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SOUTH AUSTRALIAN FIRE AUTHORITIES

Community Safety Department

BUILT ENVIRONS SECTION POLICY NO. 14

Above Ground Water Storage Tanks for Fire Fighting Purposes

1 PURPOSE

To provide advice specifying the requirements of the South Australian fire authorities, being the South Australian Metropolitan Fire Service (MFS) and the South Australian Country Fire Service (CFS) as per the South Australian Development Act 1993, in regards to above ground water storage tanks for fire fighting purposes.

2 SCOPE

This policy applies to above ground external water storage tanks used for fire fighting purposes as typically found adjacent to industrial and rural buildings. This policy is in addition to the requirements found in the relevant Australian Standards for water storage tanks for fire fighting purposes.

While this policy does not strictly apply to tanks within buildings or on the roofs of buildings, there are a number of requirements which are applicable, such as the requirements for connections and valves, tank capacities, overflows microbiological air breaks.

3 GENERAL

Fire fighting water storage tanks shall be of approved size, accessible by a fire appliance and incorporate valves and water connections as nominated in this document.

Two tanks must be provided for hydrant systems where the floor area of the building or combined area of buildings served exceeds 2,000m^2. In all other cases a single tank may be provided.

See Section 5 for details on the required tank and fire service connections.

Specific advice must be obtained from the relevant fire authority before any fire tank system is constructed.

4 FIRE APPLIANCE ACCESS

Tanks shall be located in an approved position and should be located between the appliance connections and the building. Accessible, drained hardstand must be provided adjacent to the tanks so that a fire brigade pumping appliance can be positioned side on to the tank with its pump inlet connection not more than **6 metres** from the tank suction connection.

Where two large bore connections are installed, the distance between them must be not less than **10 metres** to enable one pumping appliance to park behind another and align with the tank connections.

The hard standing must be horizontal and 600 mm (± 50mm) below the centreline of the large bore suction connection.

NOTE: *Each large bore suction hose is 2.4m long; a maximum of 3 lengths is carried on any MFS pump appliance.*

5 STORAGE TANK CONNECTIONS, VALVES AND ACCESSORIES

5.1 Small Bore Suction Connection

Each tank must be fitted with a minimum of 2 x 65mm nominal bore, rigid feed connections, each comprising a 65mm diameter lever-operated ball or butterfly valve, or a gate valve, each with a 65mm nominal bore SA Round Thread male hose connection with blank cap and chain (see Figure 1 for further information). Where a tank is not located in a secure area, then each valve must be padlocked in the closed position with the padlock keyed equivalent to the Lockwood 003 lock.

NOTE: *The use of traditional hydrant landing valves is permitted only where the valve jumper is held captive in the valve spindle. It has been found that with the traditional hydrant valve, the rubber washer vulcanises to the valve seat due to heat from direct sunlight, and the jumper remains securely in place when the valve spindle is raised because there is insufficient static pressure to lift the valve jumper.*

5.2 Large Bore Suction Connection

Each tank, or a common tank manifold, in a MFS or mutual aid MFS/CFS area must be fitted with not less than one suction point comprising a female 140mm BS Round Thread connection, complete with a metal plug and captive chain (see Figure 1 for further information).

Each tank in a CFS area where the MFS are unlikely to respond must be fitted with not less than one suction point comprising a 125mm German “Stortz” hermaphrodite connection suitable for use by the CFS. The connection must include a 125mm – 100mm German Stortz adaptor, fitted with a 100mm cap and captive chain.

All large bore connections are rated up to 60 L/s. Where the system flow is greater than this, additional connections will be required. For large installations in a mutual aid area, a 140mm BS Round Thread to German Stortz adaptor may be required to be installed in each 140mm BS Round Thread tank connection. This requirement is at the discretion of the relevant fire authority.

5.3 Suction Isolating Valve

Each large bore suction connection must be provided with a lever or gear operated, normally closed butterfly stop valve, of not less than 150mm nominal bore (see Figure 1 for more information). Where a tank is not located in a secure area, then each valve must be secured in the closed position by a padlock keyed equivalent to the Lockwood 003 lock.

