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Fire Prevention Standard

Title: Stored Water Fire Protection Systems			
Number: # 06-07	Effective Date: 08-0120-08	Revised Date: 06-30-2011	
Code References: 2010 CFC, Sec. 507			
Note: <i>This guideline is a summary of Fire Department clarifications of County and State Codes. Information contained herein applies to typical circumstances and may not address all situations.</i>			
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Sign:		Sign: On File	07-29-08

Scope

This standard has been developed to assist development applicants, architects, and contractors in determining the **minimum** requirements for stored water for the purpose of Fire Department use where commercial buildings and single family units are outside of a water purveyor's service district. For projects served by a water purveyor, stored water will not be allowed unless approved by the Fire Chief.

Codes and Standards

This standard is based upon the 2010 California Fire Code, Sec. 507 requirements for allowable types of water supply for the purposes of providing the required water supply for fire protection. Appendix B section B103.3 and NFPA 1142 shall also be applicable.

Plans Required

Detailed architectural and site plans shall be submitted to the Riverside County Fire Department Fire Protection Planning Section (RCoFD) for review and approval prior to construction. Please provide the Tank Manufactures specifications and details as required by this handout. A minimum of two sets of the site plans shall be required for review and one set of architectural plans. A copy of RCoFD stamped approved plans shall be available at the time of inspection.

Specific Requirements

- 1) Storage: The following sections are from NFPA 1142 for reference
 - For non-sprinklered buildings, the tank shall be sized in accordance with recognized standard NFPA 1142 Water supplies for Suburban and Rural Fire Fighting 2001 edition.
 - After completing the structure survey and determining the construction classification number and the occupancy hazard classification number, the authority having jurisdiction shall compute the required minimum water supply.
 - A structure shall be considered an exposure hazard if it is 100 ft² (9.29 m²) or larger in area and is within 50 ft (15.24 m) of another structure. However, if a structure, regardless of size, is of occupancy hazard classification number 3 or 4, it shall be considered an exposure hazard if within 50 ft (15.24 m) of another structure.

CALCULATING WATER STORAGE FOR RESIDENTIAL PROJECTS

STEP1: Determine the cubic footage of each residence, including attached garages, covered porches, etc. everything under the horizontal roofline. (Length x Width x Height).

STEP 2:

Single family residences have a National Fire Protection Association (NFPA) Occupancy Hazard Classification of 7. Calculate the water storage requirements as follows:

FORMULA 1:

Length times Width times Height (Use 10' for single story structures) = Total Cubic Feet. The Total Cubic Feet is then divided by 7 = Minimum Water Storage Quantity in gallons.

EXAMPLE: 2,500 SF home X 10 = 25,000 ÷ 7 = 3,571 (then round up) = minimum tank size of 3,600 gallons

STEP 3:

When an exposure is within 50 feet of an existing building and the exposure is greater than 100 square feet of total floor space, use the following calculation:

FORMULA 2:

Length times Width times Height (Use 10' for single story structures) = Total Cubic Feet times 1.5, then divide by 7 = Minimum Water Storage Quantity in gallons.

EXAMPLE: 2,500 SF home X 10 = 25,000 X 1.5 = 37,500 ÷ 7 = 5,357 (then round up) = minimum tank size of 5,400 gallons

NOTES:

- Water storage for multiple structures **without an exposure hazard** shall be calculated based on the single largest structure as in Formula 1.
- Water storage for multiple structures **with an exposure hazard** shall be calculated based on the single largest structure as in Formula 2.
- Water storage requirements may change if a NFPA 13 or a residential sprinkler system is installed.
- Buildings located in High Fire Severity Zones and meeting the requirements for Chapter 7A of the California Building Code will be a different construction factor than the examples provided and will require less water due to the increase in Fire Resistant Construction type. Please verify this with your Riverside County Fire Safety Specialist. (Referenced Standard Sections).
- All storage requirements are per National Fire Protection Association 1142.
- **The minimum water tank size allowed for residential use is 2,000 gallons.**
- **The minimum water tank size allowed for commercial buildings will be calculated from the formula in Appendix H (H.2.2) for commercial buildings and divided by half.**
- You must meet or exceed the minimum tank requirements for your project.
- When more tanks are purposed for a single occupancy, they shall be connected with 4" plumbing to meet fire requirements and be engineered.
- All structures 3600 square feet and greater shall be protected by Fire Sprinklers per Riverside County Fire Protection Ordinance 787.

