



**BST&G Fire District
Fire Prevention Bureau
Under Ground Fire Protection Plan Submittal Checklist**

Date:
Project Name:
Project Address:
Designer's Name:
Company Name:
Phone Number:
Fax Number:
Email:

All supporting documentation showing items listed below are required for review. The checklist is based upon the following:

- **2016 NFPA 24** – Installation of Private Fire Service Mains and their Appurtenances.
- **2016 NFPA 13** – Installation of Sprinkler Systems.
- **2017 Ohio Fire Code with Orange Township Fire Department Specifications.**

THE FOLLOWING CIRCLES MUST BE CHECKED WITH AN (X) UPON COMPLETION

- Plans shall clearly indicate the responsible designer's name, address and contact information.
- A copy of the Company and Installer(s) Licenses **issued by the State of Ohio Fire Marshal's Office** shall be included in the submittal.
- Fire protection underground plans shall address the double check assemble, Post Indicator Valve (PIV), Fire Department Connection (FDC), all pipe, all fittings, device(s), vault, from the FDC to one foot (1') above finished floor and from the PIV to one foot (1') above finished floor.
- Paper media of **ONE (1)** full set of 30" x 42" shop drawings, 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 this code and relevant laws and specific provisions.
- Electronic media of **ONE (1)** AutoCAD Base w/TIFF image of each sheet, PDF or Jpeg on an USB drive.

- Manufacture Data Sheets shall be provided with the application for material list approval.
- The submitted plans shall be drawn to an indicated scale and include the following items that pertain to the design of the system. **2016 NFPA 24 – Section 4.1.3**
 1. Name of owner.
 2. Location of the project, including the street address.
 3. Point of compass.
 4. A graphic representation of the scale used on all plans.
 5. Name, address and contact information of the installing contractor.
 6. Size and location of all water supplies
 7. Size and location of standpipe risers
 8. Size of the private fire service main.
 9. Length of main to be installed
 10. Location of the private fire service main to be installed in reference to the building.
 11. Weight of the private fire main material to be installed
 12. Type / material of fire service main to be installed
 13. Point of connection to the Delco Water Company water main or other source of water.
 14. Size, type and location of all fittings, valves, valve indicators, regulators, meters, backflow prevention device vault and backflow prevention device, including friction loss tables.
- Depth of cover measured from the top of the pipe to finish grade. **Minimum depth of cover is four feet (4')**
 1. Method of restraint, engineered thrust blocking or type of devices to be used and the manufacturer's installation requirements.
 2. Plans shall indicate the location and sizes of all piping and equipment used to maintain the backflow prevention device vault free from accumulation of water. **2016 NFPA 24 Section – 6.4.3**

Valve Vaults:

1. FDC valve vault, refer to 2016 NFPA 24 Figure A.6.2.2.2
2. Sump pump and drain line to storm sewer or acceptable discharge location.
3. Engineered drain field, requires professional engineer's sealed drawing(s) and calculations for drain field. **Special Condition:** Requires third party inspection and certification prior to requesting a vault inspection.
4. Plans shall indicate size and show routing of electrical conduits to valve vault.
5. Conduit for fire alarm system circuit providing electronic monitoring valves.
6. Where applicable; Conduit for 110vac sump pump circuit installation.

Fire Department Connection:

- Plans shall show location of fire department connection (FDC), indicating the location of the check valve and automatic ball drain; **2016 NFPA 24 – Section 5.9**
- The fire department connection shall be located at the address side of the building, five feet (5') behind the right-of-way. The Code Official, prior to construction, **shall approve** the location of the fire department connection. 2017 Ohio Fire Code Section 912.2.1