5.4 General Pipe and Valve Requirements

All pipe and pipe fittings used in above ground fire hydrant installations, including booster connections, must be in accordance with AS 2419.1. As per this Standard, plastic pipes and pipe fittings are not permitted to be used for any part of the systems that is above ground.

Valves suitable for use with storage facilities as detailed in this document must:

a) Be of **all-metal** construction in accordance with AS 2419.2 *Fire hydrant installations, Part 2: Fire hydrant valves*.

b) Be capable of being locked in the open or closed position as appropriate.

c) Be listed by the water supply authority and suitable for the working pressures experienced at the valve location.

Butterfly stop valves comprise two principal parts, the valve body and the valve operator and must incorporate the following:

i) Employ an **all-metal** construction, low torque, gear-driven wheel or crank operator complete with a "Chisel" or equal type raised valve position indicator. This must indicate to a fire fighter by feel, through protective gloves, the position of the valve, and in normal circumstances will readily visually indicate the position of the valve butterfly when the valve actuator is viewed from above or to the side; or

ii) Employ an **all-metal** construction lever operator with notch plate to permit partial opening of the valve. The position of the lever is to be parallel to the longitudinal axis of the pipe when the valve is open and must not interfere with the swing of any hose coupling keys used by fire fighters to attach hose to the outlet.

5.5 Quick Fill Facilities

Automatic inflow and manual quick fill facilities are required to be provided in accordance with AS 2419.1-2005. All tank infill facilities shall be located such that they are visible from the suction connection location(s).

Where automatic inflow facilities are provided, a manual by-pass quick fill facility should also be provided.

The water supply to a site must be able to satisfy the flow requirements for all fire fighting systems operating simultaneously for the required duration.

See Figure 2 for further information.

NOTE: *Automatic infill is required where the effective storage capacity of the tank(s) has been reduced to allow for town main make-up supply in accordance with AS 2419.1-2005.*

5.6 Vortex Inhibitor (Anti-Cavitation Plate)

Vortex inhibitors are required and shall be provided in accordance with AS 2419.1-2005. Where the tank serves a combined hydrant and sprinkler system and a combined flow rate in excess of 40 L/s is required, the design of the vortex inhibitor shall be in accordance with AS 2118.1-1995 suitable for the specified flow conditions.

5.7 Tank Contents Indicator

Each tank shall be fitted with a tank contents indicator in accordance with AS 2419.1-2005. See Figure 3 for examples.

5.8 Signage

Water storage tanks for fire fighting shall have the following signs written in upper case lettering in a colour contrasting with that of its background. The following signs are required as a minimum:

a) "WATER FOR FIRE FIGHTING" Written in 100 mm lettering on the side of the tank and repeated so that the sign is visible from all approaches to the tank.

b) Each contents indicator shall be sign-written, as per AS 2419.1-2005 Clause 5.4.4.1, and display the contents of the tank in lettering not less than 100mm in height as follows:
F (full), ½ (half full) and E (empty)

c) Each quick fill valve shall be sign-written in lettering 50mm in height as follows:

i) For automatic infill valves:
"AUTOMATIC TANK FILL VALVE”

ii) For manual infill valves:
"MANUAL TANK FILL VALVE FOR FIRE FIGHTERS USE"

NOTE: *Contents gauges must be sign-written because some gauges read in the reverse direction to other gauges, as shown in Figure 3.*

6 TANK CAPACITIES

In accordance with AS 2419.1:

"*the minimum capacity of the source of water supply for fire hydrant installations shall be not less than that necessary to satisfy the minimum flow rates specified in Clause 2.3.1 or 3.3, as appropriate, for a duration of not less than* ***4 hours***."

Further:

"*Where the town main is capable of providing make-up supply to the on-site storage, the capacity of the on-site storage shall be such that a 4 h supply is available based on the difference in flow rates between the fire hydrant system required flow rate and the make-up flow rate.*"

Where the effective storage capacity of the tank is reduced in accordance with AS 2419.1-2005 to incorporate an automatic inflow to supplement the supply from a reticulated town main, **no on-site storage tank shall have a useable capacity of less than 30 minutes supply at the required flow rate for the individual / combined systems**, as appropriate.

