

Shop Drawings Corrections List for Automatic Sprinkler Systems

This list is to be used in conjunction with the attached General Correction List. Note that this correction list is not all inclusive. See additional items on the General Correction List.

Items listed require amended construction documents such as revised plans, supplemental instructions, addenda, field orders, or change orders before plans approval will be issued. Answers in letter form may be provided to explain the changes to the construction documents. All drawing revisions should be clouded with a corresponding revision number tag.

This review does not authorize construction to begin. Starting construction before plans approval may result in a Stop Work Order. Rule 0780-02-07-.09

Shop drawings, sprinkler systems, and sprinkler system components are reviewed for compliance with the following State of Tennessee adopted codes:

- National Fire Protection Association (NFPA) 13, 13R, and 13D, 2010 edition
- National Fire Protection Association (NFPA) 24, 2010 edition
- International Building Code (IBC), 2012 edition

Submittal Requirements

1. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of the referenced code.
IBC 107.2.1

Automatic Sprinkler System Shop Drawings, based on an Approved Engineered Design Intent, shall provide details from the *point of service*. Point of service is defined as the point immediately after the tap of the service main where water is used exclusively for fire protection purposes.

Rule 0780-02-07-.01(g)

All documents to be sealed (with signature and date) by a Tennessee registrant in accordance with the Architects and Engineers Licensing Law Rules.

Rule 0780-02-03-.03, 0780-02-03-.03(b), Rule 0120-02-.08(3)

2. All Shop Drawings plan sheets, the first page the Hydraulic Calculations for each design area, and the cover sheet for the Materials Submittal (Manufacturer's Cut Sheets verifying fire protection listings for underground and above-ground piping, fittings, valves, devices, sprinkler heads, hangers, etc.) are to include the following general information (IBC 107.2.1, NFPA 13 22.1.4):
 - (1) Name and address of contractor.
 - (2) R.M.E. name, R.M.E. number & R.M.E. signature
 - (3) Project or Building Name.
 - (4) Location, including street address.
3. The shop drawings and calculations should be submitted to the engineer of record prior to submittal to the submittal to the State Fire Marshal's Office. The engineer of record will document his review of the shop drawings and calculations, using a review stamp. This is an engineer's acceptance, acceptance as noted, rejection, or revise and resubmit, etc. of the shop drawings. This is based on review of the

shop drawings against the design concept identified in the preliminary plans. The engineer should never place his P. E. seal on the sprinkler contractor's drawings or calculations unless he actually prepared them or supervised their preparation. A&E Board Reference Manual, Appendix F

4. Where the equipment is to be installed as an addition to an existing system, the plans should include enough of the existing system to make all conditions clear. NFPA 13 22.1.3(30)

Hydraulic Calculation Forms

1. Where quick-response sprinklers are used in accordance with 6.2.1.3, the discharge and design area requirements of NFPA 13 shall apply. NFPA 13R 7.1.2
2. Hydraulic calculations shall be prepared on form sheets that include a summary sheet, a graph sheet, a water supply analysis, a node analysis, and detailed worksheets (NFPA 13 22.3.1, 22.3.5.1, NFPA 13R 7.1.2, NFPA 13D 4.7):
 - (1) NFPA 13: Density/Area Concept—duration based on occupancy hazard
 - (2) NFPA 13R: 4-head design, 30 minute duration
 - (3) NFPA 13D: 2-head design, 10 minute duration
3. Summary Sheet information shall include (NFPA 13 22.3.2, 22.3.5.2):
 - (1) Remote area information and drawing number reference
 - (2) Occupancy or commodity classification
 - (3) The design area of water application, minimum rate of water application (density), and coverage area per head
 - (4) Total water requirements as calculated, including allowance for inside hose, outside hydrants, water curtain, and exposure sprinklers
 - (5) Allowance for in-rack sprinklers, gpm
4. Provide a graphic representation of the complete hydraulic calculation shall be plotted on semi exponential graph paper (Q1.85) and include the following (NFPA 13 22.3.4, 22.3.5.3):
 - (1) Water supply curve
 - (2) Sprinkler system demand
 - (3) Hose allowance (where applicable)
 - (4) In-rack sprinkler demand (where applicable)
5. Organized information regarding the node tags given to each hydraulic reference point on the system as indicated on the shop drawings shall include the following information (NFPA 13 22.3.3, 22.3.5.5):
 - (1) Node tag for each specific point on the system used in the hydraulic calculations
 - (2) Elevation in ft.. of each node tag
 - (3) K-factor of flowing nodes (such as sprinklers)
 - (4) Pressure in psi (bar) at the node
 - (5) Discharge in gpm calculated at the node
 - (6) Notes that indicate any special requirements for the node
6. Additional information in detailed worksheets or computer printout sheets shall contain the following (NFPA 13 22.3.3, 22.3.5.6):

- (1) Actual internal diameter of pipe in inches
- (2) Pipe lengths in ft., center-to-center of fittings
- (3) Equivalent pipe lengths in ft. (m) of fittings and devices for the step
- (4) Friction loss in psi/ft. (bar/m) of pipe
- (5) Total friction loss in psi (bar) between reference points
- (6) Required pressure in psi (bar) at each reference point
- (7) Velocity pressure and normal pressure if included in calculations

Manufacturer Material (Cut Sheet) Submittal

1. Provide a signed copy of the owner's certificate with the material submittal. Include manufacturer's installation instructions for any specially listed equipment including descriptions, applications, and limitations for any sprinklers, devices, piping, or fittings. NFPA 13 22.1.4, NFPA 13R 8.1.7, NFPA 13D 4.7
2. Provide UL fire-stop details in their entirety including design illustrations and material specifications without modification or manipulation for penetrations through rated assemblies. IBC 107.2.1, Section 714, NFPA 13 22.1.4, NFPA 13R 8.1.7, NFPA 13D 4.7

