

**Boulder  
County**

Boulder County  
Land Use Department  
Publications

# Emergency Water Supply for Firefighting

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## Emergency Water Supply for Firefighting

Water is a critical resource in firefighting, both for suppressing structural fires and for defending structures from wildland fires. When firefighters arrive at a home, they need a dependable and ready supply of water. But in most rural and mountainous areas of Boulder County, there are no high-pressure water mains and fire hydrants to deliver the water, as in urban areas. Instead, fire districts must rely on equipment and personnel to move water from local water sources to the fire.

This can be a slow and time-consuming process that requires coordination of many resources. Water sources are all too often a long distance from the fire, and it can take a great deal of time and effort to transport the water to where it is needed. Additionally, transporting water requires equipment and personnel that could otherwise be utilized for fighting fire. The lack of readily available water can seriously impair the ability of firefighters to do their job in a safe and effective manner.

If firefighters are unable to maintain an uninterrupted supply of water on the fire, the result can be a relatively unchecked spread of the fire, leading to the complete loss of structures or an extension of the fire beyond the capabilities of the emergency personnel involved. To help mitigate this situation, Boulder County is requiring the installation of individual and community emergency water storage and delivery systems in rural and mountainous areas.

### Individual Fire Cisterns

One of the most basic and reliable means for storing large amounts of water for firefighting is an individual fire cistern. This is essentially a large, watertight concrete, fiberglass, or reinforced polyethylene plastic tank installed in the ground near a residence, with some plumbing attached to facilitate drafting the water. Individual cisterns must meet the following criteria:

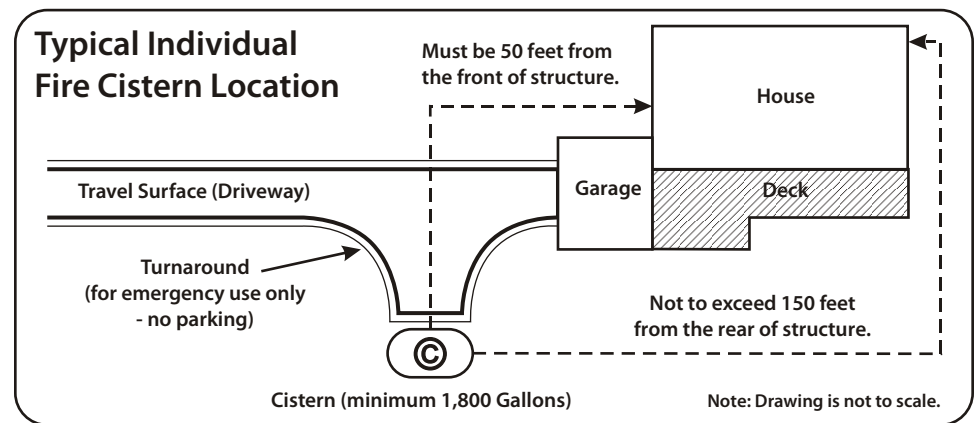


Figure 1: Typical Individual Fire Cistern Location.

- It must be a **minimum 1,800 gallons** capacity (note that some fire districts require a **minimum of 2,400 gallons**, and the amount may be greater depending upon the total square footage of the structures).
- It must be located at least **50 feet from the front** of the structure, and not less than **150 feet from the rear** of the structure. It should be located next to an emergency turn-around, or where the driveway meets the road, whichever is closer (see Figure 1).
- Fire cisterns do not necessarily need to be located next to an operational well, and in fact should be a separate and independent water supply. Note that a well at the home **will not provide water quickly enough and in sufficient quantity** for fire control; some kind of additional water storage is necessary.
- The fire cistern **may not be the same** as that used for your domestic water supply or your sprinkler system (if applicable). Aside from the more obvious problems of cross-contamination, these fire cisterns often need to be in very different locations. While the domestic water or a sprinkler system storage tank is generally next to or underneath the house, the fire cistern needs to be some distance away.