Where the effective storage capacity of the tank is reduced as per above **and the flow requirements of AS 2419.1 are for the operation of 1 hydrant valve only**, then no on-site storage tank shall have a useable capacity of less than 25,000L..

NOTE: *See AS2419.1 for further details regarding on-site tank storage capacities.*

7 OVERFLOWS & MICROBIOLOGICAL AIR BREAKS

Overflow pipe sizes and air space between the ball valve and tank water level must be designed in accordance with AS 3500 and suitable for the ball valve size only. Quick fill pipes must be raised above the water level a minimum of 4 times the diameter of the pipe. The tank must be sufficiently robust and be complete with suitable relief openings in the tank lid to accommodate overflow should a manual quick fill valve be left on with the tank completely full of water. The water supply authority must be consulted to assess if any back flow prevention device is required for the ball valve, which could be submerged for a short period if a manual quick fill is allowed to overfill the tank. (See Figure 2 for further information).

NOTE: *See AS 3500 Section 8 for further information. To prevent mosquitoes breeding via the opening left for the quick fill water flow, it may be necessary to provide a thin film of paraffin oil on top of the tank water surface.*

8 MULTIPLE TANKS

Where multiple tanks are required for the water supply, each tank must provide an independently valved water supply. Where only two tanks are provided, each valved connection must be not less than 150mm in diameter. Where 3 or more tanks are provided, each valved connection must be not less than 100mm in diameter. A common manifold interconnecting each valved tank must be of not less than 150mm nominal bore.

NOTE: *A 150mm bore is required for a suction connection. Where two tanks are provided, when one is shut down the remaining tank must supply the total flow. For more than two tanks, a minimum of two supplies will be available, hence the permitted reduced tank connection size.*

9 EXAMPLES OF SYSTEM ARRANGEMENTS

Figure 4 shows a typical system arrangement where the performance of the street main does not meet the design requirements of AS 2419.1.

Figure 5 shows a tank system where pumps are provided to achieve the required performance specified in AS 2419.1. In this instance, a pump appliance is connected to the tank and can supplement the pumped supply.

Whilst a large incoming water supply is shown in this figure with provision for a fire appliance to draw water from a twin outlet feed hydrant, in some cases where only a small domestic water supply is available, the tank will be a stand alone facility with no large bore water supply. In such instances, a ball valve make up supply will be necessary having a performance sufficient to compensate for evaporative and routine hydrant flow test losses.

Figure 6 shows acceptable interconnections between fire storage tanks.

Figure 7 shows acceptable hardstand arrangements and dimensions for fire service pump appliances in relation to single/dual tank suction connection arrangements. Where more than two pump appliances are required, the hardstand area shall be increased as required.