General Shop Drawing Requirements

1. Working plans shall identify the edition year of the applicable standard(s) used and be drawn to an indicated scale, on sheets of uniform size, include details from the "point of service", a plan of each floor, and a building cross section. NFPA 13 22.1.3, , NFPA 13D 4.7, TDCI Rule 0780-02-09-.01(g)
2. Show hydraulic reference points on all working plan sheets that correspond with comparable reference points on the hydraulic calculation sheets. IBC 107.2.1, NFPA 13 22.1.3, NFPA 13R 7.1.2, NFPA 13D 4.7
3. Working plans shall show the following (IBC 107.2.1, NFPA 13 22.1.3, NFPA 13R 8.1.7, NFPA 13D 4.7):
 - (1) Building height,
 - (2) Location of partitions,
 - (3) Location and limits of fire rated walls,
 - (4) Occupancy class of each area or room,
 - (5) Location and size of concealed spaces, closets, attics, and bathrooms, and
 - (6) Any small enclosures in which no sprinklers are to be installed.
4. A full height cross section, or schematic diagram, shall include structural member information (if required for clarity), ceiling construction detailing and method of protection for nonmetallic piping. NFPA 13.22.1.3, NFPA 13R 8.1.7, NFPA 13D 4.7
5. General detailing shall include the following (IBC 107.2.1):
 - (1) A lead-in detail where the underground piping passes through the foundation and attaches to the riser. Provide clearance to prevent breakage of the piping due to building settlement. NFPA 13 9.3.4.1, NFPA 13R 5.3, IPC 305.2, 503.3, NFPA 13D 4.7
 - (2) Provide a method for drainage where the lead-in terminates at a point lower than grade. NFPA 13 8.16.2
 - (3) A sprinkler system riser schematic with control and check valves, backflow prevention devices, supply and system pressure gauges, water flow switches, tamper supervising switches, local

waterflow alarm location, and spare sprinkler head cabinet location. NFPA 13 8.16.1.1, Figure A, NFPA 13R 9.3, NFPA 13D 4.7, NFPA 13D 6.2

- (4) Component type & locations for system supervision and alarms in accordance with IBC 903.4.
- (5) For hydraulically designed systems, the information on the hydraulic data nameplate. NFPA 22.1.3, NFPA 13R 8.1.7, NFPA 13D 4.7
- (6) Seismic bracing and sleeve details, when applicable. NFPA 13 9.3.4, NFPA 13R 6.13, NFPA 13D 4.7

Shop Drawing Site Plan and Water Supply Information

1. The following information shall be included on the sprinkler shop drawing site plan:
 - (1) The *point of service* for the sprinkler system. TDCI Rule 0780-02-07-.01(g)
 - (2) Underground pipe sizes, lengths, locations, weights, and materials. NFPA 13 22.1.3(28)
 - (3) Locations of valves, valve indicators, and regulators. NFPA 13 22.1.3(28)
 - (4) Size and location of hydrants, showing size and number of outlets and if outlets are to be equipped with independent gate valves. NFPA 13 22.1.3(43)
 - (5) Whether hose houses and equipment are to be provided, and by whom, shall be indicated NFPA 13 22.1.3(43)
 - (6) Size, location, and piping arrangement of fire department connections. NFPA 13 22.1.3(44)
 - (7) Location of alarm bells. NFPA 13 22.1.3(26)
2. Static and residual hydrants used in flow tests shall be shown on the Shop drawing site plan (NFPA 13 22.2.1), include:
 - (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, gpm
 - (6) Date
 - (7) Time
 - (8) Name of person who conducted the test or supplied the information
3. Where a water flow test is used for the purposes of system design, the test shall be conducted no more than 12 months prior to working plan submittal. NFPA 13 22.2.1.1, NFPA 13R 7.1.2, NFPA 13D 4.7

Shop Drawing Floor Plans

1. The following information shall be included on the sprinkler shop drawing floor plans (NFPA 13 22.2.1, NFPA 13R 8.1.7, NFPA 13D 4.7):
 - (1) Location and number of sprinkler heads on each riser and on each system by floors and total area by each system on each floor.
 - (2) Remote design area(s) of water application, density, and area of sprinkler coverage.
 - (3) Make, type, model, and nominal K-factor of sprinklers including sprinkler identification number, including temperature rating and location of high-temperature sprinklers.
 - (4) 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.
 - (5) 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.

- (6) Locations of hangers, sleeves, braces, and methods of securing sprinklers when applicable.
- (7) Location of all control valves, check valves, drain pipes, and test connections.

Special Condition Requirements

1. Documentation for the setting for pressure-reducing valves shall be in accordance with IBC 107.2.1, NFPA 13 22.1.3, NFPA 13R 5.1.3, NFPA 13D 4.7.
2. Working plans for dry pipe systems should include (IBC 107.2.1, NFPA 13 22.1.3, NFPA 13R 8.1.7, NFPA 13D 4.7):
 - (1) The total number of sprinklers on each dry pipe system, preaction system, combined dry pipe-preaction system, or deluge system.
 - (2) Include the approximate capacity in gallons of each dry pipe system.
3. Location of standpipe risers, hose outlets, hand hose, monitor nozzles, and related equipment (when applicable). IBC 107.2.1, NFPA 13 22.1.3
4. The following information shall be included when water supply treatment is provided in accordance with 23.1.5:
 - (1) Type of condition that requires treatment
 - (2) Type treatment needed to address the problem
 - (3) Details of treatment plan