

Fire Protection Underground Piping

ASCE Meeting 12/17/14

Columbia, SC

What We'll Cover Today

2

- Applicable NFPA standards
- Shop Drawing Requirements
- State Fire Marshal's Review
- Sprinkler Act
 - Fire Sprinkler System Specification Sheet
 - Certificate of Compliance
- Why you get pulled
- Strategies to Ease the Pain

How Well Do You Know NFPA 24?

3

- Answer True or False:
 1. Fire Protection piping may not be smaller than 6”
 2. Water meters are not allowed on fire protection lines
 3. Fire Department Connections must use National Standard Threads
 4. Underground piping must be restrained with thrust blocks
 5. All fire protection lines must be equipped with a Post Indicator Valve
 6. The top of a PIV shall be set so the top is 40 inches above valve
 7. Hydrants must be located at least 40 feet from the building protected
 8. FP underground may not be run underneath a building
 9. FP underground must always be flushed to provide a velocity of 10 ft/sec
 10. FP underground is always tested to 200 psi

NFPA Standards

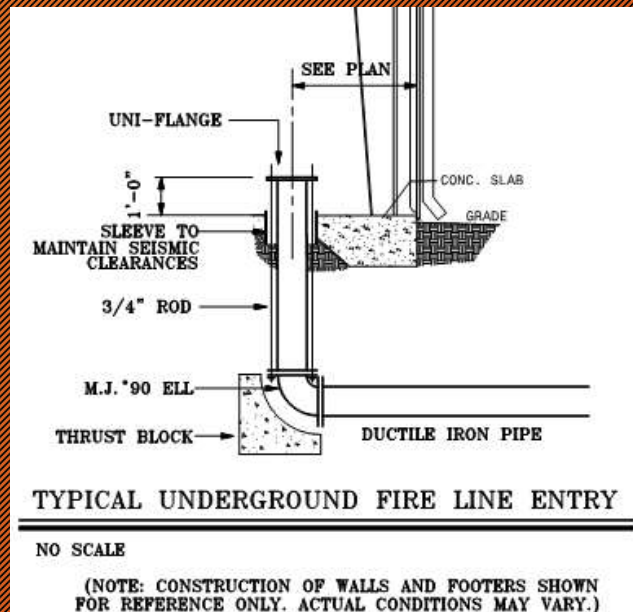
- National Fire Protection Association 13 - 2010
 - Standard for the Installation of Sprinklers Systems
 - Chapter 10
- National Fire Protection Association 24 - 2010
 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances
- Can you use the 2013 editions of these codes - Yes
 - State Agencies - Must accept full compliance with current codes §1-34-40
 - Local AHJ - May accept more current code using Chapter 1 of the IBC & IFC

NFPA 24 - Key Definitions

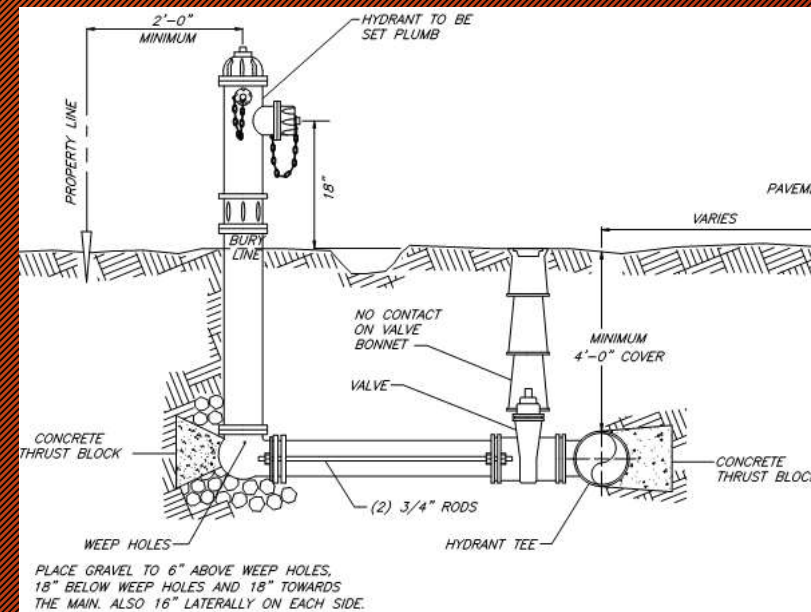
- AHJ - Authority Having Jurisdiction - an approval authority
- Private Fire Service Main (3.3.11)
 - Pipe and its appurtenances on private property between a source of water and:
 - the base of the system riser for water-based fire protection systems,
 - the base elbow of private hydrants or monitor nozzles,
 - the fire pump suction and discharge piping, and
 - the inlet side of the check valve on a gravity or pressure tank

