

City of Vista Fire Department

Development Services Section
200 Civic Center Drive, Vista CA 92084

Guideline:

Residential Water Supplies for Fire Protection



Guideline G-16

Date: February 2009

Residential Water Supplies for Fire Protection

PURPOSE

The intent of this standard is to provide the minimum water supply requirements (fire sprinklers and fire fighting) for one and two family dwellings in rural and suburban areas in which an adequate reliable water supply does not exist.

SCOPE

This standard shall apply to single-family residential and accessory structures that are to be protected by on-site water storage when approved by the Chief.

The Chief may require a waterline extension for the purpose of installing a fire hydrant if the water main is 1,500 feet or less from the property line. The installation of on-site water storage is not to be considered as an alternative to any *required* water line extension.

Timing of Installation: Operable Fire Hydrants and required access roads shall be provided prior to and during the time of construction.

Projects located within a water purveyor's service area shall obtain written permission from the water purveyor to use a water storage tank for fire protection under this standard in lieu of connection and or upgrades to the water purveyor's system.

DEFINITIONS

FIRE FLOW: The flow rate of a water supply measured at 20 psi residual pressure that is available for firefighting. When water supply tanks are approved for use the flow rate of a water supply may be at draft.

WATER PURVEYOR: A public utility, mutual water company or other entity owning and operating a water system and holding a valid permit from the State or County Health Department to purvey water.

REQUIREMENTS

1. TANKS

A. Tank Types

- 1) Aboveground metal tanks
- 2) Underground metal tanks that are protected against corrosion
- 3) Fiberglass tanks

B. Location

- 1) Water tanks shall be located a minimum of 20 feet from any structure to avoid being subject to fire exposure. Where this is impractical, fire proofing of not less than two hours may be required.
- 2) Foundations or footings shall furnish adequate support for the tank.
- 3) Water tanks 5,000 gallons or greater may require a building permit and could require additional agency approvals.
- 4) Elevation of the tank floor shall be equal to or higher than the fire hydrant outlet.

C. Venting

An air vent shall be located above the maximum water level. It shall have a cross sectional area at least equal to one half the area of the discharge pipe or fill pipe whichever is larger.

D. Sight Gauge

A water level gauge visible from the hydrant outlet shall be provided for all tanks. The preferred sight gauge is a marker board type as shown on *Figure 1*.

E. Automatic Fill

A suitable means shall be provided to automatically maintain the water level in the tank. The tank shall completely re-fill within 8 – 10 hours.

F. Separate Tanks

A separate tank may be used for hose supply. Fire sprinkler and domestic water shall be supplied from the same tank / source. Multiple tanks may be used to provide the required storage capacity. *See standard 9.*

G. Multiple Buildings

Tanks may serve up to four separate buildings. Reciprocal use and maintenance easements & agreements shall be recorded for each property being served by a single tank.

2. CALCULATING TANK SIZE

See Table 508.2.2 for required capacity. For multiple buildings add 750 gallons to the table capacity for each additional building. Note that additional storage capacity and fire flow may be required when exposure distance is one hundred feet or less.

TABLE NO. 508.2.2			
Building Square Feet	Gallons Per Minute Water Flow	Capacity Gallons	Duration Minutes
Up to 1,500	250	5,000	20
Over 1,500	250	10,000	40
When exposure distance is one hundred feet (100') or less from adjacent property an increase in water storage may be required by the Chief.			

3. CONNECTIONS TO THE TANK

Refer to *Figure 1* for all the connections to the water tank.

4. PIPING AND HYDRANT OUTLET REQUIREMENTS

- A. The hydrant outlet shall be not closer than 50 feet or further than 150 feet from the structure. This outlet shall be visible and accessible from the fire equipment access road. A turnout may be required. Final location of the hydrant outlet is subject to Fire Department approval. *See Standard 7 for hydrant outlet details.*
- B. A permanent sign shall be installed and maintained at the hydrant which states:

“DRAFTING FIRE HYDRANT

_____ GALLONS”

4” red letters on white background

- C. Hydrant

- 1) Outlet size shall be 4 inch male NST reduced to 2-1/2” male NST with cap.
- 2) Hydrants shall be painted red.
- 3) Hydrant outlet shall be 18 to 24 inches above the finished grade.

- 4) The hydrant outlet shall be located 5-8 feet from the access road edge. A turnout may be required so access road will be passable when the engine is connected to the hydrant outlet.
- 5) The applicant shall provide and store at an approved location two (2) ten-foot lengths of hard suction hose: 2 lengths of Kocheck (or other brand) 4" X 10' flexible suction hose. The hose must have NST threads with 4 inch long handled female X 4 inch rocker lug male. The hose shall be stored in a locked container near the hydrant and must contain a sign on the container that reads: "Hard Suction Hose Located Inside"
- 6) A blue reflective hydrant location marker shall be provided along the access road.