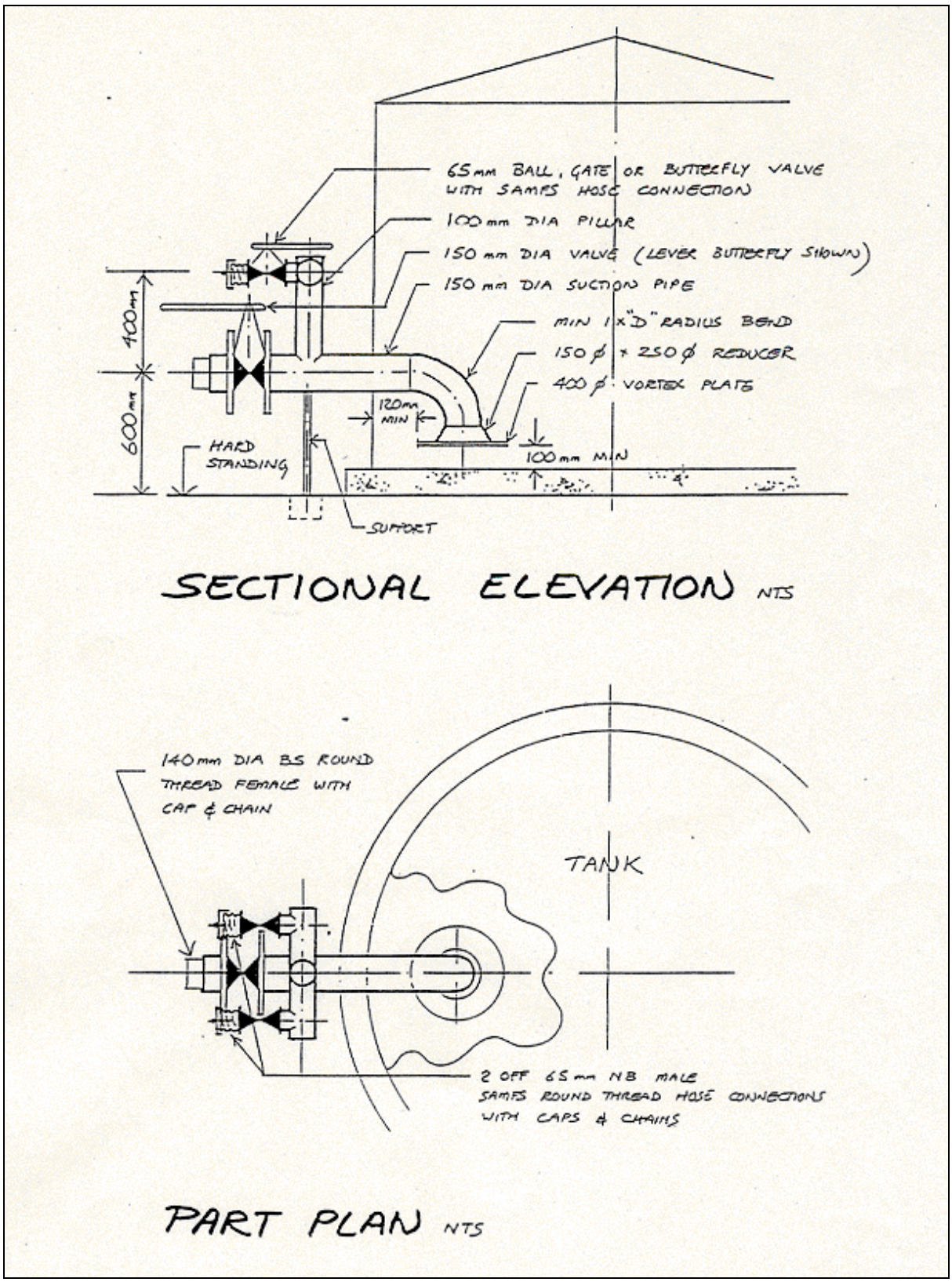

Figure 1 - Tank connections for mutual MFS and CFS response areas.

