El Dorado County Fire Prevention Standard
WATER SUPPLIES
RESIDENTIAL, WITHOUT A PURVEYOR
(Storage Tank and Piping)

SCOPE: This standard identifies 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.

TIMING OF INSTALLATION: Operable Fire Hydrants (water supply) and required access roads shall be provided prior to and during the time of combustible construction.

WATER PURVEYOR WATER SYSTEM: Projects located within a water purveyor's service area shall utilize the water purveyor's system for the most reliable water system. With the approval of the local Fire District, a water tank system may be used in lieu of the water purveyor's system.

DEFINITIONS

FIRE FLOW: The flow rate of a water supply, measured at 20 pounds per square inch (PSI) (137.9kPa) 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.

FIRE FLOW CALCULATION AREA: The total floor area of all floor levels within the exterior walls, and under the horizontal projections of the roof of the building. This calculation will determine the square footage and in turn will determine the size of the water tank.

WATER PURVEYOR: A public utility, a mutual water company, a governmental body, or other entity, owning and operating a water system and holding a valid permit from the State Department of Public Health to purvey water (El Dorado County Irrigation District, Georgetown Divide Public Utility District, etc…).

HOSE STREAM ALLOWANCE: Water supply that is used for fire department personnel specifically for the purpose of suppressing a fire of any type.

SPRINKLER DEMAND- NFPA 13D: This standard shall cover the design and installation of automatic sprinkler systems for protection against fire hazards in one and two-family dwellings and manufactured homes.

DOMESTIC WATER SUPPLY: Water that is used for domestic consumption only.

1. TANKS:

A. Storage Tanks shall be constructed in accordance with the American Water Works Association Standards (AWWA). Some examples could be;

1) Plastic Tanks for potable use with UV Protection
2) Underground metal tanks that are protected against corrosion and lined
3) Fiberglass tanks approved for potable use
4) Above ground metal tanks that are corrosion protected and lined for potable use.

B. Location

1) Water tank(s) shall be located a minimum of 30 feet from the structure to be protected and a minimum of 10 feet from the property line. This will limit the water tanks exposure to a wildland fire. Where this is impractical, fire proofing of not less than two hours may be required. All combustible vegetation shall be cleared and maintained 30 feet around the tank, or to the property line, to prevent damage in a wildland fire.
2) Footings or foundational supports shall be required per tank manufacturer's specifications. The foundation around the outside edge of the tank shall be tapered away from the tank to avoid undermining from outside water runoff.
3) Water tanks 5,000 gallons and greater require a building permit and could require additional agency approvals.
4) Elevation of the tank floor shall not be more than 5 feet below the fire hydrant outlet.
5) Where topography allows, the water tank should be located as high of an elevation as possible to create the greatest amount of head pressure.
6) The water tanks may be located within a structure as long as the vegetation and setback requirements are met.

C. Venting

1) 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 draft dwarf hydrant supply pipe or fill pipe, whichever is larger.
2) Screens and filters shall be installed to prevent animals and insects from entry into the vent pipe. The vent shall be installed so that the open end is facing downward to keep debris and litter from falling in. Filters must be on the inlet side.

D. Sight Gauge

1) A mechanical level indicator gauge board shall be furnished using a stainless steel float and cable. Recommended manufacturer is Varec or equal (the clear tube has a tendency to become obscure and is not allowed).

E. Automatic Fill

1) A suitable means shall be provided to automatically maintain the water level in the tank. The auto fill feature shall be set to the amount indicated on either Chart A or B. The water level shall not drop below the domestic water use level. It is optimum that the tank will completely refill within 8-10 hours.

F. Freeze Protection

1) All above ground water supply or discharge piping shall be designed to protect against freezing. If the tank installation is at an elevation greater than 3,000 feet, the tank water shall be protected against freezing.
2) Where anti-freeze protection is utilized (example- glycol in the sprinkler piping), a backflow prevention device that is approved by the Fire District shall be installed.

G. Tank Circulation

1) The water inlet and outlet shall be configured in such a way as to create water movement at all levels of the tank. This will prevent contamination or growth that would render the hose supply and the fire sprinkler water storage unreliable when used.