RIVERSIDE COUNTY FIRE PROTECTION STANDARD INSTALLATION SECTIONS:

- The authority having jurisdiction shall be permitted to waive the water supply required by this standard when a structure is fully protected by an automatic sprinkler system (except for the minimum water supply of 2,000 gallons) that meets the requirements of NFPA 13, Standard for the Installation of Sprinkler Systems; NFPA 13D, Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes; or NFPA 13R, Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height, **(residential only)**.
- The tank shall be maintained full at all times by an automatic refilling device.
- When the fire service connection outlet is directly on the tank, the tank outlet and the approved control valve shall have a minimum inside diameter of 4 inches. The fire connection outlet shall have National Standard threads and be protected by a threaded 4 inch plastic cap.
- The outlet on the tank shall be located on the side of the tank, at the base, and shall face the road/driveway. The outlet shall be accessed by a fire department approved all-weather road located no closer than 4 feet and no further than 12 ft of the outlet and situated in such a manner that the fire apparatus will be able to connect to the outlet without blocking the roadway.

- When a standpipe or other fire service connection outlet is remote from the tank, an approved shutoff valve, locked in the open position or handle removed, must be provided on the tank. (Ref. Detail A)
- An underground cistern may also be used for a **STORED WATER FIRE PROTECTION SYSTEM (SWFPS)**. An approved fire service connection and water main shall be installed and the base of the cistern shall be higher than the fire service connection outlet.
- For projects located in a designated High Fire Hazard Area, all above ground piping, including all pipes at the water tank as well as hydrant location(s), shall consist of galvanized metal or other material suitable for corrosion resistance.
- The suction vortex plate inside the tank shall be within six inches of the bottom of the tank. Manifolds shall have a vortex plate either at the beginning of entry from one tank to another in the 4 inch connection or in the middle of the 4 inch connection joining the 2 tanks, so the tanks will draw down evenly and provide better utilization of the stored supply.
- Tanks shall be set on a three (3) inch compacted crushed stone or granular base, or on a concrete foundation.
- Water Source Approval: Any water source used to meet the requirement of this standard shall be of suitable quality as approved by the authority having jurisdiction and be maintained and accessible on a year-round basis.
- Fire Department Connections:
Any connection provided at a water source required by this standard shall be approved by the authority having jurisdiction and shall conform to NFPA 1963, Standard for Fire Hose Connections.

YARD HYDRANT

- The yard hydrant shall have a minimum of one 4 inch discharge outlet. SWFPS providing in excess of 2,000 gals; other outlet configurations are acceptable subject to fire department approval. (Ref. Detail A)
- All SWFPS piping shall be no less than 4 in. (Ref. Detail A)
- The standpipe hydrant valve shall be mounted on a supported 4 in. galvanized riser or other approved corrosion resistive material.
- The standpipe hydrant shall be located no closer than 25 ft and no further than 150 ft from the structure being protected along the path of approach. (Ref. Detail A)
- The standpipe hydrant valve shall be a minimum of 16 inches and a maximum of 18 inches above grade and shall in no case be higher than the tank base. (Ref. Detail A)
- The standpipe hydrant and riser shall have a 2 inch blue reflective tape band within six inches of the top of the riser.
- The standpipe hydrant shall have national standard hose threads, a pentagonal operating nut and plastic caps to protect threads.
- The standpipe hydrant shall be accessed by a fire department approved all-weather road located no closer than 4 feet and no further than 12 ft of the standpipe outlet and situated in such a manner that fire apparatus will be able to connect to the standpipe outlet without blocking the roadway. (Ref. Detail A)
- The water main shall be a minimum of 4 in. inside diameter. (Ref. Detail A)
- Plans for any SWFPS shall be submitted to the fire department for approval prior to project construction.

THE FOLLOWING SECTIONS OR AREAS OF NFPA 1142 SHALL NOT BE UTILIZED

- Chapter 7 section 7.2 and the use of Water use agreements.
- Chapter 7 section 7.5 access to water sources (see department standard).
- Chapter 7 section 7.6 Mobile Water Supply Training.
- Chapter 8 entire section.
- B.6, B 3.1, C 12.2.3 Swimming pools

