

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**DRY HYDRANT**

(No.)

**CODE 432**

**DEFINITION**

A non-pressurized permanent pipe assembly system installed into a water source that permits the withdrawal of water by suction.

**PURPOSE**

To provide all weather access to an available water source for fire suppression.

**CONDITIONS WHERE PRACTICE APPLIES**

Where a dependable source of water is available, where transport vehicles can access the site, and where a source of water is needed for fire suppression.

**CRITERIA**

**Utilities and Permits.** The landowner shall be responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

The landowner shall obtain all necessary permissions from regulatory agencies, including the Illinois Department of Agriculture, US Army Corps of Engineers, US Environmental Protection Agency, Illinois Environmental Protection Agency and Illinois Department of Natural Resources – Office of Water Resources, or document that no permits are required.

**Site Conditions.** Site conditions shall be such that an all weather vehicle access is available to the dry hydrant or can be developed. The dry hydrant shall be reasonably close to the water source to minimize the length of suction line. The location of the hydrant should be

determined in conjunction with local fire officials. Special care and maintenance will be required when debris and fine soil particles are part of the stream bed.

**Water Requirement.** The quantity to be considered available to a dry hydrant is the minimum available (at not over 15 feet total static lift) during a drought. A minimum of 4,000 cubic feet of pumpable impoundment water or a minimum pump flow rate of 250 gpm without interruption for 2 hours is considered a dependable water supply.

**Location.** A location map showing the exact site of the hydrant and vehicle access shall be furnished to the local fire department with a copy to the landowner. A letter of approval to use the site shall be obtained from the landowner prior to construction. This could be a Water Use Agreement, made with the local Fire Department. Access, topography, and location should be reviewed by fire department personnel prior to installation.

The fire truck connection shall be located within 10 feet of the edge of an all weather access road. The all weather access road and fire truck pumper connection shall be higher than the auxiliary spillway elevation if installed in a constructed impoundment.

**Water supply.** The adequacy of the water supply from impoundments shall be determined. The volume of water available from ponds and lakes shall be based on the low water drought level, which shall be assumed to be 3 feet below the permanent pool elevation. The adequacy of stream flow source can be determined from regional analysis of stream gage data.

**Pipe.** The pipe material may be Poly Vinyl Chloride (PVC) pipe and fittings conforming to

ASTM D 1785 and ASTM D 2466 for Schedule 40 pipe. The pipe may also be steel conforming to ASTM A 53, or iron pipe conforming to ANSI/AWWA C151/A21.51 and ANSI/AWWA C115/A21.15.

PVC pipe must be protected from or resistant to ultraviolet rays. No more than two 90-degree elbows shall be used in the entire pipe system. Pipe shall be 6 inches nominal diameter or larger. The pipe shall be fitted with intake screen or strainer and standard fire truck hose adapters for quick connect/release operations acceptable to the local fire department.

If pipe supports are required, they shall be shown on the drawings or as otherwise approved by the engineer.

Always install a brace 2 to 4 feet in front of the hydrant to bear the weight of the hard suction between the pumper and the hydrant head. The weight of the hard suction full of water can crack the standpipe, particularly during extremely cold weather.

The depth at which the pipe is installed shall be below the frost-free depth for the area.

**Frost Protection.** Prevent water within the pipe from freezing, when the high water level is at or above the average frost-free depth, using methods such as:

- mounding soil in additional height and perimeter to attain adequate thermal protection or
- by adding commercial pipe insulation around the pipe.

**Pipe Intake.** The intake screen should have a minimum opening of 4 times the pipe cross sectional area. Where the intake is more than 3 feet off the bottom, a trash rack may be used in lieu of a screen.

A dry hydrant installation shall provide for a positive slope toward the water source. In pits or impoundments, the intake screen or strainer shall be supported and secured at least two feet above the pool bottom. The intake shall be at least 4 feet beyond the earth slope.

To avoid a vortex or whirlpool during pumping, the centerline of the inlet pipe shall be at least 2.0 feet below the design low water level unless a special design is prepared to prevent a vortex.

For low profile stream screen intakes, the depth of water cover below the design low water level may be less than 1.0 ft as per manufacturer's recommendations.

**Pump Lift.** The top of the fire truck pumping connection or centerline of pump (whichever is higher) shall be no more than 15 feet above the design low water level or stream surface during drought conditions.

The total lift (pumping head) shall not exceed 20 feet when all losses are totaled. Pumping head for each site shall include head loss from screen or strainer, elbows, line friction, elevation (static head), and hard rubber or flexible suction hose to the fire truck.

**Dry Hydrant.** Dry barrel (conventional) hydrants may not be used due to excess suction loss and the necessity that they be absolutely airtight.

A recessed hydrant (below ground-level connection) may be specified for use in areas with special needs, such as in a high vandalism area or for low profile and esthetic needs. It is also referred to as a flush mount hydrant and does not require the riser. It may be used with the 45° or straight dry hydrant head assembly.

**Dry Hydrant Head.** The hydrant sleeve shall be made of bronze, brass, aluminum alloy or other durable, non-corrosive metal. Sleeve must be permanently affixed inside a PVC head using epoxy adhesive and stainless steel bolts.