H. Multiple Buildings

1) Tanks may serve up to three separate buildings on the same parcel. Approval from the Fire District shall be obtained to serve more than one parcel off of one tank system. Reciprocal use and maintenance easements & agreements shall be recorded for each property being served by a single tank. *See Figure 3 and Appendix A for additional information and limitations.*

I. Large Buildings

1) Buildings greater than 10,000 square feet may be subject to additional design requirements as required by the Fire District.

2. CALCULATING TANK SIZE

Tank size shall be calculated using one the following 3 cases:

CASE	WATER TANK TO SUPPLY…	MINIMUM WATER SUPPLY REQUIRED
1.	Sprinklers, Domestic & Hose Stream	Use Table "A"
2.	Hose Stream Only	Use Table "B"
3.	Sprinklers & Domestic	Tank Size: 2,250 Gallons Auto Fill: 1,500 Gallons

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 no closer than 30 feet nor farther than 250 feet from the structure that is being protected.

B. The hydrant outlet shall be visible and accessible within 5 foot of the driveway access road. A turnout shall be required per 2007 CFC, D103.1. Final location of the hydrant outlet and turnout shall be subject to Fire District approval. *See Figure 2 for hydrant outlet details.*

C. A permanent sign, on a minimum of 1/8 inch metal, aluminum or painted steel shall be at the outlet which states the following: "DRAFTING FIRE HYDRANT" _____Gallons. *See Figure 2 for sign details.*

D. Hydrant

1) The outlet size shall be a 2 ½ inch with male threads NST (also known as NH & NS). This size may be increased for larger applications.
2) Threads must be protected with a threaded cap that is removable with a lugged hydrant wrench.
3) Hydrant shall be painted red with a white bonnet and identified per *Figure 2* when static head pressure is less than 20 psi.
4) Hydrant outlet shall be 18 to 24 inches above the finished grade. *See Figure 2*
5) The hydrant outlet shall be located no more than 5 feet from the access road edge. This is to allow the use of a 10-foot long hard suction hose from the engine to the hydrant outlet. A turnout may be required so the access road will be passable when the engine is connected to

the hydrant outlet. See Appendix D103.1, Min. Clearance around a hydrant, in the 2007 California Fire Code.

6) A blue reflective hydrant location marker (dot or paddle per Fire District) shall be provided along the access road.
7) All exposed pipes, elbows, fill line and risers shall be steel and painted with a rust inhibiting paint or galvanized.

E. Piping

1) Size (minimum)
   - 11/2 inch for domestic and fire sprinkler supply.
   - 4 inch pipe from the water tank to the wharf hydrant.
   - 6 inch and above may be used to protect larger structures.
2) PVC may be allowed for horizontal runs when not subject to damage, I.E. vehicle traffic, etc. The pipe shall be a minimum of schedule 40.
   - 2 inch to 4 inch pipe, schedule 40
   - 6 inch and above – C900
3) All exposed pipes, elbows, fill line and risers shall be steel and painted with a rust inhibiting paint or galvanized.
4) The following applies to underground installations:
   - Steel pipe shall be coated and wrapped.
   - Steel pipe joints shall be field coated and wrapped after assembly.
   - After assembly, all metallic parts such as rods, nuts, bolts, washers, clamps, and other restraining devices, except thrust blocks, shall be cleaned and thoroughly coated with bituminous or other acceptable corrosion-retarding material.
5) Where above ground piping passes through an area subject to freezing, it shall be protected by a reliable means to maintain the temperature of the water in the piping between 40° F and 120° F.
6) 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 and under railroad tracks a minimum of 4 feet.
7) 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 or greater head-pressure at the hydrant. (0.5 psi per foot of elevation change).
8) A flexible connector shall be installed between the tank and the suction line. A flexible connector shall also be installed between tanks when more than one tank is connected together.

F. Vegetation, Snow and other obstructions shall be kept clear of fire apparatus access.

5. PLANS

A. The size and location of the hydrant outlet, piping and storage tank shall be approved by the Fire District prior to installation.
B. A minimum of two scaled site plans, including plan and profile view, shall be submitted to and approved by the Fire District. The plans shall include:
   - All structures; indicate square footage of each
   - Access roads; indicate width
   - Proposed tank size and location
   - Elevation view of the tank indicating point of connections to the tank relative to the structure to be protected
   - 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. Tanks located 100 feet or more above the hydrant outlet will require thrust blocks for the piping.
- If plastic tanks are used, they must be UV rated and the manufactures listing specifications must be provided.