CALCULATING WATER STORAGE FOR COMMERCIAL PROJECTS

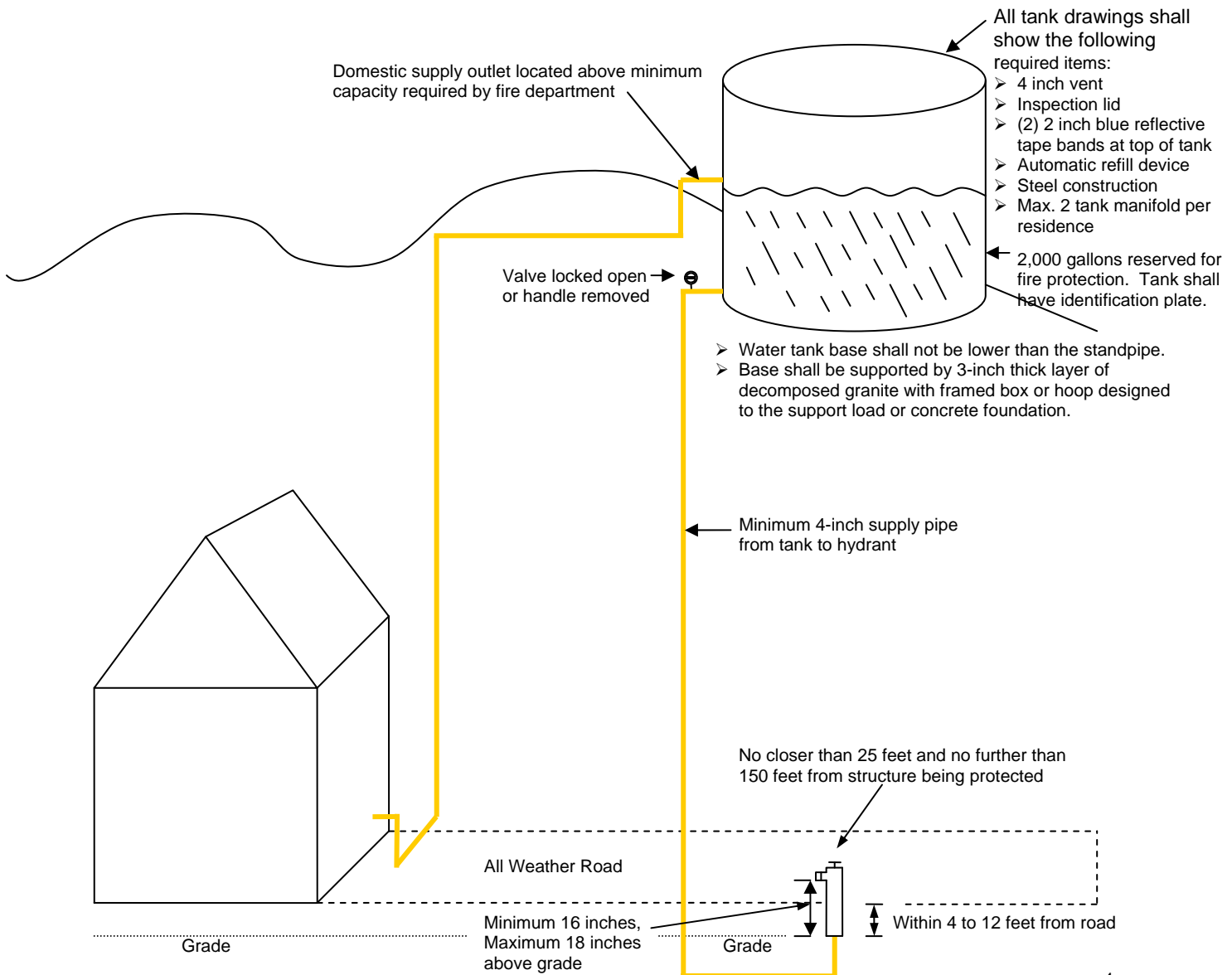
- Use NFPA 1142 for the proper Occupancy classification, building construction, cubic feet of buildings and exposures. Apply formulas and information to calculate total amount of water required. **The minimum water tank size allowed for commercial buildings will be calculated from the formula in Appendix H (H.2.2) for commercial buildings and divided by half.**

**DETAIL A
RESIDENTIAL
APPLICATIONS ONLY**

EXAMPLE:

Elevated water tank with automatic refill device, 2,000 gallons minimum capacity
3000 gallons with exposure hazards

Tanks over 5,000 gallons require a separate permit and approval from the Building and Safety Division.



Supplemental Guide.