Fire Protection Underground Piping

Typical Riser

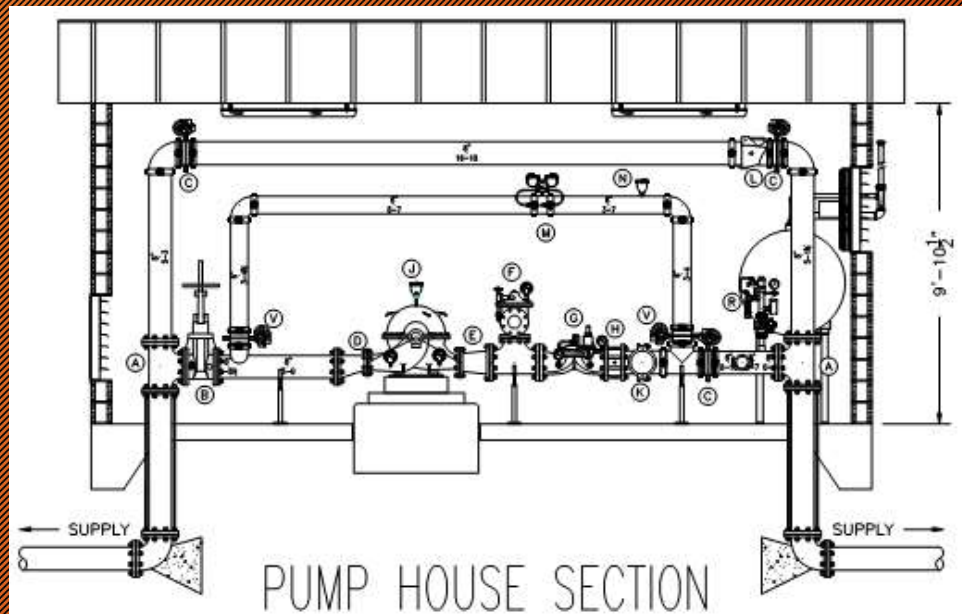


Typical Hydrant

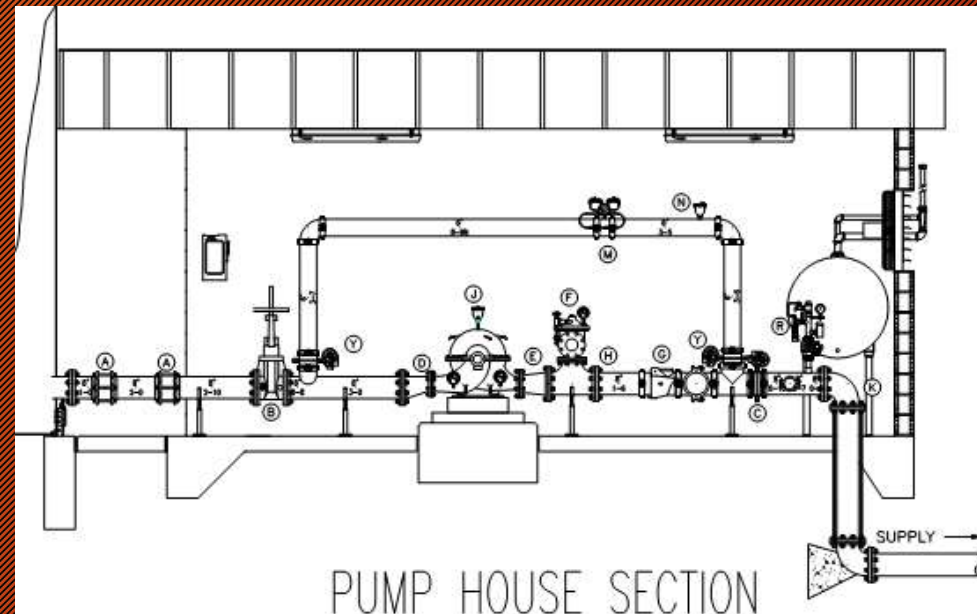


Fire Protection Underground Piping

Fire Pump



Water tanks



Fire Protection Underground Piping

- Working Plans (4.1.3) - drawn to an indicated scale on sheets of uniform size, with a plan of each floor as applicable, and include applicable information:
 - Name of owner
 - Location, including street address
 - Point of compass
 - A graphic representation of the scale used on all plans
 - Name and address of contractor
 - Size and location of all water supplies
 - Size and location of standpipe risers, hose outlets, hand hose, monitor nozzles, and related equipment