6. INSPECTIONS

A. The following inspections by the Fire District are required:

1) Any below ground piping shall have a visual inspection prior to being covered.
2) Installation shall be inspected prior to filling the tank
3) Final installation shall include testing of the auto-fill

TABLE A

BUILDING SQUARE FOOTAGE	MINIMUM WATER SUPPLY REQUIRED (HOSE STREAM+SPRINKLERS +DOMESTIC) (GALLONS)	RESERVED FOR HOSE (GALLONS)	AUTO FILL LEVEL (GALLONS)*
Up to 2,800	4,250	2,000	3,500
2,800 – 3,500	4,750	2,500	4,000
3,501 – 4,200	5,250	3,000	4,500
4,201 – 4,900	5,750	3,500	5,000
4,901 – 5,600	6,250	4,000	5,500
5,601 – 6,300	6,750	4,500	6,000
6,301 – 7,000	7,250	5,000	6,500
7,001 – 7,700	7,750	5,500	7,000
7,701 – 8,400	8,250	6,000	7,500
8,401 – 9,100	8,750	6,500	8,000
9,101 – 10,000	9,250	7,000	8,500
10,001 – 10,500	9,750	7,500	9,000
10,501 – 11,200	10,250	8,000	9,500
11,201 – 11,900	10,750	8,500	10,000
11,901 – 12,100	11,250	9,000	10,500
12,101 – 12,800	11,750	9,500	11,000
12,801 – 13,500	12,250	10,000	11,500
13,501 – 14,200	12,750	10,500	12,000
14,201 – 14,900	13,250	11,000	12,500
14,901 – 15,600	13,750	11,500	13,000
15,601 – 16,300	14,250	12,000	13,500
16,301 – 17,000	14,750	12,500	14,000
17,001 – 17,700	15,250	13,000	14,500
17,701 – 18,400	15,750	13,500	15,000
18,401 – 19,100	16,250	14,000	15,500
19,101 – 19,800	16,750	14,500	16,000

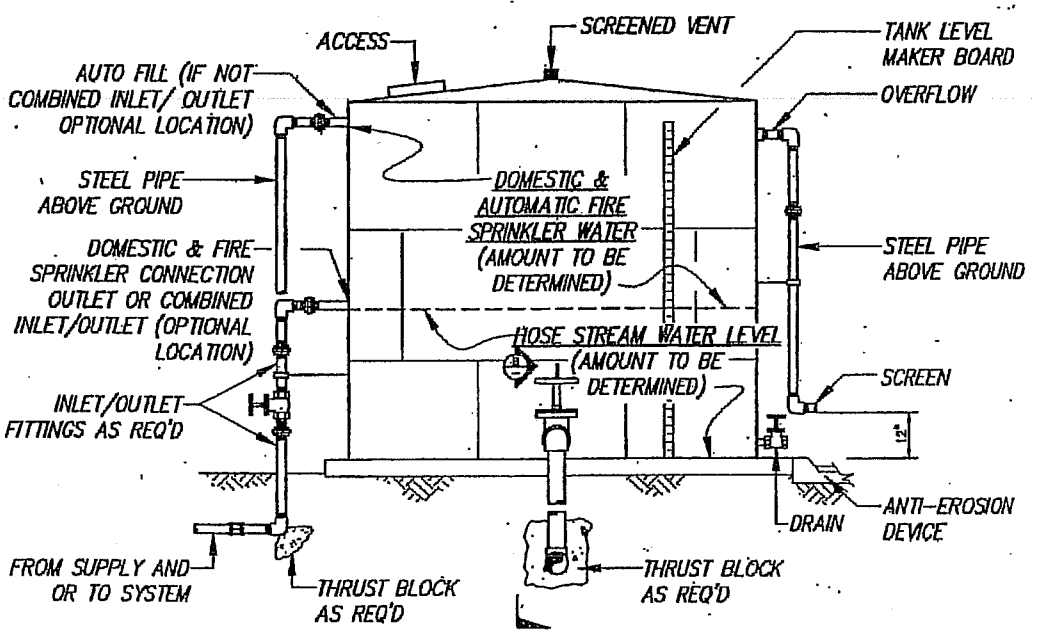
* Auto fill shall be set so the amount of water indicated in this table is always available.

