless steel hose drops equal to "Victaulic-VicFlex" series type drops, installed in accordance with the manufacturer's recommendations, are an acceptable alternative to steel hard piped drops. Corrugated metal type drops are not acceptable. Sprinkler types and finishes are noted under the Products Section of this standard.
 2. Conceal piping above ceilings in all finished and public areas wherever possible. Where rooms are exposed to the ceiling deck or no suspended ceilings exist in finished areas, piping may be exposed with prior approval of Owner and A/E. Exposed piping in finished areas shall be painted. Coordinate painting requirements with Division 09-Finishes.
 3. Piping in mechanical, electrical or similar unfinished utility rooms may be exposed and remain unpainted.
 4. All piping shall be run in a straight professional manner without springing or forcing and shall gravity drain back to the main riser drain whenever possible. Provide low point auxiliary drains or plugs in accordance with NFPA 13 for any trapped sections of piping. Piping shall be run perpendicular and/or parallel to the building features, diagonal runs are not acceptable.
- Q. All pipe hanger installations shall be in accordance with NFPA 13 requirements. All pipe hangers, hanger rods and attachments shall be secured to suitable portions of the building structure. Spring toggles or similar attachments supported from suspended ceilings are not acceptable.
- R. All fire alarms, flow switches, low-air/supervisory alarms where applicable, and tamper switches shall be connected to the building fire alarm and monitoring systems. All control valves shall be equipped with tamper switches. Valves locked in the open position as a means of supervision are not acceptable without prior approval of the Owner and A/E.
- S. Product data submittals are required for each project and shall include, but are not limited to, the following information specific to each project:
1. Piping materials, including dielectric fittings, flexible connections, specialty fittings, wall/floor escutcheons and piping sleeves where applicable.
 2. Pipe hangers, supports and building attachments.
 3. Valves, including listed fire-protection isolation valves, unlisted general-duty valves, check valves, detector check valves, standpipe hose valves, and inspectors test valves.
 4. Specialty system valves, dry-pipe, pre-action or other as applicable.
 5. Air compressors or air maintenance devices for dry-pipe or pre-action systems.
 6. Sprinklers, escutcheons, and head guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.
 7. Sprinkler head cabinet.
 8. Fire pumps, fire pump controllers, jockey/maintenance pumps, test headers and related accessories.
 9. Fire department connections.
 10. Fire alarms, flow switches, tamper switches, detection devices and specialty system release/controls panels where applicable. Include electrical data.
 11. Hydraulic calculation plates, identification signs, valve and piping labels.
- T. Field Test Reports and Certificates are required at the completion of all projects. Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

- U. Operation and Maintenance Manuals are required at the completion of all projects. Include all product data, warranties, sprinkler system operation and maintenance information.

PART 2 PRODUCTS

All products shall be Underwriters Laboratory (U.L.) listed or Factory Mutual Global (FM) approved for fire suppression system use, shall be use proven, and shall be produced by a recognized manufacturer of fire suppression products.

A. Sprinkler Heads:

1. Finished spaces with suspended ceilings: Provide concealed pendent sprinkler heads with white cover plates. Provide different finish color if directed by Owner, Architect or Engineer. Extended two-piece type escutcheons are not allowed.
 - a. Semi-recessed ceiling pendants with chrome or white finish escutcheons may be installed in finished spaces with prior approval from Owner and Architect or Engineer.
 - b. Exposed sprinklers and piping in finished spaces: Provide exposed upright or pendant. Finished color to be verified with Owner and A/E.
2. Mechanical, electrical, similar utility spaces: Provide exposed brass upright or pendent sprinklers.
3. Coolers and Freezers: Provide dry-type, semi-recessed, pendent sprinkler with chrome finish.
4. Final orifice size, coverage area, and temperature rating of all sprinkler head types to be determined by designer.

B. Steel Pipe and Fittings (CPVC and threadable thinwall piping is not allowed):

1. NPS 2" and smaller, Threaded-End, Standard-Weight/Sch. 40 Black Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, with factory- or field-formed threaded ends. Grooved ends and fittings are also acceptable for 1-1/2" and 2" pipe sizes

Threaded Joint Piping Systems:

- a. Cast-Iron Threaded Flanges: ASME B16.1.
 - b. Malleable-Iron Threaded Fittings: ASME B16.3.
 - c. Gray-Iron Threaded Fittings: ASME B16.4.
 - d. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe. Include ends matching joining method.
 - e. Steel Threaded Couplings: ASTM A 865.
2. NPS 5" and smaller, Grooved-End, Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, and NFPA 13-specified wall thickness in NPS 6" to NPS 10"; with factory or field-formed, roll-grooved ends.