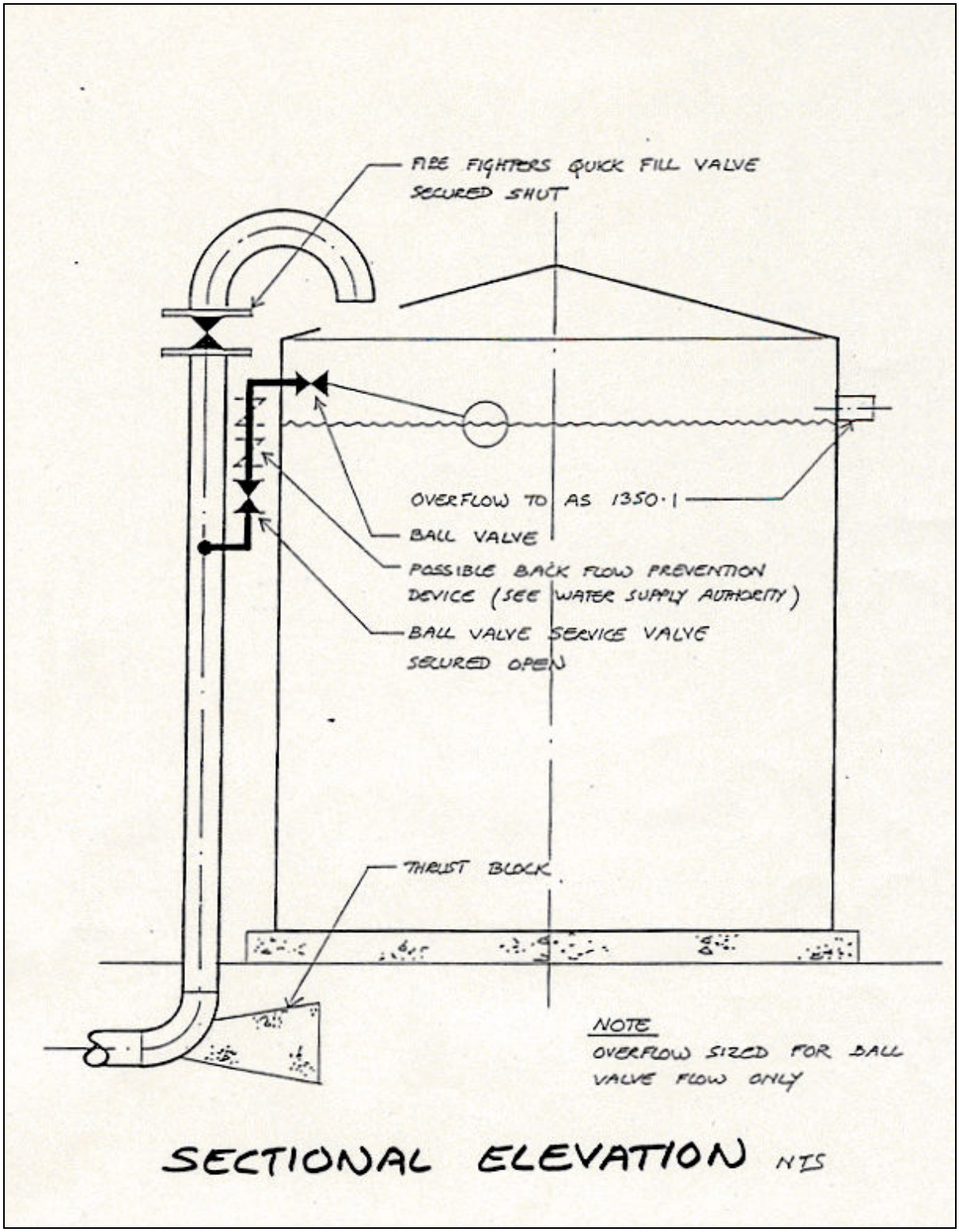

Figure 2 - Tank quick fill and evaporation/test make-up arrangement.