TABLE B

BUILDING SQUARE FOOTAGE	HOSE STREAM ONLY STRUCTURES WITHOUT SPRINKLERS (Gallons)*	HOSE STREAM ONLY STRUCTURES WITH SPRINKLERS (Gallons)*
Up to 2,800	4,000	2,000
2,801 – 3,500	5,000	2,500
3,501 – 4,200	6,000	3,000
4,201 – 4,900	7,000	3,500
4,901 – 5,600	8,000	4,000
5,601 – 6,300	9,000	4,500
6,301 – 7,000	10,000	5,000
7,001 – 7,700	11,000	5,500
7,701 – 8,400	12,000	6,000
8,401 – 9,100	13,000	6,500
9,101 – 10,000	14,000	7,000
10,001 – 10,500	15,000	7,500
10,501 – 11,200	16,000	8,000
11,201 – 11,900	17,000	8,500
11,901 – 12,100	18,000	9,000
12,101 – 12,800	19,000	9,500
12,801 – 13,500	20,000	10,000
13,501 – 14,200	21,000	10,500
14,201 – 14,900	22,000	11,000
14,901 – 15,600	23,000	11,500
15,601 – 16,300	24,000	12,000
16,301 – 17,000	25,000	12,500
17,001 – 17,700	26,000	13,000
17,701 – 18,400	27,000	13,500
18,401 – 19100	28,000	14,000
19,101 – 19,800	29,000	14,500

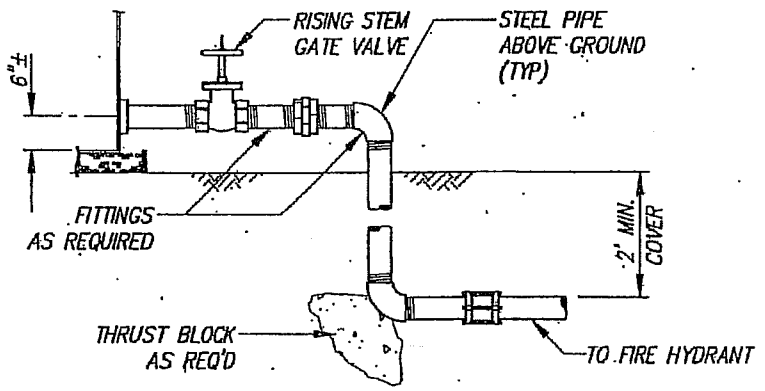
* Auto fill shall be set so the amount of water indicated in this table is always available.