The hydrant head shall be able to accept a 6 inch NHT (American National Fire Hose Thread) connection to provide maximum supply. Hydrant (6 inch) head shall conform to ASTM 2466, Poly Vinyl Chloride (PVC) Fittings, Schedule 40.

All hydrants shall contain a removable head strainer and stainless steel snap ring that can be removed without special tools. The strainer

**NRCS – Illinois**

**March 2008**

shall be conical in shape to maximize straining area. All hydrants shall use a rubber "O" ring between the threaded sleeve and PVC head.

The local Fire Department should decide at what angle they would like the hydrant head to be placed. This will depend on the type of hard suction they will run from the pumper to the hydrant, what angle the pumper sits in reference to the hydrant, and whether the pump is located on the front or side of the truck.

The hydrant head shall not be located higher in elevation than the anticipated fire truck pump intake, in order to prevent a potential air-lock.

Fire truck pump intake height is commonly 3-feet from ground level to the center of the intake.

**Dry Hydrant Cap.** The cap shall be of snap-on/snap-off design and removable without special tools. It shall be joined with a steel cable or chain and be permanently attached to the dry hydrant head. The cap shall be hard plastic or of same metal as NHT connection for maximum corrosion resistance. A rocker lug may be used if preferred by the Fire Department.

**Strainer.** The strainer shall be fabricated from PVC material compatible with the pipe. Individual inlet holes shall not exceed 3/8-inch diameter. All components, including pins, shall be non-corrosive. Manufactured well screens shall be corrosion resistant. Screens and strainers shall have a minimum open area of 4 times the pipe cross sectional area.

A strainer may be formed by drilling 1/4 inch to 3/8 inch diameter holes with a minimum of one hole diameter between the holes in PVC pipe. The size and number of holes shall be sufficient enough to pass the rated flow. Drill holes shall be deburred and the pipe cleaned before putting the strainer into service. The screens or strainers shall be capped with a removable end cap.

**End Cap.** The end cap must be easily removed without special tools. Perforations are recommended in the end cap to improve flow conditions into the strainer and for jetting action for silt cleanout. A flapper hinge can also be used for silt cleanout.

**Access.** Vehicle access to and from the dry hydrant shall be provided for fire truck and pumper units. Access shall have an all-weather surface, be well drained and be at least 12 feet wide for ease of movement by personnel and equipment during an emergency. When local road traffic may be involved, an all-weather road surface conforming to Conservation Practice Standard 560, Access Road adjacent to the dry hydrant and completely off the public road is recommended for safety of the emergency personnel and the public.

After the dry hydrant installation, the site shall be graded for surface drainage and vegetated or otherwise protected from erosion. Vegetation shall be in accordance with Conservation Practice Standard 342, Critical Area Planting.

## CONSIDERATIONS

- Effect of the use of the dry hydrant on upstream and downstream water quantity.
- Sediment production caused by erosion during construction.
- Provide protective barrier around dry hydrant head to prevent damage.
- Intakes placed in streams are typically difficult to maintain due to debris and sediment accumulation and fluctuations in stream depth due to drought conditions. They are not recommended and should be used ONLY as a last resort after all other water supplies in the region have been investigated, evaluated and eliminated as an alternative.
- To minimize the volume of air in the pipe requiring evacuation when priming, place a pipe reducer at or below the anticipated drought pool elevation, thus reducing the time needed to prime the pipe during a fire emergency.
- Possible effects on surface and ground water of spilled fuels and lubricants by fire trucks using the dry hydrant.
- This practice has the potential to negatively affect National Register listed or eligible (significant) cultural resources (archaeological, historical or traditional

cultural properties); it also has the potential to protect listed or eligible historic structures. Consider these factors during planning and also follow the NRCS State policy during construction and maintenance.

- Any work in and/or around streams or water-bodies may require a permit from the Department of Natural Resources – Office of Water Resources, Army Corp of Engineers, Illinois Environmental Protection Agency or local permitting authorities.
- Consider any man-made or natural uses of the water supply that may affect the available water.

### **PLANS AND SPECIFICATIONS**

Plans and specifications for installing dry hydrants shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. Plans and specifications shall include construction plans, drawings, job sheets or other similar documents. These documents shall specify the requirements for installing the practice, including the kind, amount and quality of materials to be used.

### **OPERATION AND MAINTENANCE**

An Operation and Maintenance (O&M) plan shall be prepared for and reviewed with the landowner or operator. The plan shall specify that the treated areas and associated practices are inspected annually and after significant storm events to identify repair and maintenance needs.

The O&M plan shall detail the level of repairs needed to maintain the effectiveness and useful life of the practice.

Keeping the site clear of obstruction and regular mowing of the dry hydrant access area will be required to keep the area readily available for emergency use.

Pumper testing of the dry hydrant shall be done at least annually to verify site usability. This test shall include back flushing, followed by a pumper test at the maximum designed flow rate. Careful attention should be given to silt, debris, aquatic growth, or other interference that may limit the full operation of the dry hydrant.

