

**Natural Resources Conservation Service
Conservation Practice Standard**

**DRY HYDRANT
(Ea.)
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

General

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. This 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 streambed.

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 30,000 gallons (1.1 acre-inches) 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 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. Access, topography, and location should be reviewed by fire department personnel prior to installation.

The fire truck connection shall be 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.

Design

Water supply. RESOP or a similar computer program shall be used to

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determine the water supply requirements for earthen construction or water impounding embankments unless the following minimum criteria are met:

1. The impoundment has a surface area greater than or equal to 1.0 acre.
2. The pool depth is greater than or equal to 6 feet.
3. The drainage area to surface area ratio is greater than or equal to 8:1.

Pipe. The pipe material may be iron, steel or plastic. Plastic pipe shall be schedule 40, SDR-26 and protected from 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.

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

Pipe Intake. The pipe intake depth shall be placed 2.0 feet below the 50-year drought elevation to account for the minimum water supply requirements and to avoid a vortex or whirlpool during pumping. 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.

Dry hydrant installation shall provide for a minimum 0.25 ft/100 ft of slope toward the water source. In impoundments, the intake screen or strainer shall be supported and secured at least 2.0 feet above the pool bottom. The intake shall be at least 8 linear feet beyond the fill slope – pipe contact point.

For streams, the intake screen or strainer shall be anchored in a 2-4 foot deep by 4-foot wide bed of crushed stone or gravel located below the streambed. The inlet end of the screen or strainer shall be capped to prevent entry of silt and debris.

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

The fire truck connection shall be approximately 24 inches above the ground surface, but never higher than the intake of the using fire truck.

The total lift (pumping head) shall not exceed 20 feet when line, elbow, and fitting losses are added. Pumping head shall be figured for each site to include screen loss, elbow loss, line loss, and elevation (static head) loss. Each head loss (in terms of equivalent length of pipe) shall be figured using the below tables and in accordance with the following formula:

Total Head Loss = head loss x (line length + Equivalent length of pipe) + elevation change.

Equivalent length of pipe for 250 GPM Pumping Rate:

<u>Pipe Feature</u>	<u>Pipe Diameter</u>		
	<u>6 inch</u>	<u>8 inch</u>	<u>10 inch</u>
Intake Screen	2.0 ft.	2.0 ft.	2.0 ft.
90° elbow (standard)	16.0	22.0	27.0
90° elbow (long sweep)	11.0	14.0	18.0
45° elbow	7.5	10.0	13.0
Hydrant Connection (6" x 4W")	2.5	2.5	2.5

Equivalent length of pipe for 500 GPM Pumping Rate:

<u>Pipe Feature</u>	<u>Pipe Diameter</u>		
	<u>6 inch</u>	<u>8 inch</u>	<u>10 inch</u>
Intake Screen	8.0 ft.	8.0 ft.	8.0 ft.
90° elbow (standard)	16.0	22.0	27.0
90° elbow (long sweep)	11.0	14.0	18.0
45° elbow	7.5	10.0	13.0
Hydrant Connection (6" x 4W")	2.5	2.5	2.5

Head loss (per 100' of pipe)

	<u>Pipe Diameter</u>		
	<u>6 inch</u>	<u>8 inch</u>	<u>10 inch</u>
250 gpm Pumping Rate	0.586	0.126	0.039
500 gpm Pumping Rate	2.343	0.503	0.153
750 gpm Pumping Rate	5.267	1.131	0.344

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 24 inch 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.

All hydrants shall contain a removable head strainer and stainless steel snap ring that can be removed without special tools. The strainer shall be conical in shape to maximize straining area. All hydrants shall use a rubber "O" ring between the threaded sleeve and PVC head.

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.

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. 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, also, to improve flow conditions into the strainer and for jetting action for silt cleanout.

Materials. All materials shall meet or exceed the minimum requirements for materials described in the various sections of this standard.

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 14 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 adjacent to the dry hydrant and completely off the public road is recommended for safety of the emergency personnel and the public.

Protection. 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 Critical Area Planting Standard and Specification (342).

Testing. Before testing the piping system, allow the pipe joint sealants to cure. The local fire department is responsible for performing an initial pump test at the designed capacity after installation to confirm satisfactory operation. Careful attention shall be given to any interference that may limit the full operation of the hydrant.

CONSIDERATIONS

- Effect of the use of the dry hydrant on upstream and downstream water quantity.
- Sediment production caused by erosion during construction.
- 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.

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. Required permits shall be obtained prior to initiating any work. As a minimum, include the following items in the plans and specifications:

- Dry hydrant location
- Plan view of the installation
- Profile of the pipe line
- Access road requirements
- Details of pipe intake
- Details of stand pipe, including hydrant head
- Site stabilization requirements
- Material list

OPERATION AND MAINTENANCE

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.