This supplemental guide shall be used to assist when classification of occupancy and hazard is beyond the typical application. This supplemental guide will identify minimum requirements for water supplies for structural fire-fighting purposes in rural and suburban areas where adequate and reliable water supply systems where determined by the authority having jurisdiction, do not otherwise exist. The **minimum** requirements identified in this standard shall be subject to increase by the authority having jurisdiction to meet particular conditions such as the following:

- (1) Limited fire department resources
- (2) Extended fire department response time
- (3) Delayed alarms
- (4) Limited access
- (5) Hazardous vegetation
- (6) Structural attachments, such as decks and porches
- (7) Unusual terrain
- (8) Special uses

Purpose.

The water supply requirements developed by this standard shall be performance oriented, and the authority having jurisdiction shall specify how these water supplies are made available.

The minimum water supply required under this standard shall be determined by obtaining the following information:

- Step #1 Classification of occupancy hazard
- Step #2 Classification of construction
- Step #3 Structure dimensions
- Step #4 Exposures, if any

Step #1 Classification of Occupancy Hazard

Where more than one occupancy is present in a structure, the occupancy hazard classification number for the most hazardous occupancy shall be used for the entire structure.

Occupancy Hazard Classification Number.

Occupancy Hazard Classification 3.

Occupancy Hazard Classification 3 shall be used for severe hazard occupancies.

When an exposing structure is of occupancy hazard classification 3, it shall be considered an exposure hazard if within 50 ft (15.24 m), regardless of size.

This classification shall include occupancies with operations or functions similar to the following:

- (1) Cereal or flour mills
- (2) Combustible hydraulics
- (3) Cotton picker and opening operations
- (4) Die casting
- (5) Explosives and pyrotechnics manufacturing and storage
- (6) Feed and gristmills
- (7) Flammable liquid spraying
- (8) Flow coating/dipping
- (9) Linseed oil mills
- (10) Manufactured homes/modular building assembly
- (11) Metal extruding

- (12) Plastic processing
- (13) Plywood and particle board manufacturing
- (14) Printing using flammable inks
- (15) Rubber reclaiming
- (16) Sawmills
- (17) Solvent extracting
- (18) Straw or hay in bales
- (19) Textile picking
- (20) Upholstering with plastic foams

Occupancy Hazard Classification 4.

Occupancy Hazard Classification 4 shall be used for high hazard occupancies.

When an exposing structure is of occupancy hazard classification 4, it shall be considered an exposure hazard if within 50 ft (15.24 m), regardless of size.

This classification shall include occupancies having conditions similar to the following:

- (1) Barns and stables (commercial)
- (2) Building materials supply storage
- (3) Department stores
- (4) Exhibition halls, auditoriums, and theaters
- (5) Feed stores (without processing)
- (6) Freight terminals
- (7) Mercantile
- (8) Paper and pulp mills
- (9) Paper processing plants
- (10) Piers and wharves
- (11) Repair garages
- (12) Rubber products manufacturing and storage
- (13) Warehouses, such as those used for furniture, general storage, paint, paper, and woodworking industries

Occupancy Hazard Classification 5.

Occupancy Hazard Classification 5 shall be used for moderate hazard occupancies, in which the quantity or combustibility of contents is expected to develop moderate rates of fire spread and heat release. The storage of combustibles shall not exceed 12 ft (3.66 m) in height.

This classification shall include occupancy locations similar to the following:

- (1) Amusement occupancies
- (2) Clothing manufacturing plants
- (3) Cold storage warehouses
- (4) Confectionery product warehouses
- (5) Farm storage buildings, such as corn cribs, dairy barns, equipment sheds, and hatcheries
- (6) Laundries
- (7) Leather goods manufacturing plants
- (8) Libraries (with large stockroom areas)
- (9) Lithography shops
- (10) Machine shops
- (11) Metalworking shops
- (12) Nurseries (plant)
- (13) Pharmaceutical manufacturing plants
- (14) Printing and publishing plants

- (15) Restaurants
- (16) Rope and twine manufacturing plants
- (17) Sugar refineries
- (18) Tanneries
- (19) Textile manufacturing plants
- (20) Tobacco barns
- (21) Unoccupied buildings

Occupancy Hazard Classification 6.

Occupancy Hazard Classification 6 shall be used for low hazard occupancies, in which the quantity or combustibility of contents is expected to develop relatively low rates of fire spread and heat release.