# Individual On-site Cistern for Fire Protection

## Single Family Residence - Precast Concrete Cistern

All concrete fire cisterns include the tank, a lid, a 2' Riser & Cistern Filler Lid, a suction vent and a draft connection (dry fire hydrant)

### Installation Instructions:

- Cisterns must be buried to prevent the water in the tank from freezing; this requires excavation and may require blasting to achieve. Excavations for the tank should be at least **12" larger than the outside dimensions** of the tank.
- The base of the excavation must be level with no protruding rock. It must be covered with a minimum of 6" of compacted sand, gravel or crushed stone  $\frac{3}{4}$ " in diameter or less. Bed must be leveled and compacted before setting the tank.
- Backfill material must be 2" in diameter or less in order to avoid damage to the tank. Granular backfill should be rolled in from the side in equal lifts around the tank and compacted. Avoid dumping directly on the lid of the tank.
- Excavator should provide a safe and clear offloading site within 15' from the rear of the truck to the center of the tank. After installation, **DO NOT** drive on the tank.

The installer must check with the local FPD and the Land Use Department for requirements on tank placement, dry hydrant connection, and filling requirements. Some FPDs will fill the tank at the time of testing and inspection. Others require the tank be filled before testing.

**Note:** A separate building permit may be necessary for cistern installation if it is not associated with another specific construction project.

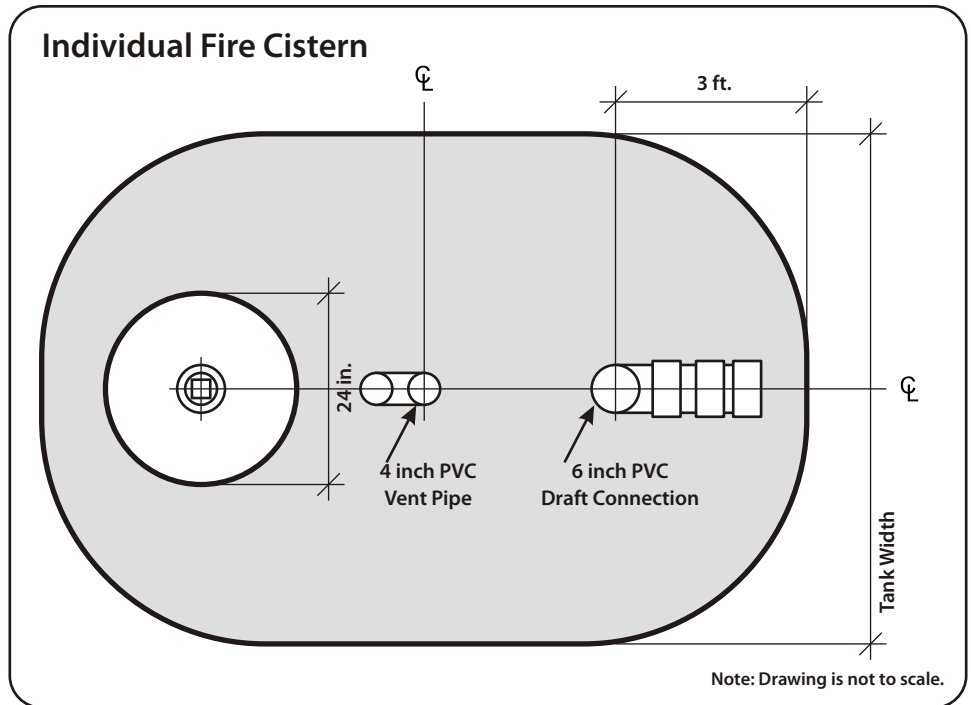


Figure 2: Individual Fire Cistern Plan View.