Checks of the intake screen should be made once every five years to identify any sediment build up and to provide information for a clean-out operation or for aquatic growth control needs. The hydrant should be back-flushed each spring and fall to remove any silt or debris that may have accumulated on the screen.

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSTRUCTION SPECIFICATION**

**DRY HYDRANT**

**Scope**

The work shall consist of excavation and installation of the dry hydrant along with other materials and fixtures as shown on the construction plans.

**Location**

The installation shall be as shown on the construction plans and as staked in the field.

**Site Preparation**

All loose rock, sediment, logs, and vegetation that can obstruct the free discharge from the water body shall be removed and disposed of so they will not endanger the dry hydrant.

**Installation**

Pipe shall be installed at a sufficient depth below the ground surface to provide protection from hazards imposed by traffic crossing, farming operations, freezing temperatures, or soil cracking. The minimum depth of cover shall be 2.5 feet; but in soils subject to deep cracking, the cover shall be a minimum of 3 feet.

At low places on the ground surface, extra fill may be placed over the pipe to provide the minimum depth of cover. The fill material shall be placed and compacted before the trench is excavated. If extra protection is needed at vehicular crossings, encasement pipe or other approved methods may be used.

The trench at any point below the pipe shall be only wide enough to permit the pipe to be easily placed and joined. The width of the trench shall allow the initial backfill material to be uniformly packed around and along the sides of the pipe. The maximum trench width shall be 2.5 feet greater than the diameter of the pipe. If the trench is precision excavated and has a semicircular bottom that closely fits

the pipe, the width shall not exceed the outside diameter of the pipe by more than 10 percent.

The trench bottom shall be uniform so that the pipe lies on the bottom without bridging. Clods, rocks, and uneven spots that can damage the pipe or cause non-uniform support shall be removed.

If there are rocks, boulders, or any other material that might damage the pipe, the trench bottom shall be cut a minimum of 1/3 foot below final grade and filled with bedding material consisting of sand or compacted fine-grained soils.

Care shall be taken to prevent permanent distortion and damage when handling the pipe during unusually warm or cold weather. The pipe temperature shall be at or near the soil temperature before backfilling. The pipe shall be uniformly and continuously supported over its entire length on firm, stable material. Blocking or mounding shall not be used to bring the pipe to final grade.

All joints and connections shall be capable of withstanding the design maximum working pressure for the pipeline without leakage. Pipe joints shall leave the inside of the pipeline free of any obstructions that can reduce its capacity below design requirements.

All fittings such as couplings, reducers, and bends shall be installed according to the recommendations of the pipe manufacturer.

All exposed polyvinyl chloride (PVC) or metal surfaces and all underground metal surfaces should be adequately treated to prevent deterioration of the material.

Thrust blocks should be considered at the elbow joint both to resist hydraulic forces and

**NRCS – Illinois  
March 2008**

to steady the installation in unstable soils. When required, thrust blocks must be formed against solid, unexcavated earth, undamaged by mechanical equipment. They shall be constructed of concrete, and the space between the pipe and the trench wall shall be filled with concrete to the height of the outside diameter of the pipe or as specified by the manufacturer.

If it is necessary to partially backfill the line before testing to hold the pipeline in place, backfilling shall be such that all joints and connections shall be left uncovered for inspection; only the body of the pipe sections shall be covered.

It shall be demonstrated by testing that the system will function properly at design capacity. At or below design capacity there shall be no objectionable flow conditions such as water hammer, continuing unsteady delivery of water, damage to the system, or discharge detrimental to the tankers.

The initial backfill material shall be selected soil or sand, free from rocks or stones larger than 1 inch in diameter and earth clods greater than 2 inches in diameter. The material shall be placed so that the pipe will not be displaced, exclusively deformed, or damaged.

Water packing shall be used when possible to consolidate the initial backfill around the pipe. The initial backfill, before wetting, shall be of sufficient depth to ensure complete coverage of the pipe after consolidation occurs. Water packing is accomplished by adding enough water to saturate the initial backfill thoroughly. If conditions do not permit water packing, the initial backfill shall be placed in layers and

compacted around and above the pipe to a depth of ½ foot by hand or mechanical methods.

Final backfill material shall be free of large rocks, frozen clods, and other debris greater than 3 inches in diameter. The material shall be placed and spread in uniform lifts so that there will be no unfilled spaces in the backfill. The finished backfill will be level with the natural ground or at the design grade required to provide the minimum depth of cover after settlement takes place.

All special backfilling recommendations of the pipe manufacturer shall be met.

The acceptability of the installation shall be determined by inspections to check compliance with all the provisions of this standard (including the design grades), the pipe and pipe markings, the appurtenances, and the minimum installation requirements.

If requested by the state conservation engineer, the manufacturer shall certify that the material meets the requirements specified in this standard.

All construction shall be performed in a workmanlike manner, and the job site shall have a neat appearance when finished.

#### **Material**

All backfill material, pipe, and fixtures shall conform to the requirements listed on the plans.

#### **Utilities**

The landowner shall be responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.