





**WINCHESTER FIRE & RESCUE DEPARTMENT**  
**OFFICE OF THE FIRE MARSHAL**  
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## **UNDERGROUND FIRE LINE INSTALLATION & TESTING GUIDELINES**

It is solely the responsibility of the installing contractor to ensure the installation complies with the requirements of NFPA 24 Standard for the Installation of Private Fire Service Mains and Their Appurtenances. The points in this document coincide with the requirements of NFPA 24-2016 edition.

### **INSTALLATION AND PERMIT REQUIREMENTS:**

1. All underground fire lines shall be a separate connection to the water main with a valve at its point of connection unless otherwise directed by the City of Winchester Utilities Department.
2. Detailed plans for underground fire lines and a fire protection permit application shall be submitted to Building Development Services for approval prior to installation. Profiles of the underground fire line are optional but are recommended. Any hydraulic calculations used to determine the size of the fire line shall also be included at the time of submittal.
3. Underground fire lines for fire sprinkler, fire sprinkler/standpipe, or fire standpipe systems shall be installed such that the underground line terminates in a riser room located immediately adjacent to an exterior wall with a personnel door, permitting immediate access to the main fire sprinkler, fire sprinkler/fire standpipe, or fire standpipe control valves, located in the riser room for use by Fire/Rescue personnel.
4. Underground fire lines shall extend horizontally a minimum of twenty-four (24) inches, but not more than ten (10) feet, into a building or structure beyond the exterior wall of the building or structure.
5. Underground fire lines shall be a minimum of six (6) inches in diameter unless hydraulic calculations are provided, and approved by the Fire Marshal's Office, documenting that a smaller diameter fire line will provide the pressure and flow demands of the fire protection system it serves. All hydraulic calculations shall be prepared, sealed, and signed by a professional engineer.
6. Underground fire lines must have forty-two (42) inches of compacted soil cover depth.
7. Underground fire lines must maintain a perimeter clear of other utilities and other non- compacted soil for a minimum of thirty-six (36) inches around the pipe.

### **Exceptions:**

- a. In cases where this clear area is not possible and/or the forty-two (42) inches of cover is not possible, supplemental insulating measures to keep pipe exposure from temperatures below forty (40) degrees Fahrenheit. (NOTE: A minimum of thirty-six (36) inches depth of cover must be maintained per code.) However, if the depth of cover for the fire line is sixty (60) inches or greater, from the finished grade, the thirty-six (36) clear area may have other fill material and be crossed by any utility, except in cases where the utility is open to the atmosphere. (Example: Storm water management and/or roof drain lines) In that case supplementary insulation measures shall be utilized.

- b. Supplementary insulation measures permitted by the Fire Marshal's Office include extruded polystyrene (XCCPS), suitable for underground burial and the density to reduce compaction. (Example: Kingspan Greenguard XPS). Material data sheets must be submitted with the design/engineering plans and showing profiles and details in how it is to be installed. Other insulation measures may be permitted but will be subject to approval of the Fire Marshal's Office. The Designer or Engineer must provide material safety data sheets that clearly indicate the material being used and its suitability from the manufacturer for this application. In either case, the designer or engineer must demonstrate that the amount of insulation installed meets the required geothermal criteria. (Example: 1" of insulation will equate to the amount of missing soil to provide adequate thermal protection for the fire line at or above 40 degrees Fahrenheit.)

### **TESTING AND ACCEPTANCE:**

8. The installing contractor shall be responsible for the following:
  - a) Notifying the authority having jurisdiction and the owner's representative of the time and date testing is to be performed. At least 48 hour notice is required.
  - b) Performing all required acceptance tests.
  - c) Completing and signing the *Contractor's Materials and Test Certificate* (attached).
9. Acceptance testing shall be required of all underground fire lines prior to concealment and use. Underground fire lines shall have a **Visual Inspection, Hydrostatic Test, and a Flush Test.**
10. **Visual Inspection** – A visual inspection of the piping, connections, thrust blocks, threaded rods, and restraint systems from the street water valve to the base of the flange for the connection to piping of the automatic sprinkler system. The visual inspection of the installation **shall be performed prior to cover**. If the piping, joints, or thrust blocks are covered prior to installation, you will be required to uncover the piping for inspection.
11. **Hydrostatic Test** – A water pressure test of the underground fire line from the valve at the water main up to, and including, the temporary flange/gate valve assembly. It shall not be less than two hundred (200) pounds per square inch (psi) for two (2) hours or at fifty (50) psi in excess of the maximum static pressure when the maximum static pressure is in excess of one hundred fifty (150) psi. Gauge must be in 5 or 10 pound increments.
12. **Flush Test** – A flush of the piping between the street water valve and the base of the automatic sprinkler system flange. Flushing of an underground fire line shall occur prior to admittance of any water through the underground fire line and into the fire protection system it serves. Proper methods and equipment to perform the flush must be used. All piping and hoses used to flush must be properly secured or restrained. The Fire Marshal must approve of flushing method and equipment.
13. The following chart should be used to determine the appropriate number and size of hose lines for reach desired water flow for proper flushing. Example: a 6" underground fire line requires a flow of 880 gallons per minute for proper flushing. To achieve a proper flow 2 – 2 ½" hoses would need to be attached to the manifold. Alternately a single 4" hose could be attached to the manifold to achieve the same flow.