This classification shall include occupancy locations similar to the following:

- (1) Armories
- (2) Automobile parking garages
- (3) Bakeries
- (4) Barber or beauty shops
- (5) Beverage manufacturing plants/breweries
- (6) Boiler houses
- (7) Brick, tile, and clay product manufacturing plants
- (8) Canneries
- (9) Cement plants
- (10) Churches and similar religious structures
- (11) Dairy products manufacturing and processing plants
- (12) Doctors' offices
- (13) Electronics plants
- (14) Foundries
- (15) Fur processing plants
- (16) Gasoline service stations
- (17) Glass and glass products manufacturing plants
- (18) Horse stables
- (19) Mortuaries
- (20) Municipal buildings
- (21) Post offices
- (22) Slaughterhouses
- (23) Telephone exchanges
- (24) Tobacco manufacturing plants
- (25) Watch and jewelry manufacturing plants
- (26) Wineries

Occupancy Hazard Classification 7.

Occupancy Hazard Classification 7 shall be used for light hazard occupancies, in which the quantity or combustibility of contents is expected to develop relatively light rates of fire spread and heat release.

This classification shall include occupancy locations similar to the following:

- (1) Apartments
- (2) Colleges and universities
- (3) Clubs
- (4) Dormitories

- (5) Dwellings
- (6) Fire stations
- (7) Fraternity or sorority houses
- (8) Hospitals
- (9) Hotels and motels
- (10) Libraries (except large stockroom areas)
- (11) Museums
- (12) Nursing and convalescent homes
- (13) Offices (including data processing)
- (14) Police stations
- (15) Prisons
- (16) Schools
- (17) Theaters without stages

Step #2 Classification of Construction

Guide to Classification of Types of Building Construction

Classification of types of building construction shall be in accordance with NFPA 220, *Standard on Types of Building Construction*, and 2010 California Building Code.

Type I (443 or 332) Construction [Construction Classification Number 0.5]. Type I (2010 California Building Code, Chapter 6, A or B can be used) construction shall be that type in which the structural members, including walls, columns, beams, girders, trusses, arches, floors, and roofs, are of approved noncombustible or limited-combustible materials and shall have fire resistance ratings (Table 3.1 in NFPA 220).

Type II (222, 111, or 000) Construction [Construction Classification Number 0.75]. Type II (2010 California Building Code, Chapter 6, A or B can be used) construction shall be that type in which not qualifying as Type I construction in which the structural members, including walls, columns, beams, girders, trusses, arches, floors, and roofs, are of approved noncombustible or limited-combustible materials and shall have fire resistance ratings not less than those specified in Table 601 [220:3.2]

Type III (211 or 200) Construction [Construction Classification Number 1.0]. Type III (2010 California Building Code, Chapter 6, A or B can be used) construction shall be that type in which exterior walls and structural members that are portions of exterior walls are of approved noncombustible or limited-combustible materials, and interior structural members, including walls, columns, beams, girders, trusses, arches, floors, and roofs, are entirely or partially of wood of smaller dimensions than required for Type IV construction or of approved noncombustible, limited-combustible, or other approved combustible materials. In addition, structural members shall have fire resistance ratings not less than those specified in Table 601. [220:3.3]

Type IV (2HH) Construction [Construction Classification Number 0.75]. Type IV (2010 California Building Code, Chapter 6, Heavy Timber sections can be used) construction shall be that type in which exterior and interior walls and structural members that are portions of such walls are of approved noncombustible or limited-combustible materials. Other interior structural members, including columns, beams, girders, trusses, arches, floors, and roofs, shall be of solid or laminated wood without concealed spaces.

Wood columns supporting floor loads shall be not less than 8 in. (203 mm) in any dimension; wood columns supporting roof loads only shall be not less than 6 in. (152 mm) in the smallest dimension and not less than 8 in. (203 mm) in depth. [220:3.4.2]

Wood beams and girders supporting floor loads shall be not less than 6 in. (152 mm) in width and not less than 10 in. (254 mm) in depth; wood beams and girders and other roof framing, supporting roof loads only, shall be not less than 4 in. (102 mm) in width and not less than 6 in. (152 mm) in depth. [220:3.4.3]

Framed or glued laminated arches that spring from grade or the floor line and timber trusses that support floor

loads shall be not less than 8 in. (203 mm) in width or depth. Framed or glued laminated arches for roof construction that spring from grade or the floor line and do not support floor loads shall have members not less than 6 in. (152 mm) in width and not less than 8 in. (203 mm) in depth for the lower half of the member height and not less than 6 in. (152 mm) in depth for the upper half of the member height. Framed or glued laminated arches for roof construction that spring from the top of walls or wall abutments and timber trusses that do not support floor loads shall have members not less than 4 in. (102 mm) in width and not less than 6 in. (152 mm) in depth.