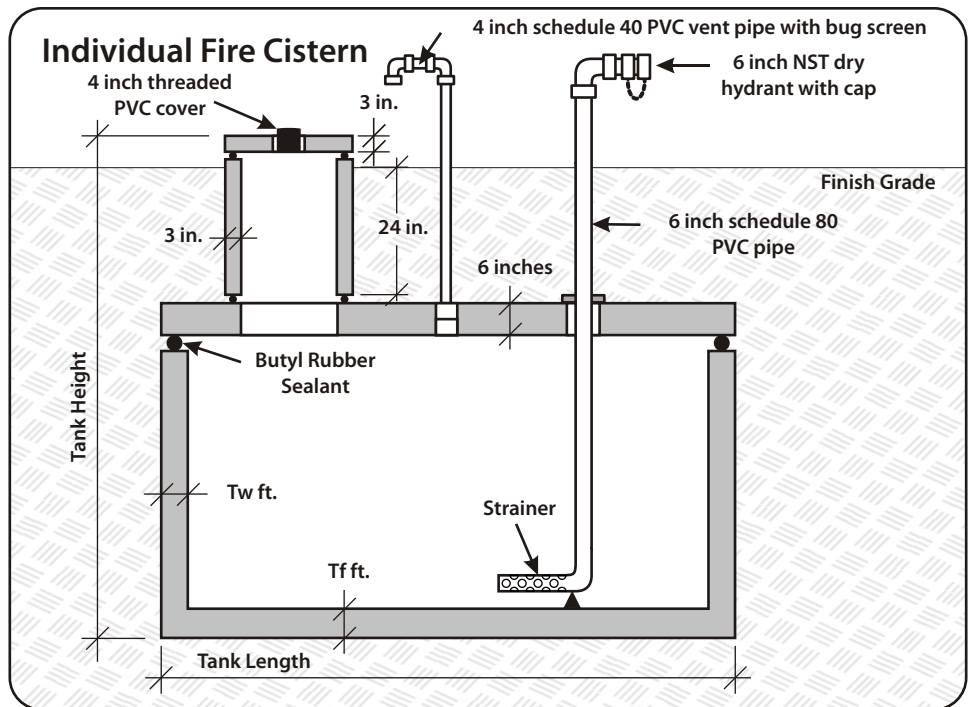


Figure 3: Individual Fire Cistern Elevation Drawing.

### Water Cistern Size Table

	Width	Length	Height	Tw	Tf	Weight
1800 Gallon	6'-8"	10'-2"	8'-1"	4"	4"	14,489
2400 Gallon	6'-8"	12'-8"	8'-1"	4"	4"	16,549

## Community Fire Cisterns

Many fire protection districts prefer that individual homeowners make a monetary contribution to a community cistern fund (usually \$2,500) in lieu of the placement of an individual fire cistern on site. This saves the individual homeowner the cost and hassle of installing an individual fire cistern and dry fire hydrant, and potentially provides the fire district with a more reliable water source, since they have ownership and general control over the use of the community cistern. If a community cistern program is available in your area, you are encouraged to make a contribution for its use and maintenance.

■ Community fire cisterns differ from individual cisterns in that they are much larger, often 10,000 gallons or more. They are centrally located, usually near a fire station or fire barn, or in some other easily accessible area within a community. These kinds of fire cisterns are generally installed and maintained by a fire protection district. Typically, the excavation and grading associated with the installation of a community cistern is handled thru a Limited Impact waiver process initiated by the Fire Protection District.

■ Community fire cisterns are most appropriate in subdivisions where the majority of the lots are around one (1) acre in size and residential driveways are generally less than 150 feet in length. If your parcel is 5 acres or more and/or your driveway is over 400 feet or more in length, it is very likely you will need an individual fire cistern on your site. Contact your local fire authority for more specific information about contributing to a community fire cistern fund.

## Other Water Sources

Static bodies of water, such as ponds, lakes, rivers and other non-pressurized sources such as perennial streams, can also be used as water supplies for firefighting. These sources are not considered as reliable as cisterns, however, because they can be seasonally unavailable (they may dry up in the summer, and be frozen over during the winter) and may be difficult to access (due to sloping and/or soft ground, and/or vegetation along the shoreline). Additionally, the water in them is often privately owned and therefore may not be as readily available during an emergency as that in a cistern.

## Dry Fire Hydrants

Regardless of the type of water source, firefighters need to have an effective way of getting water from the source into the engine and onto the fire. For this, they utilize a non-pressurized pipe system permanently installed in a water source. These are known as "draft" or "dry" fire hydrants.