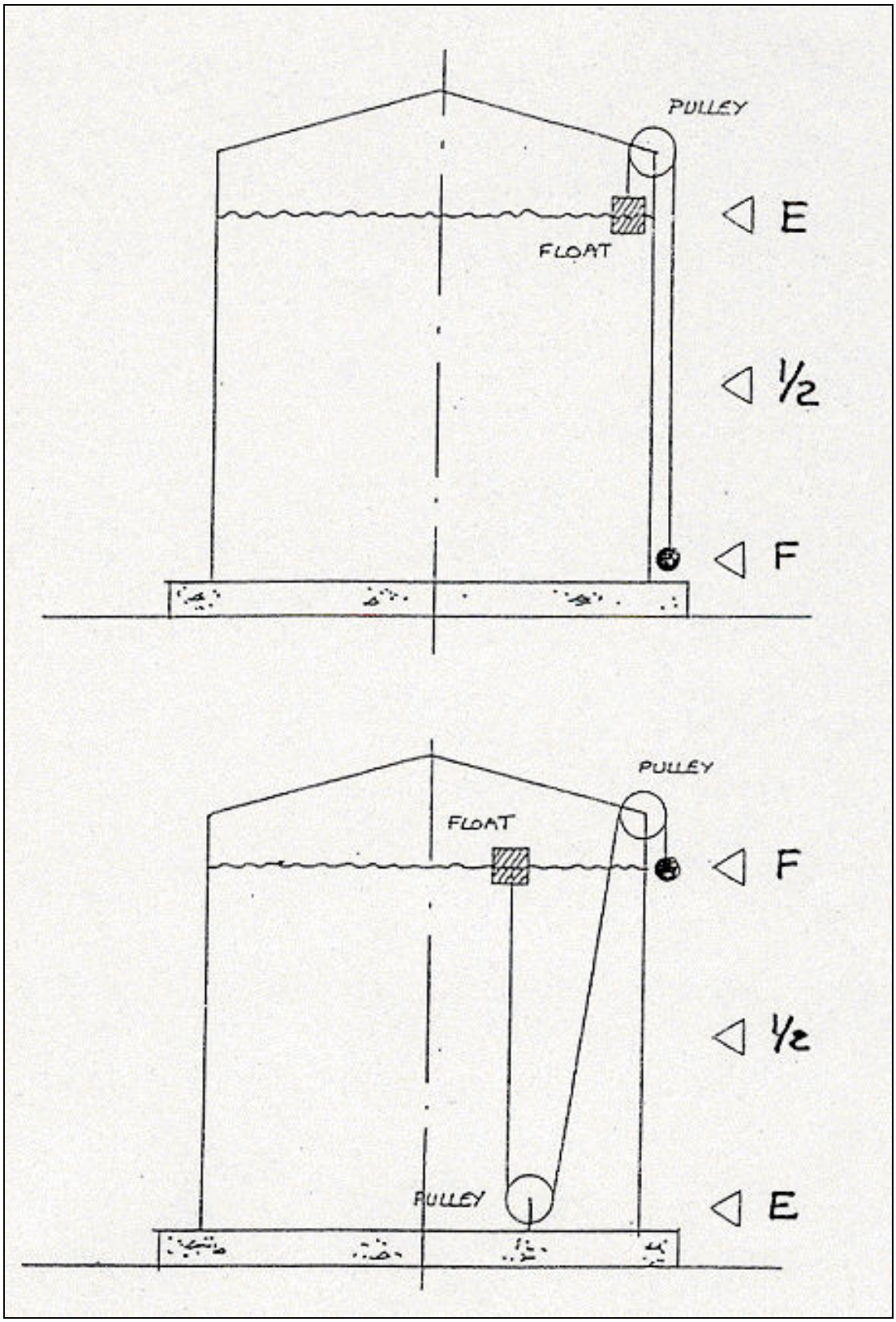

Figure 3 - "Cat & Mouse" contents indicators.