Fire Protection Underground Piping

- Working Plans (continued)
 - The following items that pertain to private fire service mains:
 - Size
 - Length
 - Location
 - Weight
 - Material
 - Point of connection to city main
 - Sizes, types, and locations of valves, valve indicators, regulators, meters, and valve pits
 - Depth at which the top of the pipe is laid below grade
 - Method of restraint

Fire Protection Underground Piping

10

- Working Plans (continued)
 - The following items that pertain to hydrants:
 - Size and location, including size and number of outlets and whether outlets are to be equipped with independent gate valves
 - Whether hose houses and equipment are to be provided, and by whom
 - Static and residual hydrants used in flow
 - Method of restraint
 - Size, location, and piping arrangement of fire department connections
- May also need to show the BFP flushing connection

Fire Protection Underground Piping

11

- Size of Fire Mains (5.2)
 - When supplying a hydrant - 6 inches is the minimum size
 - When supplying fire protection systems
 - Sized by hydraulic calculations or
 - Same size as the riser
 - Not as clear in NFPA 24 are Class I & III standpipes
 - These must be 6 inches

Fire Protection Underground Piping

12

- Pressure-Regulating Devices and Meters (5.3)
 - Only with AHJ permission
 - Devices must be listed for Fire Protection
- Backflow Preventers are required by International Building Code & International Fire Code (903.3.5)
 - NFPA 24 requires they must be listed for Fire Protection
 - BFP shall be protected against mechanical damage where needed (6.5.2)

Fire Protection Underground Piping

13

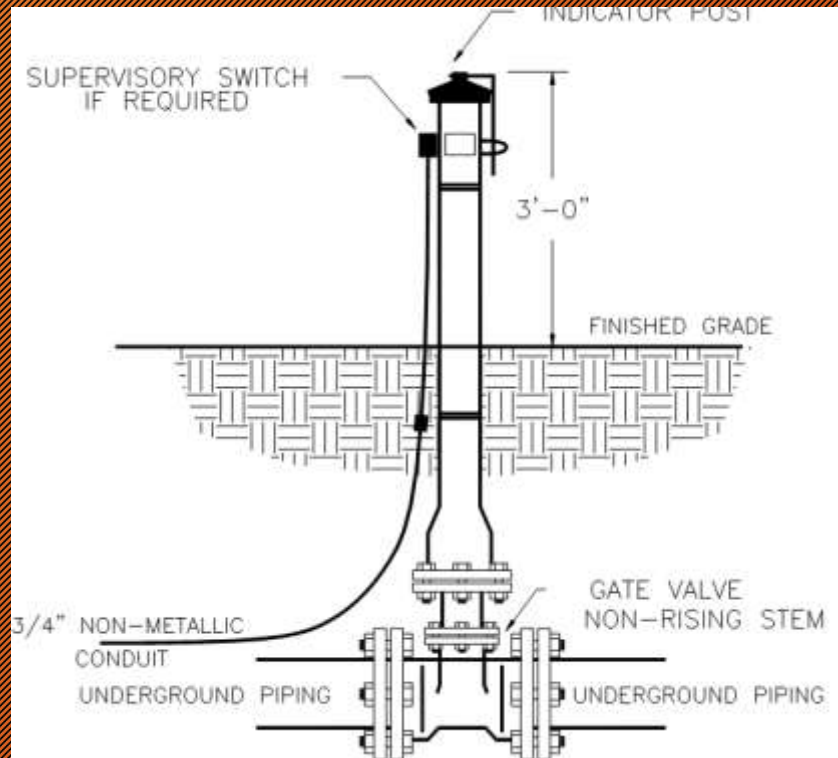
- Fire Department Connections (5.9)
 - AHJ may permit omission of the FDC
 - FDC must be an approved type
 - This is why some AHJs require the Stortz connections
 - FDC shall use NH internal threaded swivel fitting(s) with an NH standard thread(s) -
 - NH = National Hose or National Standard Thread
 - Local FDC does not use NH -> the AHJ shall designate the connection to be used
 - FDC must have a check valve - allows for removal of hoses
 - FDC must have a ball drip - to prevent freezing

Fire Protection Underground Piping

- Valves Controlling Water Supplies
 - A listed underground gate valve equipped with a listed indicator post (PIV)
 - An underground gate valve with approved roadway box and T-wrench may be accepted by the AHJ
 - Provide one per source of water supply
 - No shutoff valve is permitted in the FDC
- Acceptable valve locations
 - Not less than 40 ft from the building
 - Buildings less than 40 ft high - PIV may be installed at least as far from the building as the height of the wall facing the PIV (outside collapse zone)
- Roadway Valve, Wall PIV, and pit valves may serve as control valve