- The fire department connection (FDC) shall be a five-inch (5') Storz (non-threaded) connection 36 – inches to the top of the connection from finished grade, with thirty-degree (30°) angle towards the ground. **2016 NFPA 24 Section 5.9.2.4 2017 Ohio Fire Code Section 912.2.1**
- The FDC line shall be a minimum of six-inch (6") diameter line from the five-inch (5") Storz connection to the sprinkler riser.
- Steel pipe used for FDC shall be externally wrapped and internally galvanized between the Check Valve and the outside fitting. **2016 NFPA 24 Section 10.1.1.3**
- An approved fire hydrant shall be provided within 40 feet accessible hose lay distance from the fire department connection. The required distribution spaced fire hydrants shall not be used for the FDC.
- **“Fire Department Connection”** sign – An 18 inch (18”) high by 24 inch (24”) wide aluminum sign with white background. **FDC** shall be in six inches (6”) high by one- and one-half inches (1 ½ “) wide, bold red reflective letters. The remainder of the lettering shall be one-and one-half (1 ½ “) high by one half inch (1/2”) wide. RED reflective lettering shall be provided for each fire department connection. The sign shall also have the address of the building(s) and what it supplies. (Auto sprinkler, fire pump, standpipes) and required pumping pressure. Such sign shall be bolted to a post that shall be permanently attached by clamps or bolted to the fire department connection pipe. ***NO EXCEPTIONS.*** **2017 Ohio Fire Code Section 912.4**
- When the system demands pressure different from the standard 150psi, the fire department connection sign shall also state the required design pressure. **2016 NFPA 24 Section 5.9.5.4 and 5.9.5.5**

Fire Pumps:

- When a fire pump is required for the building systems, separate Fire Department Connection line six-inch (6”) minimum, shall be connected to discharge side of fire pump. The required check valve shall be located immediately adjacent to the point of connection of the fire department connection to the fire pump discharge piping. The fire protection underground piping shall be sloped to the automatic ball drip valve located in the valve vault. Based upon pipe configuration of multiple low point drains may be required. **2016 NFPA 13 Section 913.1.1 through 913.5.4**
- Separate signage shall be required for the pump Fire Department Connection and shall have a separate sign stating **“Fire Pump Connection.”**

Post Indicator Valve:

- The Post Indicator Valve (PIV) shall be installed at the street, five feet (5') behind the right-of-way, and shall be electronically monitored. **2017 Ohio Fire Code Section 903.4.** The Code Official shall approve the location prior to the installation.
- Post Indicator Valve (PIV) handles shall be secured to the Post Indicator Valve (PIV) with a break a way lock in addition to electronic monitoring.
- Post Indicator Valve (PIV) shall be electronically monitored per **2017 Ohio Fire Code Section 903.4.**

- Specific details shall be provided for pipe material transitions, changes in pipe connection (i.e., slip joint, fixed flange, mechanical joints, mega-lug joints) **2016 NFPA Section 4.1.3**
- The Post Indicator Valve (PIV) shall have a twelve inch (12”) wide by eighteen (18”) high white aluminum sign with six inch (6”) red reflective letter “P.I.V.” The building address in one and one half (1 ½ “) high by half inch (1/2 “) wide red reflective letters with the building’s address permanently attached to the PIV barrel. **2017 Ohio Fire Code Section 912.5**

Under Ground Pipe and Materials:

- Plans shall clearly indicate the method of providing corrosion protection for bolted/threaded assemblies, retaining rods, clamps and other restraining devices. **2016 NFPA 24 Section 10.4.1**
- Plans shall indicate the location of all thrust blocks, rodding and restraint devices, per **Under Ground Fire Protection Plans Submittal Checklist**
 - For calculated bearing and gravity thrust blocks refer to **2016 NFPA 24 Section 10.6.3, Tables A10.6.1 (a, b and c) and Figures A10.6.1 (a, b and c)**
- When thrust blocking does not bear against undisturbed soil, an engineer’s letter shall be submitted stating the method of thrust blocking to be performed.
- Threaded rod shall not be formed or bent per **2016 NFPA 24 Section 10.6.2.1.2.4**
- Listed joint restraint systems such as bolted flange, heat fused, welded joints shall comply with **2016 NFPA 24 Section 10.6.2 and 10.6.2.1.3**
- Rods and clamps shall be provided and sized per **2016 NFPA 24 Section 10.6.2.1, 10.6.2.1.2.2 and Table 10.6.2.1.2.2**
- After installing rods, nuts, bolts, washers, clamps, all other restraining devices shall be cleaned and thoroughly coated with bituminous (tar) or other acceptable corrosion-retarding material per **2016 NFPA 24 Section 10.6.2.5**

Plan Calculations:

- Plans shall provide calculated vertical and horizontal thrust forces for pipe elevation changes indicating appropriate restraint method per 2016 NFPA 13 Figure A-63.2 and Figure A-6-3.2

$$\text{Vertical Thrust Force} = T_y = PA \sin \theta$$

$$\text{Horizontal Thrust Force} = T_x = PA (1 - \cos \theta)$$

P = Water Pressure, A= Pipe Area (πr^2):

$$4'' = 12.5 \text{ in}^2$$

$$6'' = 28 \text{ in}^2$$

$$8'' = 50 \text{ in}^2$$

$$10'' = 78.5 \text{ in}^2$$

Sin θ :

$$22.5^\circ = .38$$

$$45^\circ = .70$$

$$90^\circ = 1.0$$

(1 - cos θ):

$$22.5^\circ = .076$$

$$45^\circ = .29$$

$$90^\circ = 1.0$$

$$\text{Gravity thrust block size} = V_g = \frac{S_f P A \sin \theta}{W_m} = \frac{(1.5) (T_y)}{W_m}$$

S_f = Safety Factor (1.5)

W_m = Mass of blocking material (concrete:145 lbs/ft³)

Restraint device(s), rodding, mechanical joint system.

○ Riser Stub Up – If not in Contract

Plans shall include a stub-up riser detail for piping from five feet (5') outside of the building to one foot (1') above the finished floor. The detail shall include, but not be limited to the following:

1. Depth of bury
2. Pipe size and material type
3. Restraint device(s), thrust blocks, rodding, joint system
4. Transition details for connection of dissimilar piping materials
5. Mechanical fittings and flanges for connecting sprinkler system components.

○ Provide the Following Manufacturer's Product Data Sheets:

1. Backflow prevention devices including friction loss chart.
2. Outside Stem and Yoke (OS&Y) and Post Indicator Valves (PIV)
3. Supervisory switches
4. Fire Department connection (FDC) with a minimum of one five-inch (5") Storz connection
5. Automatic ball drain for the fire department connection piping
6. Check valve for the fire department connection piping
7. Sump pump (If required)
8. Vault Lid
9. Pipe penetration seals at vault (flexible)
10. Pre-fabricated vault construction details
11. Pipe, fittings and restraint devices
12. Other _____

Note: All appurtenances, pipe, hydrants, backflow devices must meet or exceed Delco Water Company and 2016 NFPA 24 specifications and standards.

ROD NUMBER – DIAMETER COMBINATIONS

Pipe Size	5/8 in.	3/4 in.	7/8 in.	1 in.
4	2	_____	_____	_____
6	2	_____	_____	_____
8	3	2	_____	_____
10	4	3	2	_____
12	6	4	3	2

Table derived using pressure of 225 psi (15.5 bars) and design stress of 25,000. 2007 NFPA 24 Table 10.8.3.1.2.2

reas in table have been derived using a water pressure of 225 psi (15.5 bars) and a soil resistance of 2000 pounds per square foot (1.0 bars). The values include a 1.5 safety factor. NFPA 24

CONCRETE THRUST BLOCKS, MINIMUM AREA OF BEARING

Pipe Size	90° Bend		45° Bend		Tees, Plugs, Caps, & Hydrants	
	ft ²	m ²	ft ²	m ²	ft ²	m ²
4	2	0.19	2	0.19	2	0.19
6	5	0.46	3	0.28	4	0.37
8	8	0.74	5	0.46	6	0.56
10	13	1.21	7	0.65	9	0.84
12	18	1.67	10	0.93	13	1.21

CONCRETE THRUST BLOCKS, MINIMUM AMOUNT OF CONCRETE

Size of Fitting	Cubic Yards
3"-8"	¾
10"-12"	1 ½

THRUST @ 225 PSI WATER PRESSURE FOR FITTINGS

<i>Pipe</i>	90° Bend	45° Bend	Dead End
4	2,559	1,385	1,810
6	5,288	2,862	3,739
8	9,097	4,923	6,433
10	13,685	7,406	9,677
12	19,353	10,474	13,685

Water Pressure > 100 psi MULTIPLY Table by Ratio of Pressure ...150 psi/100 psi = 1.5 Factor
 2007 NFPA 24

Minimum Thrust Block Size

$$A_b = (h)(b) = T (S_f) / S_b$$

(h) = block height, (b) = block width

T = thrust force table,

S_f = safety factor (1.5)

S_b = soil bearing from table

SOIL	BEARING lb/ft ²
SOFT CLAY	1,000
SAND	4,000
SAND CLAY	6,000
HARD CLAY	9,000