WATER FLOW RATE FOR LINE FLUSHING*		
Pipe Size (inches)	Flush Orifice Size (inches)	Flow Rate (GPM)
2	2	60
4	3	400
6	4	750
8	4	1,000
10	6	1,500
12	6	2,000

\*Remote fire department connections lines between the fire department connection and the point of connection to the fire sprinkler, fire sprinkler/fire standpipe, fire standpipe, and underground breezeway loops for sprinkler systems shall be flushed at the rates shown in the table above.

14. Concealment of an underground fire line prior to acceptance testing may occur if a **visual inspection** of the line is conducted, by the Fire Marshal's Office, to verify that the piping and anchorage is installed in an approved manner, and if the developer or contractor assumes responsibility for corrections to failures of the hydrostatic test.
15. **SAFETY IS THE CONTRACTOR'S RESPONSIBILITY** If unsafe conditions are observed Fire Marshal's staff will request corrective measures be taken. If corrective measures are not sufficient staff will end the inspection.

**OPERATIONAL TESTS:**

16. Each fire hydrant (where provided) shall be fully opened and closed under system water pressure. Dry barrel hydrants shall be checked for proper drainage.
17. All control valves shall be fully closed and opened under system water pressure to ensure proper operation. Where fire pumps are available, these tests shall be completed with the pumps running.
18. Backflow prevention devices shall be forward flow tested to ensure proper operation at the system demand flow rate, including hose stream demands where applicable. (When the system is flushed using option 1 in the flow section, this can be accomplished at that stage without completing a separate test.)

# Contractor's Material and Test Certificate for Underground Piping

## PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

<b>Property Name</b>		<b>Date</b>	
<b>Property Address</b>			
<b>Plans</b>	Accepted by approving authorities (names)		
	Address		
	Installation conforms to accepted plans	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	Equipment used is approved	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	If no, state deviations		
<b>Instructions</b>	Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	If no, explain		
	Have copies of appropriate instructions and care and maintenance charts been left on premises?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	If no, explain		
<b>Location</b>	Supplies buildings		
<b>Underground pipes and joints</b>	Pipe types and class	Type joint	
	Pipe conforms to: standard	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	Fittings conform to: standard	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	If no, explain		
	Joints needing anchorage clamped, strapped, or blocked in accordance with standard	<input type="checkbox"/> Yes	<input type="checkbox"/> No
If no, explain			
<b>Test description</b>	<p><u>Flushing</u>: Flow the required rate until water is clear as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blow-offs. Flush at flows not less than 390 gpm (1476 L/min) for 4 in. pipe, 880 gpm (3331 L/min) for 6 in. pipe, 1560 gpm (5905 L/min) for 8 in. pipe, 2440 gpm (9235 L/min) for 10 in. pipe, and 3520 gpm (13,323 L/min) for 12 in. pipe. When supply cannot produce stipulated flow rates, obtain maximum available.</p> <p><u>Hydrostatic</u>: All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psi (13.8 bar) or 50 psi (3.4 bar) in excess of the system working pressure, whichever is greater, and shall maintain that pressure ± 5 psi for 2 hours.</p> <p><u>Hydrostatic Testing Allowance</u>: Where additional water is added to the system to maintain the test pressures required by 10.10.2.2.1, the amount of water shall be measured and shall not exceed the limits of the following equation (For metric equation, see 10.10.2.2.4):</p> $L = \frac{SD\sqrt{P}}{148,000}$ <p style="margin-left: 40px;"> <i>L</i> = testing allowance (makeup water), in gallons per hour  <i>S</i> = length of pipe tested, in feet  <i>D</i> = nominal diameter of the pipe, in inches  <i>P</i> = average test pressure during the hydrostatic test, in pounds per square inch (gauge)         </p>		
<b>Flushing tests</b>	New underground piping flushed according to standard by (company)		<input type="checkbox"/> Yes <input type="checkbox"/> No
	If no, explain		
	How flushing flow was obtained: <input type="checkbox"/> Public water <input type="checkbox"/> Tank or reservoir <input type="checkbox"/> Fire pump	Through what type of opening: <input type="checkbox"/> Hydrant butt <input type="checkbox"/> Open pipe	
	Lead-ins flushed according to standard by (company)		<input type="checkbox"/> Yes <input type="checkbox"/> No
	If no, explain		
How flushing flow was obtained <input type="checkbox"/> Public water <input type="checkbox"/> Tank or reservoir <input type="checkbox"/> Fire pump		Through what type of opening <input type="checkbox"/> Y connection to flange and spigot <input type="checkbox"/> Open pipe	