Fire Protection Underground Piping

15

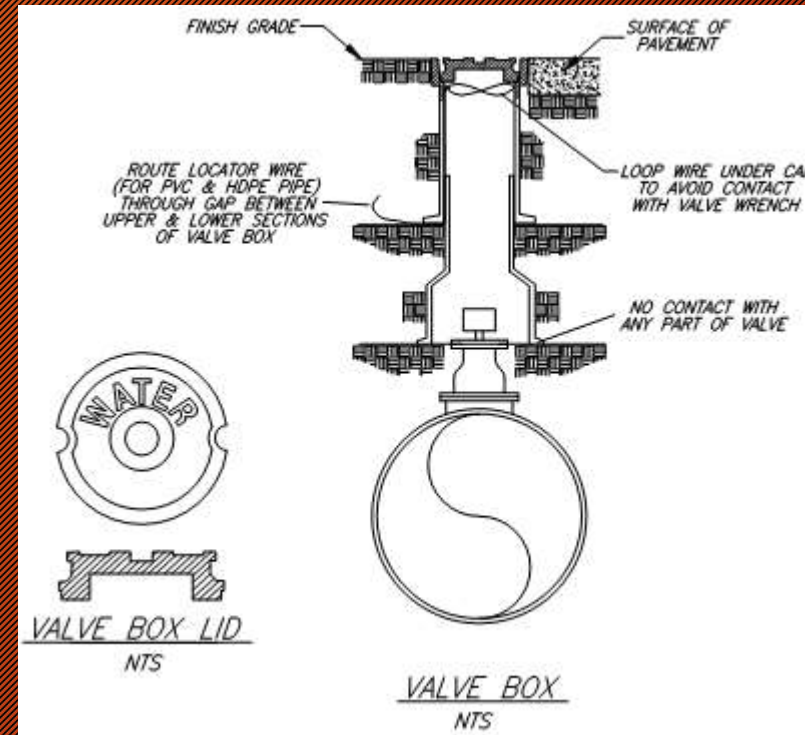


- Post Indicator Valve (PIV)
- Top of the post is 32-40 inches above the final grade
- Provisions for electronic supervision of valve
 - Required through IBC & IFC for all required sprinkler systems
- Protected against mechanical damage where needed

Fire Protection Underground Piping

16

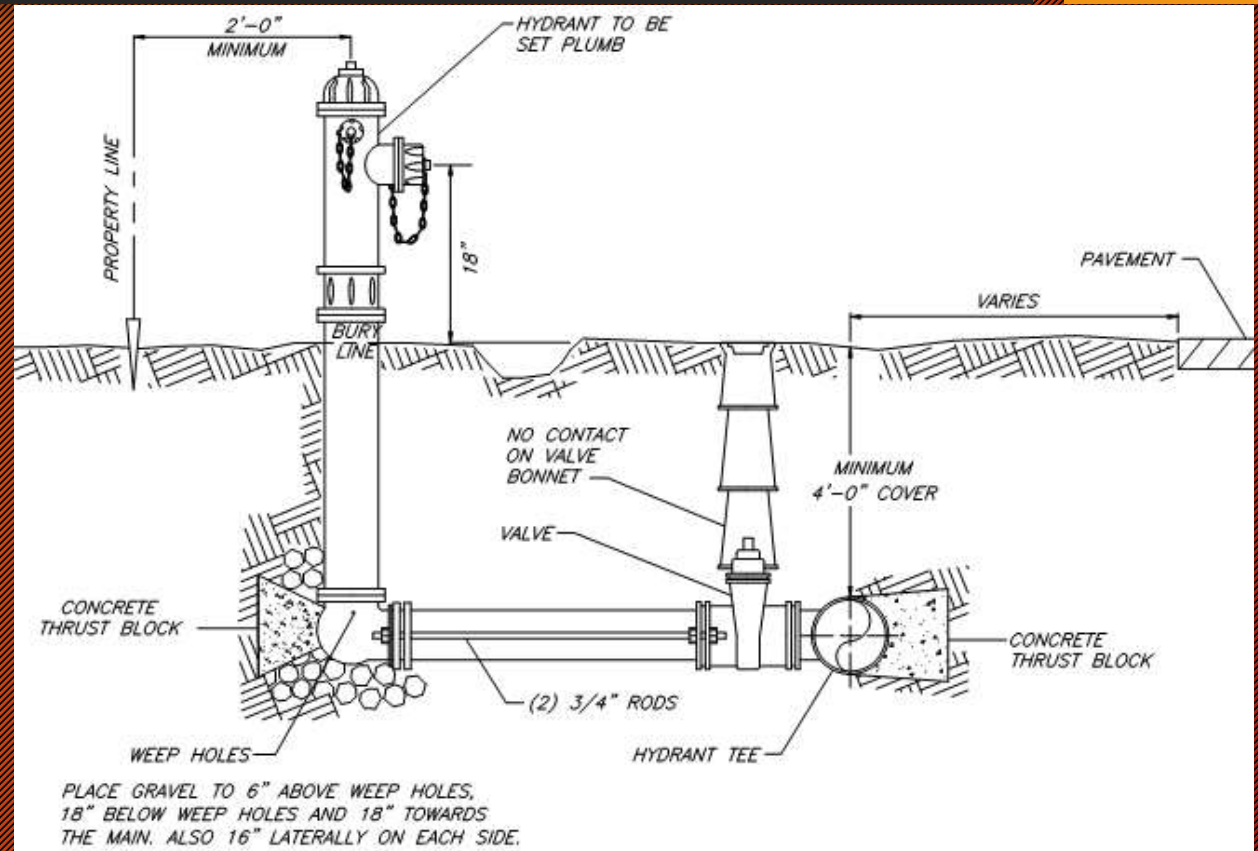
- Requires AHJ approval
- Commonly missed is not providing a T-Wrench