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



A - FIRE HYDRANT TANK OUTLET

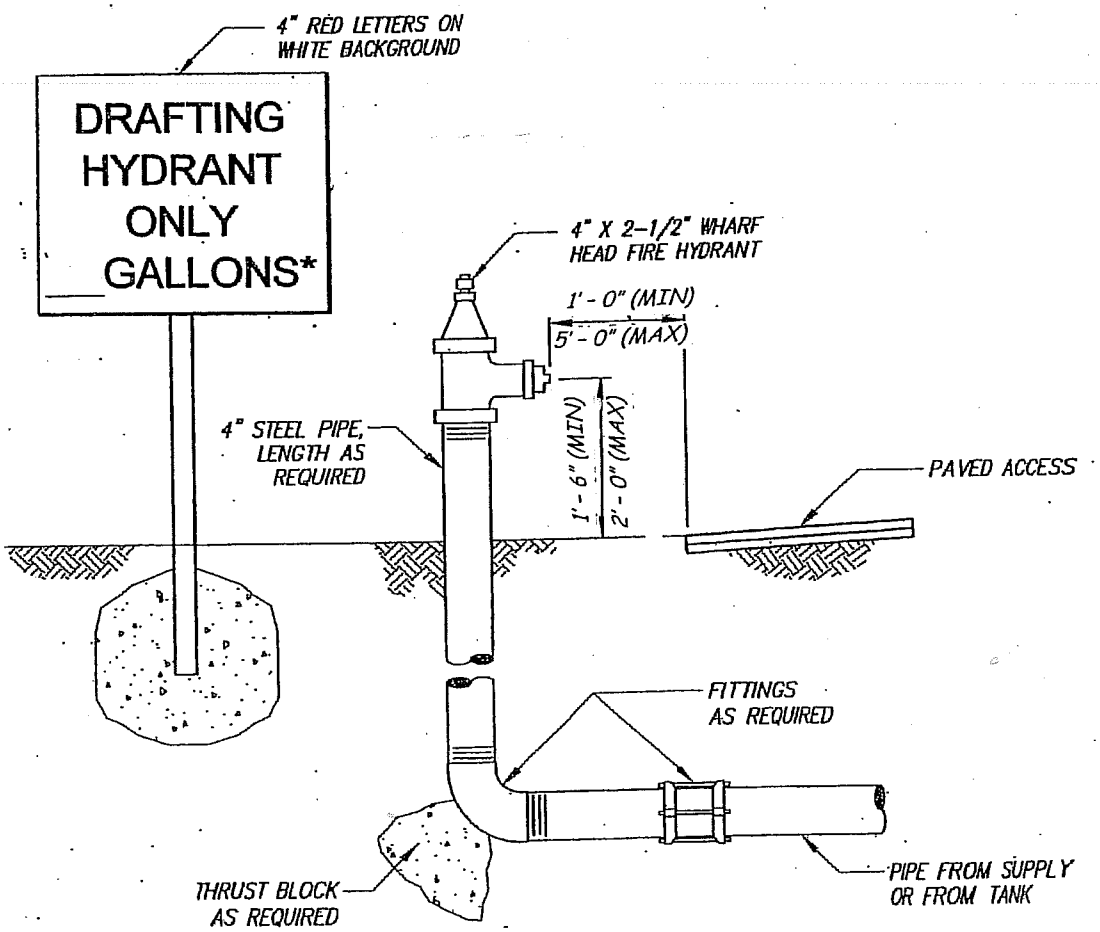
NOTES: 1. CERTAIN ITEMS MAY BE ROTATED FOR CLARITY. NOT TO SCALE
2. WATER TANKS 5000 GALLONS AND GREATER REQUIRE BUILDING PERMITS AND COULD REQUIRE ADDITIONAL AGENCY APPROVALS.



B - FIRE HYDRANT TANK OUTLET

NOT TO SCALE

FIGURE 2



NOTES:
1. SIGN FOR DRAFTING HYDRANT REQUIRED IF RESIDUAL PRESSURE AT DESIGN FLOW IS LESS THAN 20 PSI
2. AMOUNT OF WATER RESERVED FOR HOSE STREAM. EXAMPLE: 5,000 GALLONS

B — TYPICAL "WHARF" FIRE HYDRANT INSTALLATION

NOT TO SCALE

FIGURE 3

DETERMINING TANK SIZE WHEN SERVING UP TO 3 CONNECTIONS

(Requirements assume only one structure will be on fire at a time.)

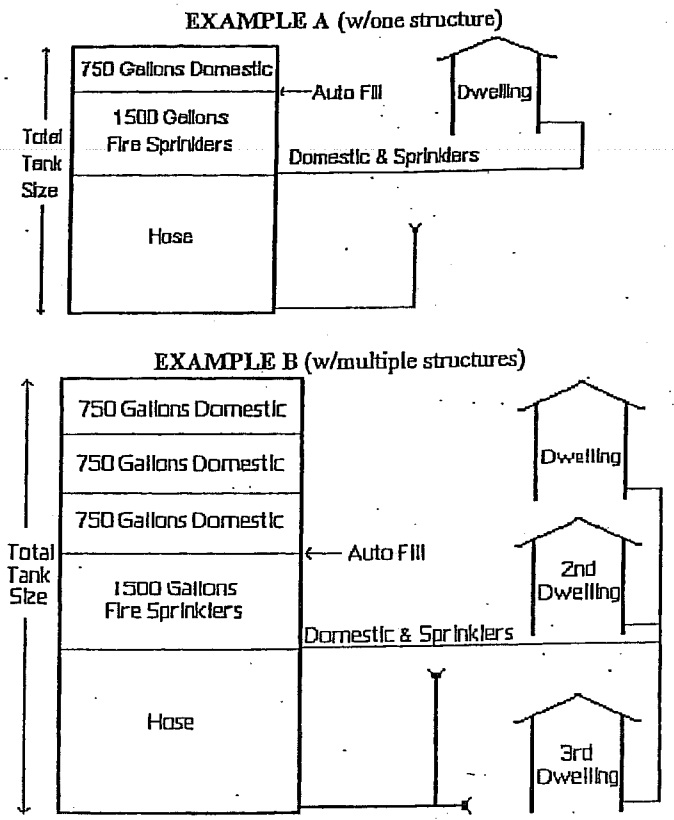
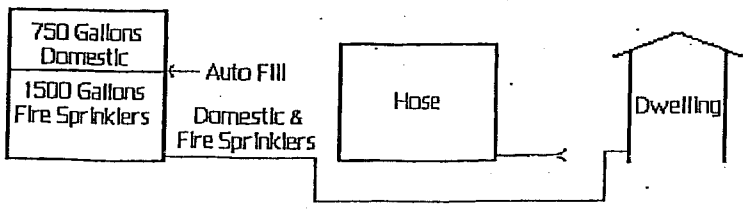