Exception: Spaced members shall be permitted to be composed of two or more pieces not less than 3 in. (76 mm) in thickness where blocked solidly throughout their intervening spaces or where such spaces are tightly closed by a continuous wood cover plate not less than 2 in. (51 mm) in thickness, secured to the underside of the members. [220:3.4.4]

Floors shall be constructed of splined or tongue-and-groove plank not less than 3 in. (76 mm) in thickness that is covered with 1-in. (25-mm) tongue-and-groove flooring, laid crosswise or diagonally to the plank, or with ½-in. (12.7-mm) plywood; or they shall be constructed of laminated planks not less than 4 in. (102 mm) in width, set close together on edge, spiked at intervals of 18 in. (457 mm), and covered with 1-in. (25-mm) tongue-and-groove flooring, laid crosswise or diagonally to the plank, or with ½-in. (12.7-mm) plywood. [220:3.4.5]

Roof decks shall be constructed of splined or tongue-and-groove plank not less than 2 in. (51 mm) in thickness; or of laminated planks not less than 3 in. (76 mm) in width, set close together on edge, and laid as required for floors; or of 1 1/8-in. (28.6-mm) thick interior plywood (exterior glue); or of approved noncombustible or limited-combustible materials of equivalent fire durability. [220:3.4.6]

Type V (111 or 000) Construction [Construction Classification No. 1.5]. Type V (2010 California Building Code, Chapter 6, A or B can be used) construction shall be that type in which exterior walls, bearing walls, columns, beams, girders, trusses, arches, floors, and roofs are entirely or partially of wood or other approved combustible material smaller than material required for Type IV construction. In addition, structural members shall have fire resistance ratings not less than those specified in Table 601. [220:3.5]

Step #3 Structure Dimensions

Determine the cubic footage of each residence, including attached garages, covered porches, etc. Everything under the horizontal roofline, (Length X Width X Height).

Step # 4 Exposures (in any)

Calculating Minimum Water Supplies

After completing the structure survey and determining the construction classification number and the occupancy hazard classification number, the authority having jurisdiction shall compute the required minimum water supply.

A structure shall be considered an exposure hazard if it is 100 ft² (9.29 m²) or larger in area and is within 50 ft (15.24 m) of another structure. However, if a structure, regardless of size, is of occupancy hazard classification number 3 or 4, it shall be considered an exposure hazard if within 50 ft (15.24 m) of another structure. Structures without Exposure Hazards.

For structures with no exposure hazards, the minimum water supply, in gallons, shall be determined by the total cubic footage of the structure, including any attached structures, divided by the occupancy hazard classification number as determined, and multiplied by the construction classification number as determined

$$\text{minimum water supply} = \frac{\text{(total volume of structure)}}{\text{(occupancy hazard classification number)}} \times \text{construction classification number}$$

The minimum water supply required for any structure without exposure hazards shall not be less than 2000 gal (7570 L), for residential

Structures with Exposure Hazards.

For structures with unattached structural exposure hazards, the minimum water supply, in gallons, shall be determined by the cubic footage of the structure, divided by the occupancy hazard classification number as determined, multiplied from the construction classification number, and multiplied by 1.5.

$$\text{minimum water supply} = \frac{\text{(total volume of structure)}}{\text{(occupancy hazard classification number)}} \times \frac{\text{construction classification number} \times 1.5}{\text{number}}$$

The minimum water supply required for structure with exposure hazards specified in 7.3.1 shall not be less than 3000 gal (11,355 L), for residential

Structures with Automatic Sprinkler Protection.

The authority having jurisdiction shall be permitted to waive the water supply requirement for residential occupancies (except for the minimum water supply of 2,000 gallons) by this standard when a structure is protected by an automatic sprinkler system that fully meets the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*; NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*; or NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*.

If a sprinkler system protecting a building does not fully meet the requirements of NFPA 13, NFPA 13D, or NFPA 13R, a water supply shall be provided in accordance with this standard.

For all commercial Structures

All commercial buildings and structures shall follow NFPA 1142 standard in its entirety and have the Riverside County Planning and Engineering Specialist assist in calculating the minimum water storage tanks required for the project. Commercial projects will require automatic fire sprinkler systems when required by the California Fire and California Building Codes, and will be installed per NFPA 13, 2002 edition. **The minimum water tank size allowed for commercial buildings will be calculated from the formula in Appendix H (H.2.2) for commercial buildings and divided by half.**