Grooved-Joint Piping Systems:

- a. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.

- b. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, rubber gasket listed for use with housing, and steel bolts and nuts. For dry-pipe systems, provide gaskets listed for use in dry-pipe systems.
- C. Schedule 40 hot-dipped galvanized steel pipe and fittings shall be used for all dry pipe systems. Provide gaskets listed for dry-pipe systems for grooved end piping and fittings. Schedule 40 black steel may only be used for dry systems with prior approval of Owner and A/E.
- D. Gate Valves: Outside Screw and Yoke (O.S.&Y) Type-
 - 1. Description:
 - a. Standard: UL 262 and FM approved.
 - b. Minimum Pressure Rating: 175 psig
 - c. Disc: Ductile iron resilient wedge, SBR coated.
 - d. Stem: Bronze.
 - e. Actuator: Cast iron handwheel.
 - f. Supervisory Switch: External mount.
 - g. Body Material: 2-1/2" and larger; ductile iron, epoxy coated interior and exterior with flanged ends.
- E. Iron Butterfly Valves With Integral Indicators
 - 1. Description:
 - a. Standard: UL 1091 and FM approved for indicating valves, (butterfly or ball type), Class Number 112.
 - b. Minimum Pressure Rating: 175 psig
 - c. Seat Material: EPDM.
 - d. Stem: Stainless Steel.
 - e. Disc: Ductile iron, nickel plated.
 - f. Actuator: Worm gear handwheel or lever.
 - g. Supervisory Switch: External mount.
 - h. Body Material: Flanged, lug or grooved-end connections. Wafer type valves are not acceptable.
- F. Unlisted General-Duty Valves
 - 1. Ball Valves NPS 2 and Smaller: MSS SP-110, 2-piece copper-alloy body with chrome-plated brass ball, 600-psig minimum CWP rating, blowout-proof stem, and threaded ends.
 - 2. Check Valves NPS 2 and Smaller: MSS SP-80, Type 4, Class 125 minimum, swing type with bronze body, nonmetallic disc, and threaded ends.
 - 3. Gate Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, solid wedge, and threaded ends.
 - 4. Globe Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, nonmetallic disc, and threaded ends.

G. Check Valves

1. Description:

- a. Standard: UL 312 and FM approved, swing check valves, Class Number 1210.
- b. Minimum Pressure Rating: 175 psig
- c. Type: Single swing check.
- d. Body Material: Cast or ductile iron.
- e. Clapper: Bronze or ductile iron with elastomeric seal.
- f. Clapper Seat: Brass, bronze, or stainless steel.
- g. Hinge Shaft: Bronze or stainless steel.
- h. Hinge Spring: Stainless steel.
- i. End Connections: Flanged or grooved.

H. Fire Pumps and Controllers

1. All fire pumps shall be U.L 448 listed, factory assembled and tested, electric-drive, centrifugal type, provided in accordance with NFPA 20. Fire pumps, fire pump controller, jockey/maintenance pumps, jockey pump controllers, test header manifolds and standard trim accessories shall be provided through a single source representative and manufacturer. Test headers manifolds shall be flush wall mounted type with 2-1/2" test outlets and chrome finish. Quantity of test outlets shall be determined by the designer specific to system requirements.
2. Fire pump gpm and boost pressure capacities shall be based on fire hydrant test data near the site and hydraulically most demanding sprinkler or standpipe system requirements.
3. Fire pump controllers shall be U.L. 218 listed for electric drive pumps, factory assembled, wired and tested for capacities and electrical characteristics and rated for the specified fire pump motor horsepower and short-circuit withstand rating. The A/E shall evaluate the fire hydrant test data and system requirements and verify with the AHJ as to whether or not a low suction cut-off switch shall be required. (Note: some areas within the City of St. Paul necessitate the need for low suction cut-off switches). All controllers shall be Full-Service type.
4. Where fire pumps are required, the A/E shall evaluate each site and the requirement for emergency power back-up systems to serve the pump. Provide combined fire pump controller and emergency power transfer switch assembly if required. The A/E shall verify with the AHJ the requirements for a fire pump room including location, rating, etc.
5. All fire pumps/bases shall be mounted on a minimum 4" high concrete pad. Concrete pad shall be properly doweled/secured to the concrete floor. Anchor bolts shall be epoxy coated.
6. The installing Contractor shall properly align the fire pump and provide complete performance testing of the fire pump system per NFPA 20 requirements. A factory representative for the fire pump shall be present and assist with the start-up and performance testing.

PART 3 - EXECUTION (Not Used)

End of Section