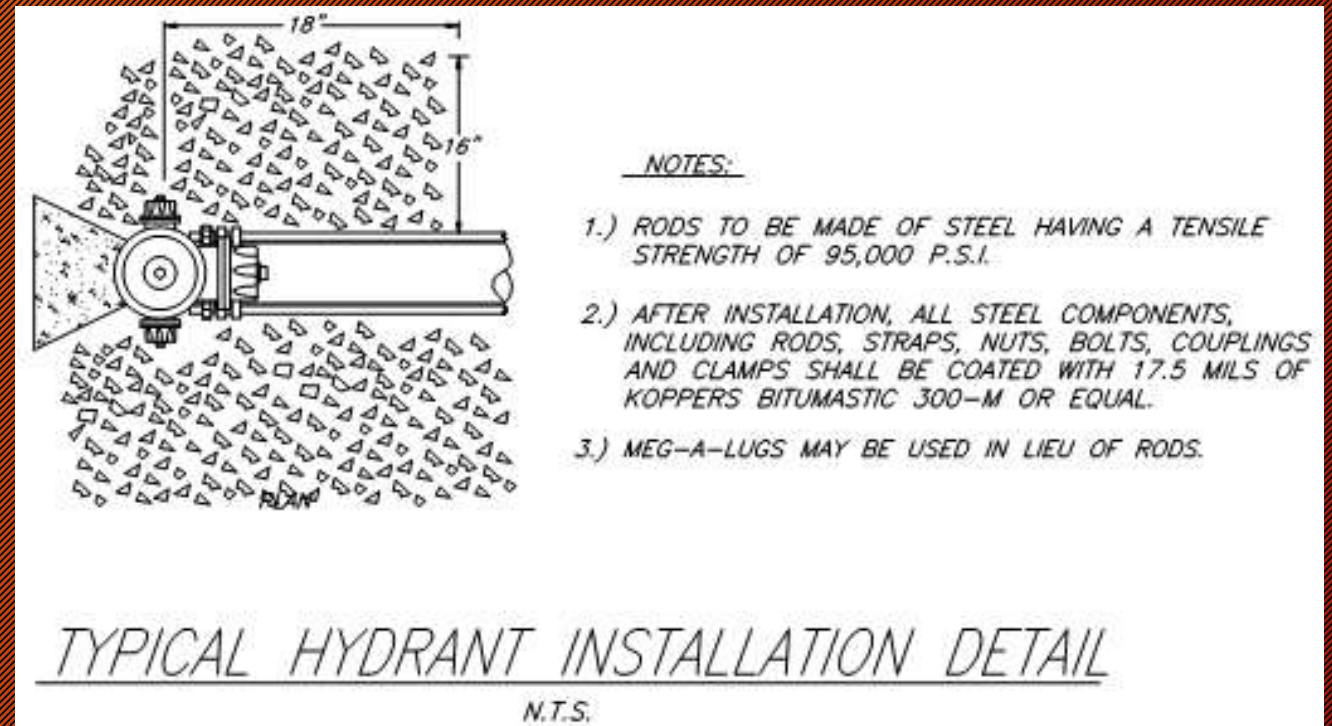
Fire Protection Underground Piping

17

- Fire Hydrant
 - 18" to CL of outlet (7.3.3)
 - Above finished grade
 - Protection from mechanical damage (7.3.6)
 - Show method of restraint
 - Rod size, number, etc
 - Thrust blocking with correct soil bearing factor
 - Ball drip or weep hole and drain field not shown



- How many Rods?
- What size?
- All underground metal must be coated (10.8.3.5)
 - Sacrificial anode not permitted



The Start of a Bad Day!