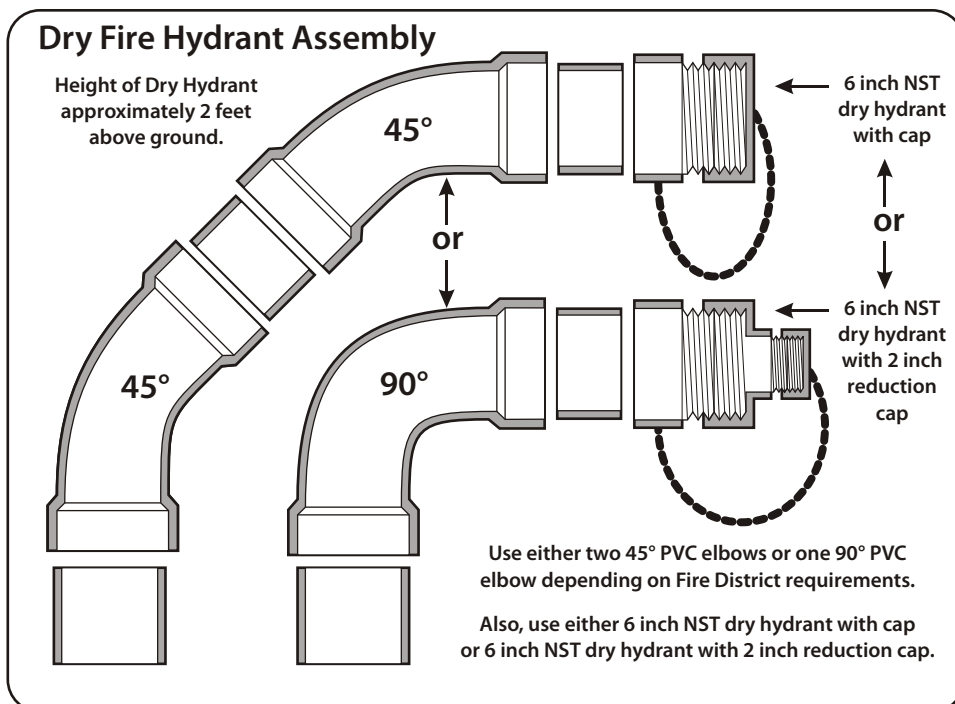


Figure 4: Dry Fire Hydrant Assembly.

## Pressurized Water Supply Systems

There are only a few fire areas in the mountainous parts of Boulder County that have pressurized water supply systems, with adequate pressure and flow from the fire hydrants, which meet minimum fire flow requirements of the Fire Code. Among these are the Pine Brook Hills, Knollwood, and Spring Valley subdivisions, some of the lower sections of Lefthand Canyon and Olde Stage Road, and some of the various mountain towns and cities. Most fire districts follow the provisions of Appendix III-A of the Fire Code on fire flow from hydrants; and the National Fire Protection Association (NFPA) "Standard on Water Supplies for Suburban and Rural Fire Fighting", NFPA 1231-1993, on water supplies without fire hydrants. Some districts services may exceed these requirements and will be determined through the review of the individual application. Consult your local fire authority for more information about whether or not your property is serviced by such a system.

## Fire Sprinkler Systems

Residential fire sprinkler systems have been shown to minimize damage from fires in structures. They are a way of buying time and getting to the fire while it's still small enough to extinguish or control until on-site or other water sources can be made available.

Fire sprinklers do not take the place of hydrants and cisterns, or vice versa, and should not be confused with fire cisterns and other emergency water supply requirements.

Even if you have a sprinkler system installed in the house, it will do little to help in case of a wildfire unless your house is already on fire.

Additionally, sprinkler systems are usually pressurized by an electric pump, which may or may not be operational during a wildfire because often power is lost during such events. It is best to have available a back-up generator as auxiliary power in the event of an electrical outage. Gravity-fed systems may also be considered.

Requirements and for residential fire sprinklers systems are addressed under the Boulder County Building Code and locally adopted Fire Codes.

## Dry Fire Hydrants (Continued)

Dry hydrants provide a simple, cost-effective and efficient means of accessing and drafting water from a water source. They help to reduce the amount of time it takes to full-up fire engines by providing a quick connection point to an uninterrupted, clean water supply. The arrangement also allows access to water from a roadway, instead of having to work on potentially soft ground immediately adjacent to a pond or stream. Dry fire hydrants also help facilitate the complex process of shuttling water long distances from a source to fire.

### Dry Fire Hydrant Assembly:

- Typically constructed from rigid pipe (such as Schedule 80 PVC). *Note that exposed portions of PVC pipe must be painted for UV protection.* Red paint is best to make the dry hydrant easier to locate under low light or smoky conditions.
- Must have a standard fire fitting (6-inch NH threaded connection with a cap and screen) on the outlet side, and a coarse filtration strainer on the intake side. *Note that before installing a dry fire hydrant you should consult your local fire authority for the exact type of connections needed to be compatible with the districts' and/or other agencies' equipment.*
- Must be clearly marked by placing reflective signs and/or reflectors on 3-foot metal posts nearby. Placing large rocks 12" in front of the pipe is also recommended to help avoid accidental collisions.