REFERENCE

NRCS Conservation Practice Standards:
Access Road, Code 560
Critical Area Planting, Code 342

ASTM 2466

NFPA Standard 1231

Natural Resources Conservation Service

CONSTRUCTION SPECIFICATION

DRY HYDRANT

1. SCOPE

Work shall consist of constructing a dry hydrant and include all clearing, excavation, backfill, installation of hydrant pipe, connection and screen to lines, grades, and elevations as specified on the drawings and staked in the field. The location of the hydrant shall be as shown on the drawings or as staked in the field.

2. SITE PREPARATION

The dry hydrant access area and pipe location shall be cleared to the extent needed for pipe installation and access by fire fighting personnel and equipment. Clearing and brush removal for safe line-of-sight to the road shall be included. Clearing debris, logs, stumps, and other trash shall be burned, buried, removed from the site, or otherwise disposed of in accordance with state and local laws in a manner that does not interfere with hydrant installation or vehicle access. Any fence encountered within the construction area shall be carefully dismantled and relocated as necessary to avoid a fence gate across the access road.

3. EXCAVATION

Excavation for placement of the dry hydrant pipe and riser shall be done by trenching or other approved methods. Excavation should begin in the pond and proceed toward the hydrant location. Trenches having cuts greater than 5 feet shall be sloped on a 2:1

slope above the 5 foot height to avoid sidewall caving and to improve backfill compaction. Care must be taken during underwater excavation to avoid ridges and valleys in the bottom grade. The bottom grade, sloping toward the water source, should be at least 0.25 ft/100 ft but not be more than 0.5 ft/100 ft.

Excavation and shaping that will facilitate and enhance easy on/off road access to the dry hydrant shall be done. Such excavation and shaping shall provide a nearly level, well-drained site which will also facilitate operation and maintenance activities.

4. FILL PLACEMENT

Material excavated from the pipe trench, access area shaping, or other source may be used for pipe backfill and other site filling and shaping activities. The fill material used in the trench must be free from all sod, roots, stones over two inches in diameter, frozen soil, and other objectionable material. Soil placed against plastic pipe shall be free of any isolated stones. A minimum of 2 feet of cover perpendicular to the slope is required. The soil surface shall be mounded over the pipe for settlement and to divert surface water.

Fill material shall be placed in thin layers not exceeding 9 inches thick and compacted. Compaction around the pipe above water level shall be by hand tamping or by manually directed power tampers. The sides of the trench shall be scarified so that they will bond with the fill material so that settlement will be

minimized. Compaction around the pipe below water level shall proceed from the embankment end and shall be done by soil weight and compaction on material above the water level. Trench confinement and compaction will force excess water from the fill material. Care must be taken so that loose soil in the water will not be pushed out over the intake screen.

5. CONSTRUCTION MATERIALS

Pipe materials shall be of the specified type, size, and length as shown on the drawings. All pipe connections shall be water tight and tested prior to placement in the trench. Testing may be done by placing water in the pipe under atmospheric pressure only or under pump pressure and a check made for leaks. All leaks found shall be repaired and pipe retested.

Pipe joint connections shall be cleaned and the appropriate cleaning and sealing material used according to manufacturer's recommendations. The pipe shall be drained, placed in the trench to design elevations and anchored in position ready for backfill. A support shall be provided for the intake screen to assure that the intake has 2 foot of clearance from the pond bottom or is below the stream bottom in a 2 ft. x 4 ft. gravel bed or similar wet well.

Connectors acceptable to and approved by the local fire department shall be used. The fire department will run a pump test at the design capacity after the pipe has been backfilled to confirm operation of the installation.

6. ACCESS

Vehicle access to and from the dry hydrant shall be provided for fire truck and pumper units. To the extent possible, access shall have an all-weather surface (gravel or blacktop), be well drained, and be at least 14 feet wide for ease of movement by men and equipment during an emergency. When local road traffic may be involved, an all-weather road surface adjacent to the dry hydrant and completely off the public road is recommended for safety of emergency personnel and the public.

7. OPERATION AND MAINTENANCE

The access road and areas disturbed during pipe installation shall be fertilized and seeded immediately after grading and shaping. Mowing of the dry hydrant access area will be required to keep area readily available for emergency use. Pump testing of the dry hydrant shall be done at least annually during training sessions to verify site usability. In-water checks of the intake screen should be made once every five years to identify any sediment build up and provide information for a cleanout operation.

8. MEASUREMENT AND PAYMENT

No measurement of quantities shall be made during construction installation. Design quantities listed in the "Bill of Materials" on the drawings shall provide the basis for payment.

Payment for work will be 'lump sum' for each site based on quantities shown in the "Bill of Materials" and individual site conditions.