D. Piping

- 1) The *minimum* pipe size required is 4 inch. We recommend 6" pipe.
- 2) PVC may be allowed for horizontal runs when not subject to damage.
- 3) PVC pipe shall be Schedule 80 or Standard Dimension Ratio (SDR) of 13.5.

E. All exposed pipes, elbow, fill line and risers shall be steel.

F. All exposed ferrous metal pipe and fittings shall be painted to protect against corrosion.

G. The following applies to underground installations.

- 1) Steel pipe shall be coated and wrapped.
- 2) Steel pipe joints shall be field coated and wrapped after assembly.
- 3) After assembly, all metallic parts such as rods, nuts, bolts, washers, clamps and other restraining devices except for thrust blocks shall be cleaned and thoroughly coated with bituminous grease or other acceptable corrosion-retarding material.

H. Depth of cover shall be not less than 2 feet to prevent mechanical damage. Pipe under driveways shall be buried a minimum of 3 feet.

I. Any piping system with a head-pressure of 50 psi or greater shall be provided with thrust blocks. Basically, any tank located 100' or more above the hydrant outlet will result in 50 psi head-pressure at hydrant. (.5 psi per foot of elevation change).

5. PLANS

- A. The size and location of the hydrant outlet, piping and storage tank shall be approved by the Fire Department prior to installation.
- B. A minimum of 2 scaled site plans shall be submitted to the Fire Prevention Bureau for review. Plans are not required to be designed by an engineer. The plans shall include:
- All structures; indicate square footage of each
 - Access roads; indicate width and surface
 - Proposed tank size and location
 - Elevation view of the tank indicating point of connections to the tank
 - Proposed outlet size and location
 - Type, size and location of piping
 - If the hydrant outlet is remote from the tank, the elevations (feet) of the tank and hydrant outlet shall be indicated
 - If plastic tanks are used they must be UV rated and the manufacturers listing specifications must be provided.
 - Engineering scale shall be used.

6. INSPECTIONS

- A. The following inspections by the Fire Prevention Bureau are required:
- 1) Any below ground piping shall have a visual inspection prior to being covered.
 - 2) Final installation and flow test including testing of the auto-fill. The contractor shall flush the piping prior to testing.

APPENDIX A

Frequently asked questions regarding private water systems (PWS)

What is Standard Design Ration (SDR) 13.5?

It is the thickness of the pipe wall. If not indicated as schedule 40 or 80 ask for the manufactures specification sheet.

Can C-900 / Class 150 pipe be used for PWS?

Yes. Class 150 is adequate for the system and drafting pressures.

What type of sight gauge can be used?

The concern is water leaking from the tank due to the sight gauge melting or being damaged due to fire / heat exposure. The preferred sight gauge is a marker board type as shown on *Figure 1*.

How does the piping have to be connected when a swimming pool is used?

Swimming pools have been determined to be an unreliable water supply and therefore are not an approved method of storage.

Can additional uses be allowed from the tank?

Yes. Uses other than domestic, fire sprinklers and; hose reserve water are allowed from the same tank. The point of connection for these other uses shall be above the level required for domestic sprinklers and hose reserve.

APPENDIX B

CALCULATING TANK LEVELS

EXAMPLE: - 3000 square foot dwelling, using a 10 foot diameter tank

Requirements from Fire Prevention Standard:

Minimum Tank Size	Reserved for Hose	Automatic Fill Level
4750 gallons	2500 gallons	4000 gallons

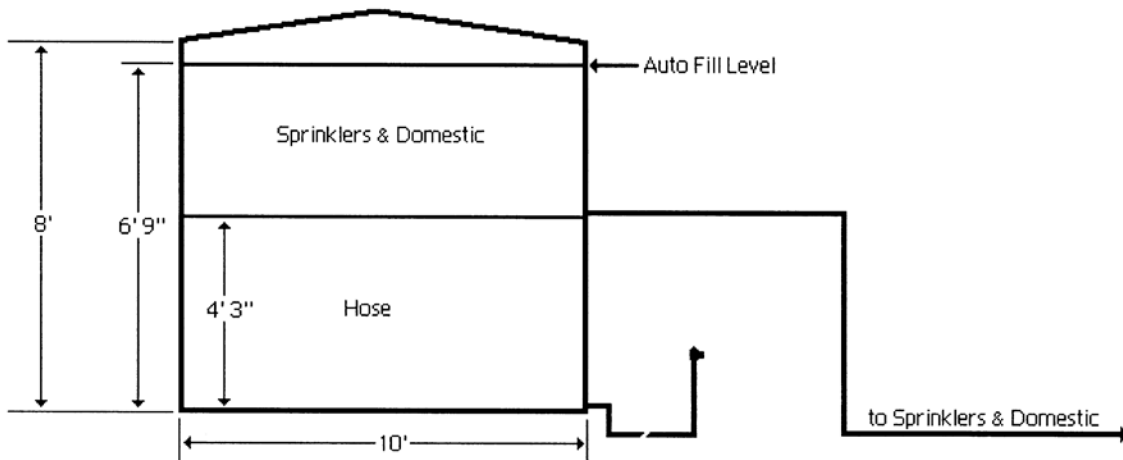
DETERMINING HEIGHTS WHEN DESIGNING PRIVATE WATER SYSTEMS:

Formula: $A = \pi R^2$: $3.1416 \times 25 = 78.54$ cu. ft. (per ft. of height)

There are 7.48 gallons per cubic ft.: $7.48 \times 78.54 = 587.47$ gallons per ft. of height

Minimum water heights:

Tank	Sprinkler/Domestic Connection	Auto Fill Height
$4750 \div 587 = 8$	$2500 \div 587 = 4.25$	$4000 \div 587 = 6.8$
8'	4' 3"	6' 9"



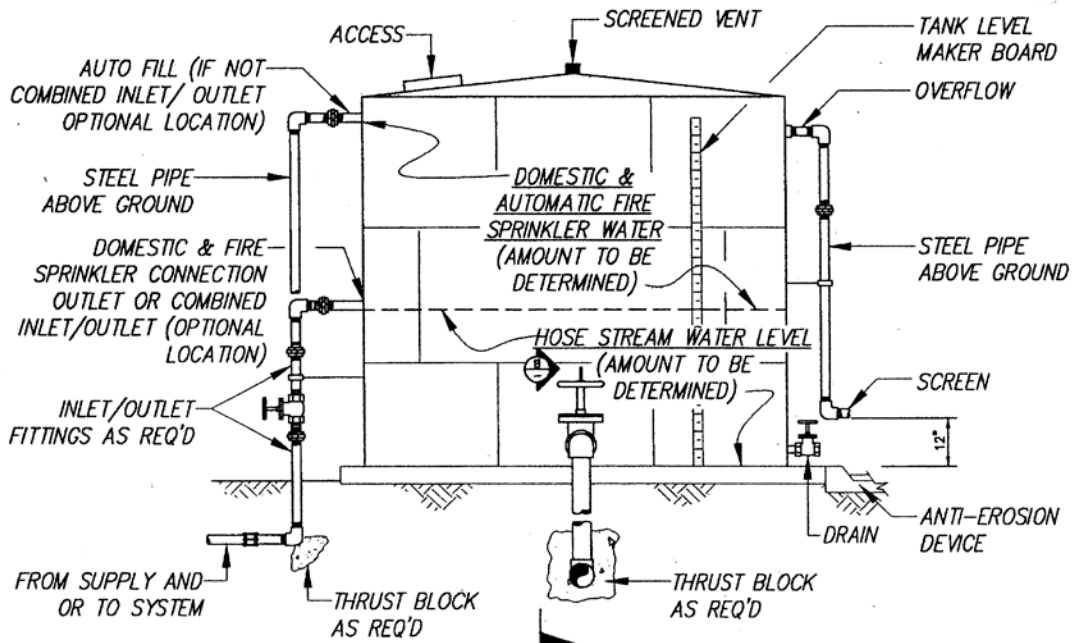
DETERMINING GALLONS WHEN INSPECTING:

Formula: $A = \pi R^2$: $3.1416 \times 25 = 78.54$ cu. ft. (per ft. of height)

There are 7.48 gallons per cubic ft.: $7.48 \times 78.54 = 587.47$ gallons per ft. of height

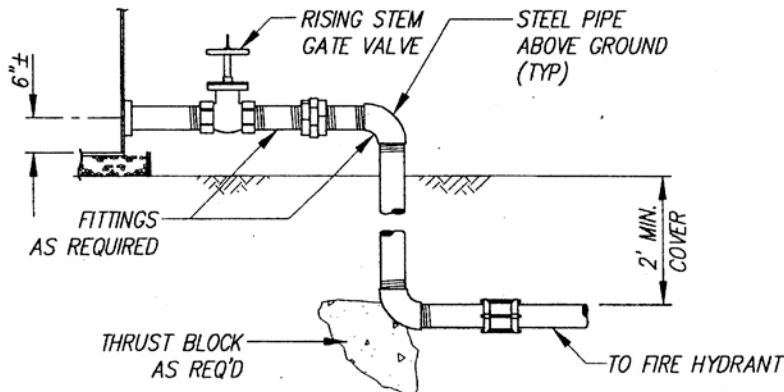
$8' \times 587 = 4696$ gallons $4.25' \times 587 = 2494$ gallons $6.8' \times 587 = 3991$ gallons

FIGURE 1
TANK INSTALLATION GUIDELINE FOR RESIDENTIAL
AND MINOR ACCESSORY USE BUILDINGS



A FIRE HYDRANT TANK OUTLET

- NOTES: 1. CERTAIN ITEMS MAY BE ROTATED FOR CLARITY. NOT TO SCALE
 2. WATER TANKS 5000 GALLONS AND GREATER REQUIRE BUILDING PERMITS AND COULD REQUIRE ADDITIONAL AGENCY APPROVALS.



B FIRE HYDRANT TANK OUTLET

NOT TO SCALE