### Other Information

More detailed information about emergency water supplies is available in the NWCG guide *Operation Water: Planning for Water Supply and Distribution in the Wildland/Urban Interface*.

## Structure Fire vs. Wildland Fire

When assessing your water needs and availability, consider the kinds of fire you may be dealing with.

In structure fires, accessible water supplies for use by local fire agencies may be the difference between saving a home and watching it burn. While fire departments carry 250 to 500 gallons or more of water on their fire engines, much more water will be needed to completely extinguish the fire, in part due to the long response times in rural areas.

When a wildfire approaches a structure, however, water is considered to be the least critical factor in the structure's survival. Instead, good site location, good construction materials and a well maintained defensible space would most likely determine the structure's survival.

If both time and resources are available to prepare the structure(s) and surrounding landscaping from an on-coming wildfire, then water (and even better - the use of foam) becomes an added protection measure.

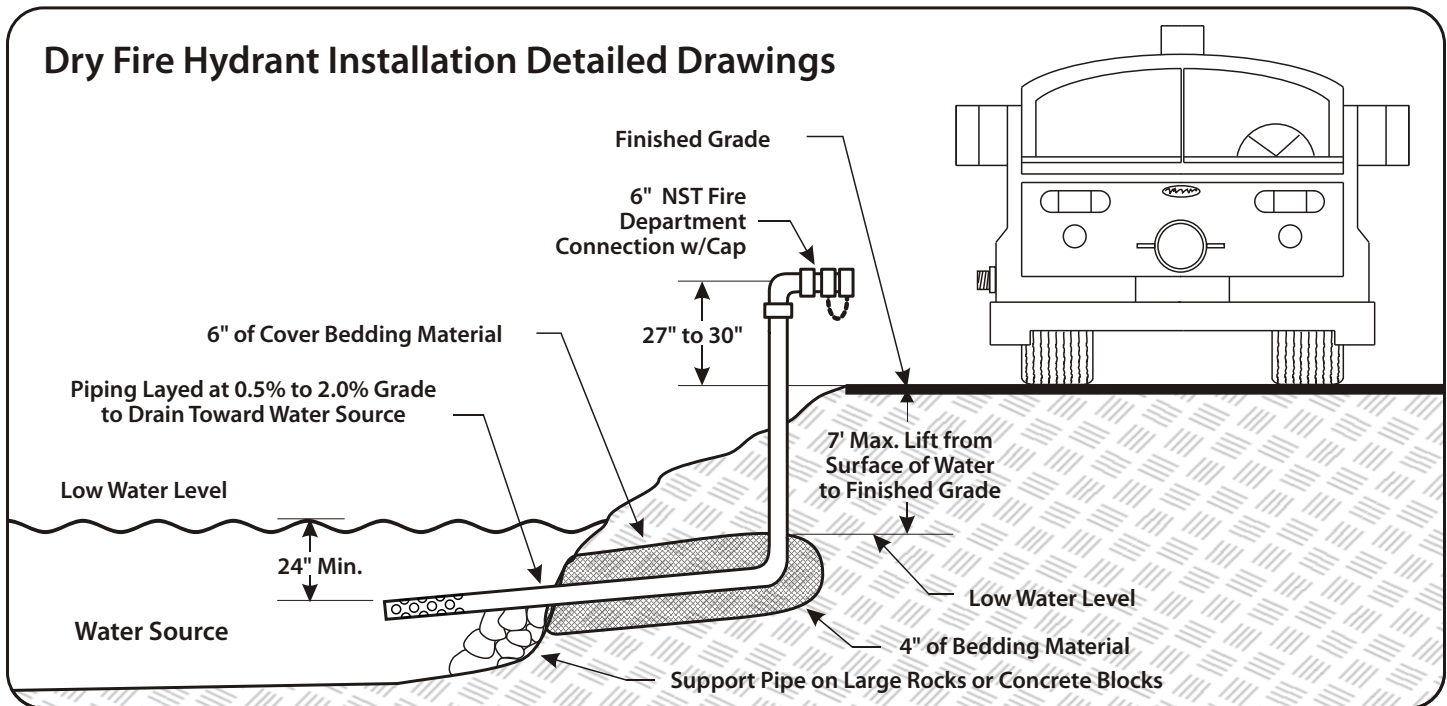


Figure 5: Dry Fire Hydrant Installation.