19



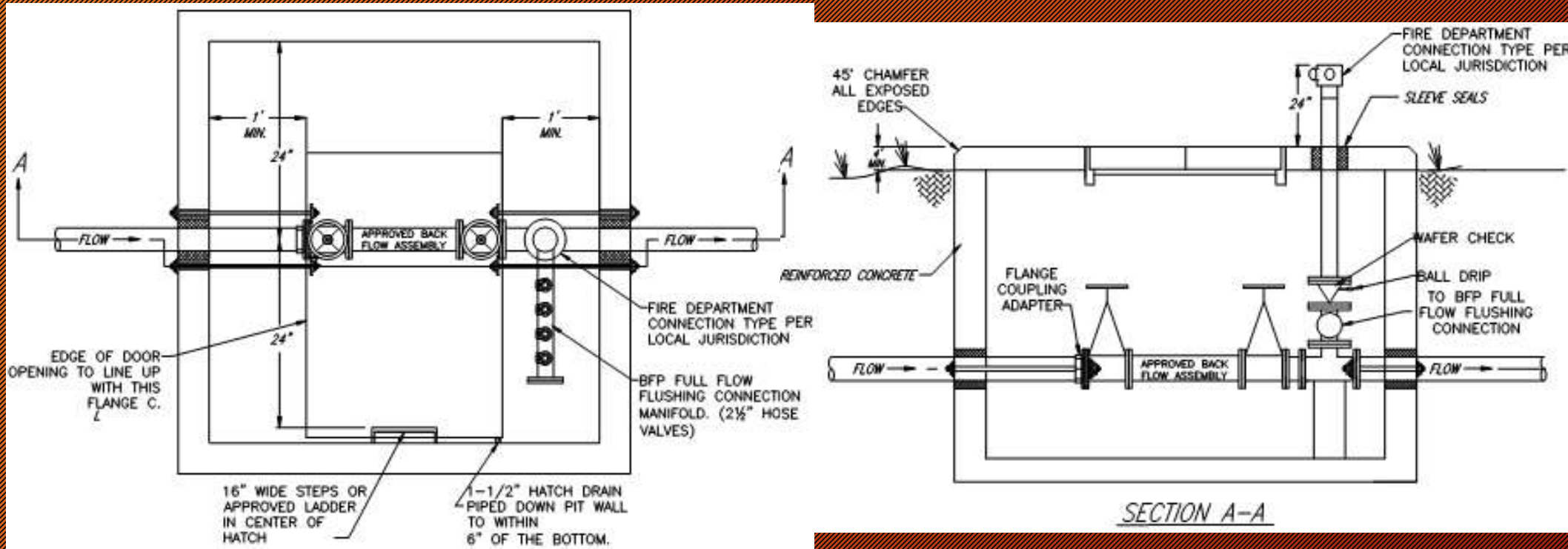
Fire Protection Underground Piping

20

- If you Fire Department Connections is at the pit
 - Be sure you provide a check valve
 - And it's pointed the correct direction
 - Provide a ball drip to drain the FDC
 - Don't create a churn between the FDC & the hydrant
- NFPA 24 does not specify a minimum height above grade
 - Annex A.5.9 does state the FDC shall not be less than 18 inched nor more than 4 ft above finished grade
 - Remember the Fire Department may use a wrench to tighten the hose