FIGURE 4

WITH SEPARATE TANKS FOR HOSE AND DOMESTIC/SPRINKLER WATER



Domestic and sprinkler may come from a purveyor or a tank which includes both the domestic and sprinkler water.

Hose supply must come from a tank. (A swimming pool may be used for this tank as approved by the Fire District).

APPENDIX A

Frequently Asked Questions Regarding Private Water Systems (PWS):

Can C-900 / Class 150 pipe be used for PWS?
Yes. It does not matter if the system is pressurized or for drafting.

How does the piping have to be connected when a swimming pool is used?
Pools may only be used for hose reserve and with special permission from the Fire District. Domestic and sprinkler water must come from a purveyor or separate tank. The hydrant piping needs to be a permanent connection to the bottom or the side of the pool such that the required amount of water is available above the connection at the pool. The connection must be the same size as the hydrant outlet. They can tee off the pool bottom drain (with correct pipe size) but must do so before the equipment. The connection at the pool cannot be more than 5 feet below the hydrant outlet or the highest portion of the piping from the pool to the outlet. A check valve is not permitted on the piping. If there is a concern about water quality in the piping to the hydrant, the piping can be flushed as needed. **NOTE:** If the pool is not completed prior to construction, a temporary water tank must be provided during the building construction. The temporary tank must be sized to the amount of water required for a non-sprinklered building per Table B. Auto-fill is not required for the temporary tank. The pool must be completed at time of the building final or the temporary tank must be retrofitted to comply with all requirements for a permanent tank.

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.

Can a tank serve more than one dwelling unit?
Yes. The tank shall be sized based upon the largest structure and add 750 gallons for each additional building served up to 3 buildings maximum on the same parcel. Approval from the Fire District will be needed to serve up to 3 buildings between multiple parcels. Tank systems for more than three dwelling units may be approved by the Fire District on a case by case basis.

NOTE: Private water systems serving more than three (3) dwelling units are required to comply with the El Dorado County Environmental Management (EDCEM) requirements. The Fire District will review water system plans for any system not within a public utility system. This review may be in addition to reviews by other agencies (EDCEM, Building & Safety, etc.).

APENDIX B
CALCULATING TANK LEVELS

EXAMPLE:
3,000 square foot dwelling using requirements from Table A with Fire Sprinklers:
Total minimum tank size = 4,750 gallons
Reserved for hose allowance = 2,500 gallons
Reserved for fire sprinklers = 1,500 gallons
Reserved for domestic use = 750 gallons
Auto fill shall be set that the hose allowance is always available = 4,000 gallons

DETERMINING HEIGHTS WHEN DESIGNING PRIVATE WATER SYSTEMS:
Formula: $A = \pi R^2$: 3.1416 x 25 = 78.54 cu. ft. (per ft. of height)
There are 7.48 gallons per cubic ft.: 7.48 x 78.54 = 587.47 gallons per ft. of height
Minimum water heights:

Tank	Sprinkler/Domestic Connection	Auto Fill Height
4,750 ÷ 587 = 8	2,500 ÷ 587 = 4.25	4,000 ÷ 587 = 6.8
8' 4' 3"		6' 9"

DETERMINING GALLONS WHEN INSPECTING:
Formula: $A = \pi R^2$: 3.1416 x 25 = 78.54 cu. ft. (per ft. of height)
There are 7.48 gallons per cubic ft.: 7.48 x 78.54 = 587.47 gallons per ft. of height

8' x 587 = 4,696 gallons	4.25' x 587 = 2,494 gallons	6.8' x 587 = 3,991 gallon