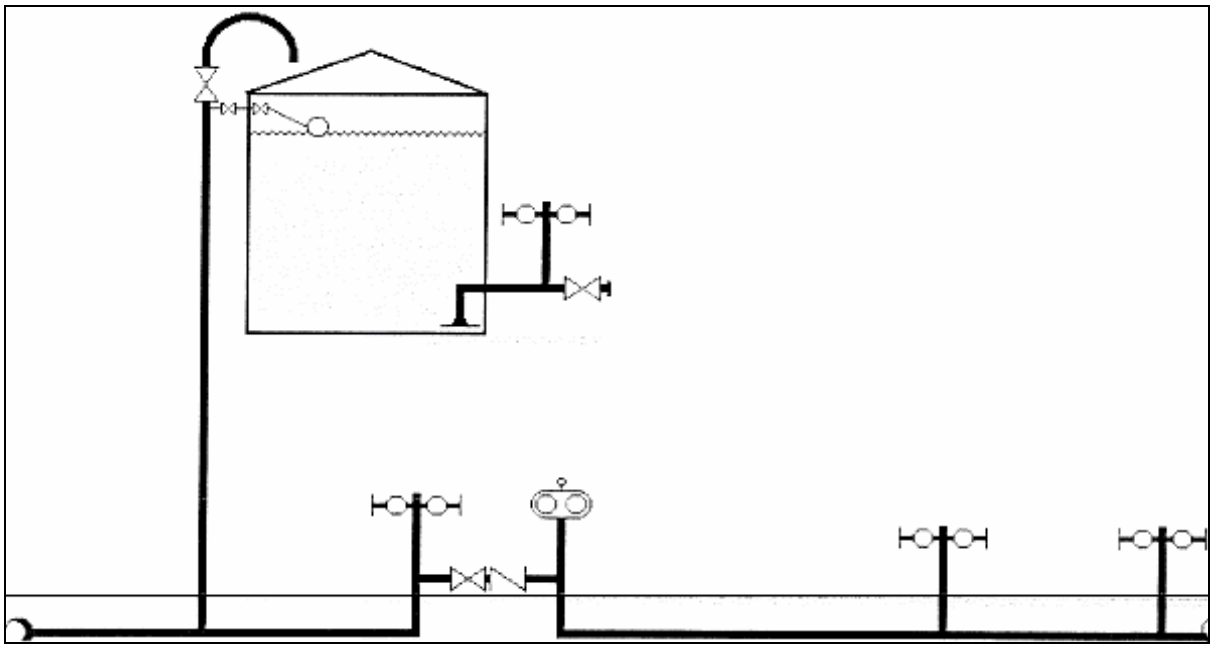

Figure 4 - Water supply when the flow rate is below that required.

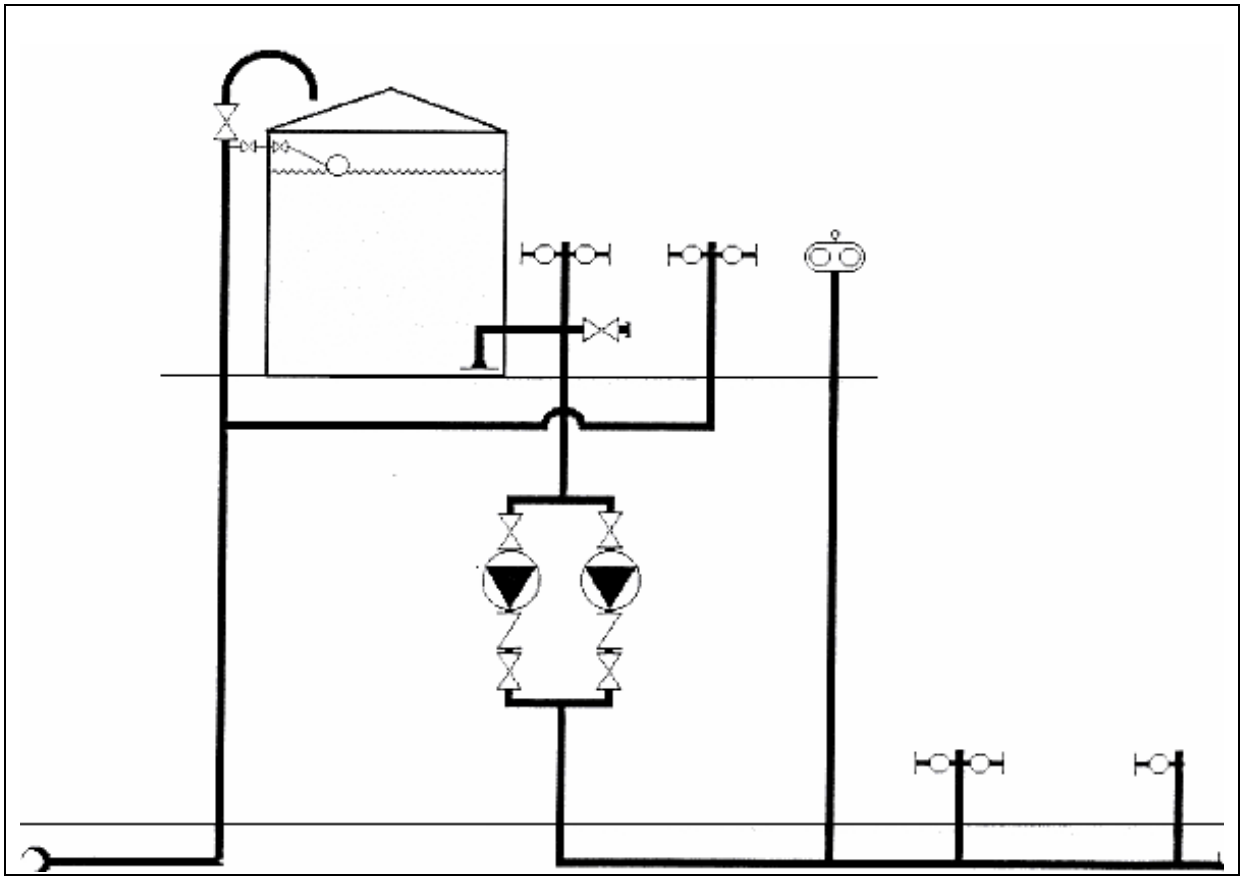

Figure 5 - Pumped system water supply when the flow rate is below that required.