BFP Flushing Connection in a Pit

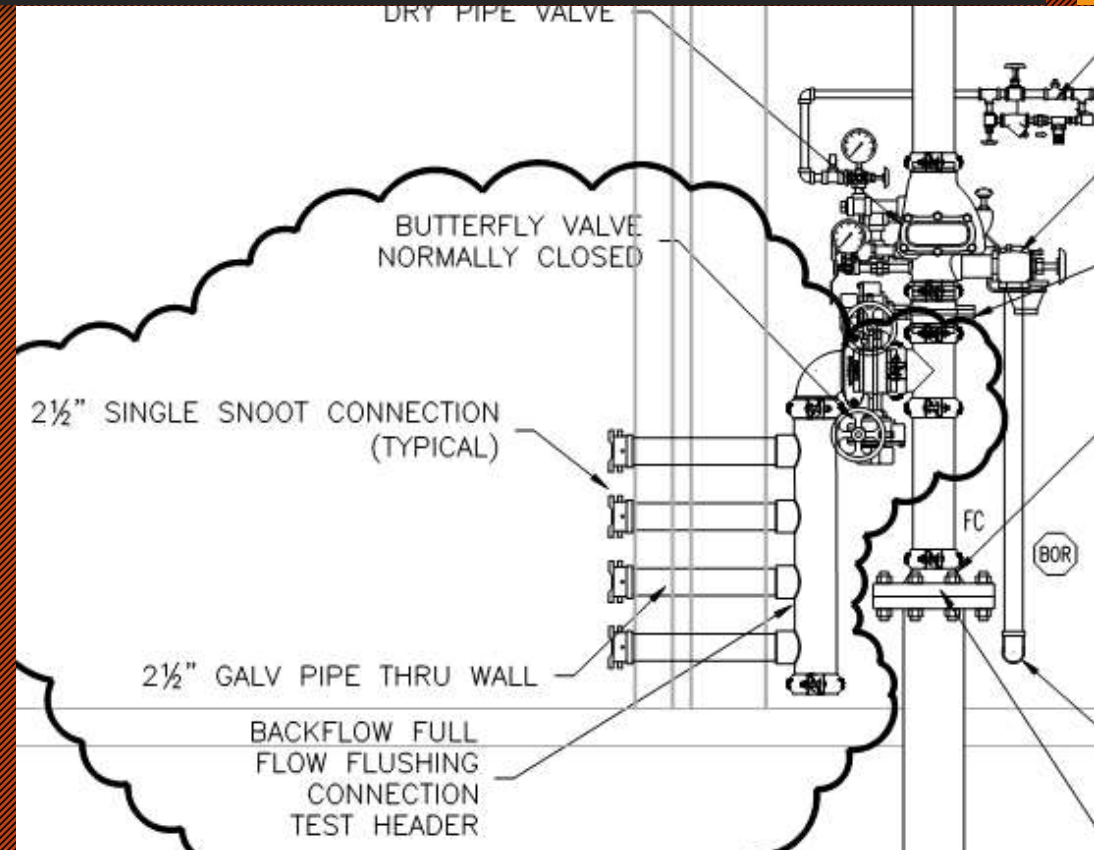
21



Fire Protection Underground Piping

22

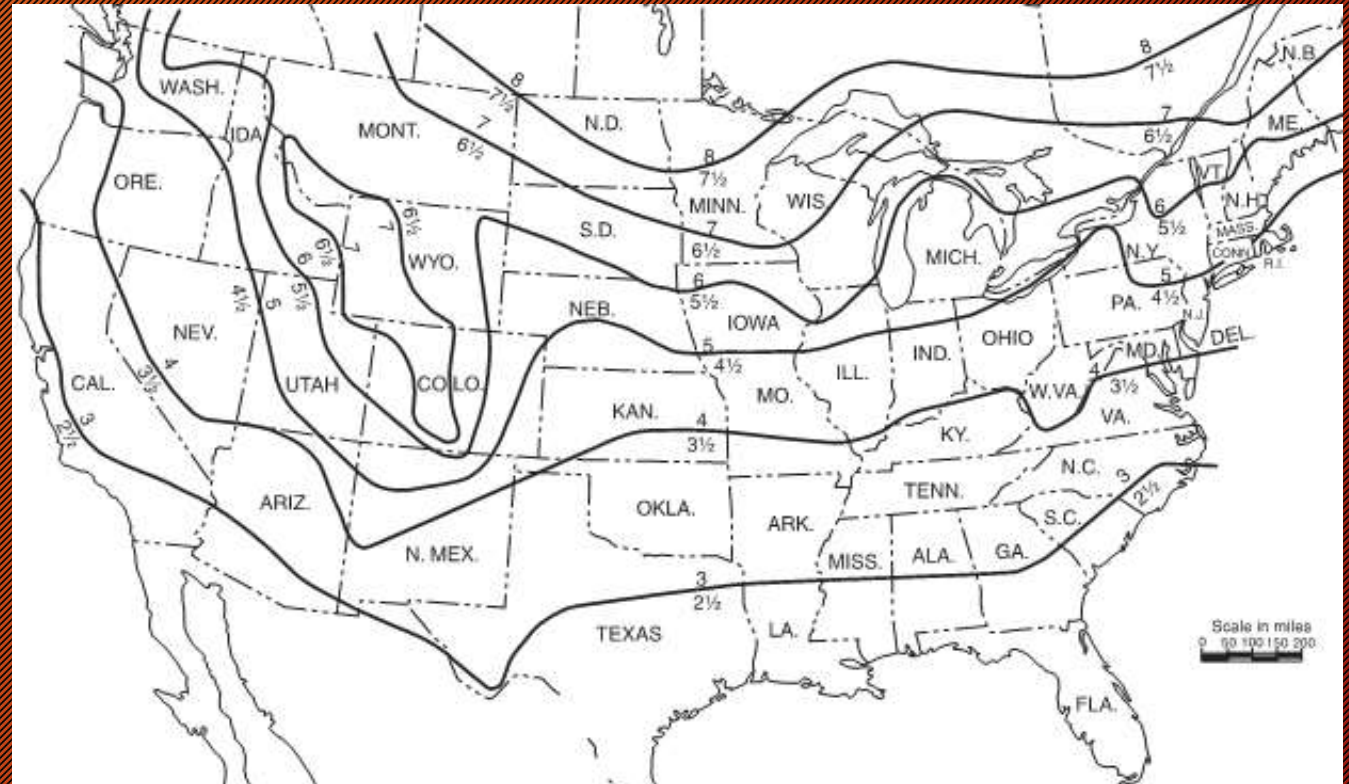
- BFP Flushing Connections
 - Required by NFPA 13 & 25
- Size and number
 - Requirement is to flush the system demand
 - Rule of Thumb - one 2.5" outlet per 250 GPM
- For Light Hazard systems - a 2" main drain will handle it



Fire Protection Underground Piping

23

- Depth of cover
 - Buried below the frost line (10.5.2)
 - In SC 30 - 42 inches deep works
 - Under driveways shall be a minimum depth of 3 ft (10.4.4)
 - under railroad tracks shall be a minimum depth of 4 ft (10.4.5)



Fire Protection Underground Piping

24

- Under building(s)
 - Special precautions shall be taken for pipe run under buildings (10.6.2)
 - Arching the foundation walls over the pipe
 - Running pipe in covered trenches
 - Providing valves to isolate sections of pipe under buildings
 - Try to locate risers immediately inside an exterior wall
 - Pipe joints shall not be located under foundation footings (10.4.5)
- Underground piping shall not be used as a grounding electrode for electrical systems (10.6.8)

Fire Protection Underground Piping

- Testing of underground piping
 - Pressure test to 200 psi OR 50 psi over static pressure exceeding 150 psi
 - Leave joints exposed
 - Some leakage allowed
 - Flush until clean @ 10 ft/sec, system demand plus hose, OR full flow of supply
- Require a UG Contractors Materials & Test Certificate

Table 10.10.2.1.3 Flow Required to Produce a Velocity of 10 ft/sec (3 m/sec) in Pipes

Pipe Size		Flow Rate	
in.	mm	gpm	L/min
4	102	390	1,476
6	152	880	3,331
8	203	1,560	5,905
10	254	2,440	9,235
12	305	3,520	13,323

Sprinkler Act §40-10

26

- 40-10-230 (6) allows utility contractors to install underground piping
- 40-10-250 B requires a Fire Sprinkler System Specification Sheet be completed by an Engineer
- 40-10-260 B requires the engineer completing the FSSSS review the shop drawings and prepare a Certificate of Compliance
 - NOT required for sealed drawings
 - SFM want you to complete a COC so they don't have to review the plans

How You Get Pulled In

27

- Utility contractors don't prepare plans
 - They install from the engineers drawings
 - No shop drawings = no SFM review or approval letter
- Sprinkler contractors will exclude underground from their scope
 - They start 1 foot above finished floor
- So guess who the GC calls when they don't have the SFM approval
 - Mr Engineer, why didn't you get your plans approved?
 - Mr GC, it was not in my scope of work!
- Don't forget the missing 6 ft!

Ways to Avoid the Emergency

28

- Be proactive and submit drawings to the SFM for review and approval
 - EOR for the sprinkler system can assist with data for the FSSSS
 - Add it as a service & bill for it
- Exclude SFM submission and approval from you scope of work
 - May still get dragged in
- Require contractor to generate shop drawings
 - This would require you to review the shop drawings and prepare a COC

Let's Review

29

- Applicable NFPA standards
- Shop Drawing Requirements
- State Fire Marshal's Review
- Sprinkler Act
 - Fire Sprinkler System Specification Sheet
 - Certificate of Compliance
- Why you get pulled
- Strategies to Ease the Pain

Thank You for Attending!

Foster Engineering & Consulting, LLC



Ralph K. Foster, III, PE

Principal Fire Protection Engineer

1539 Brockwall Drive

Columbia, SC 29206-4410

Phone (803) 787-4757

Mobile (803) 315-1549

Ralph@FosterEngr.com

www.FosterEngr.com

ASCE Meeting 12/17/14

Columbia, SC