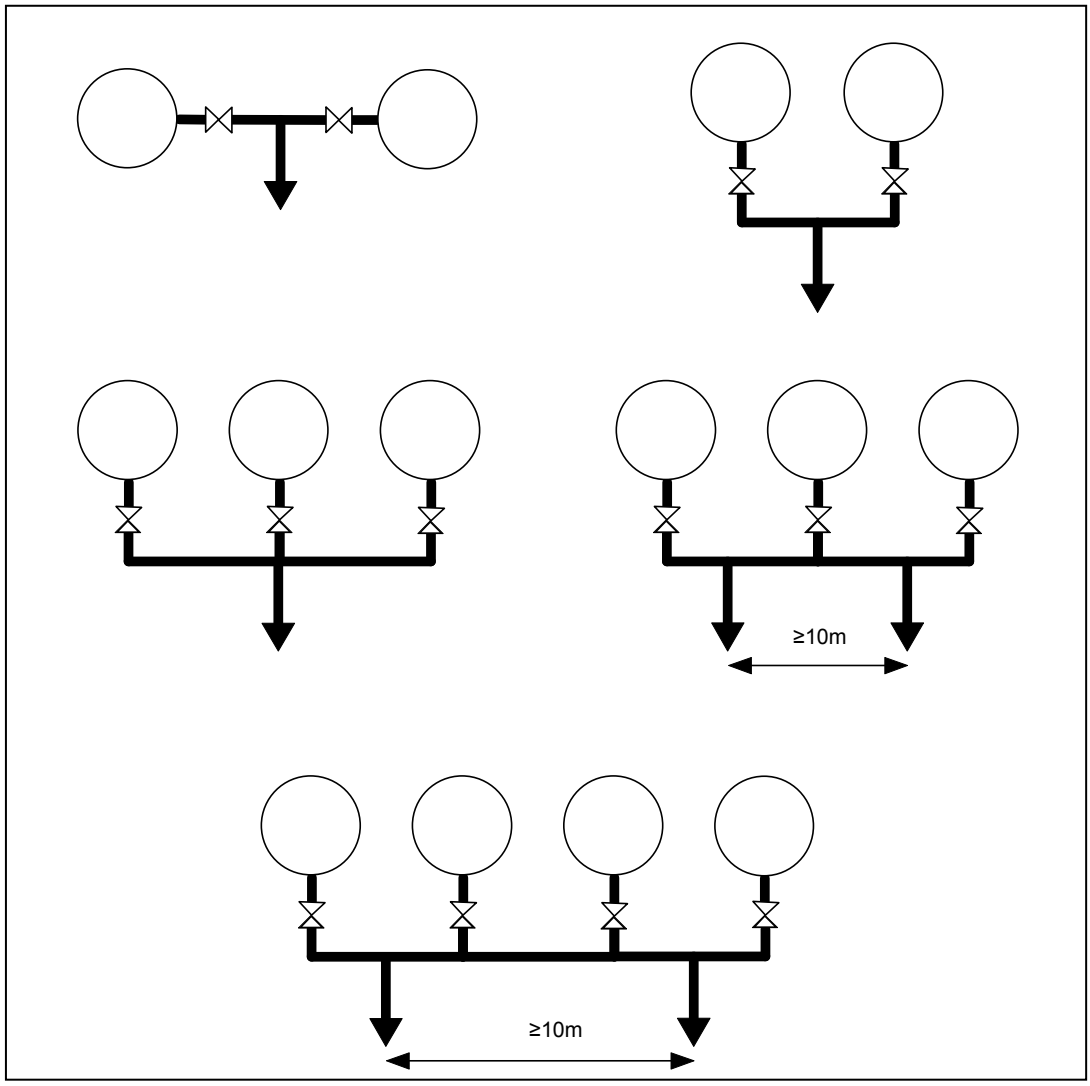

Figure 6 - Acceptable tank connection arrangements for multiple storage tanks.

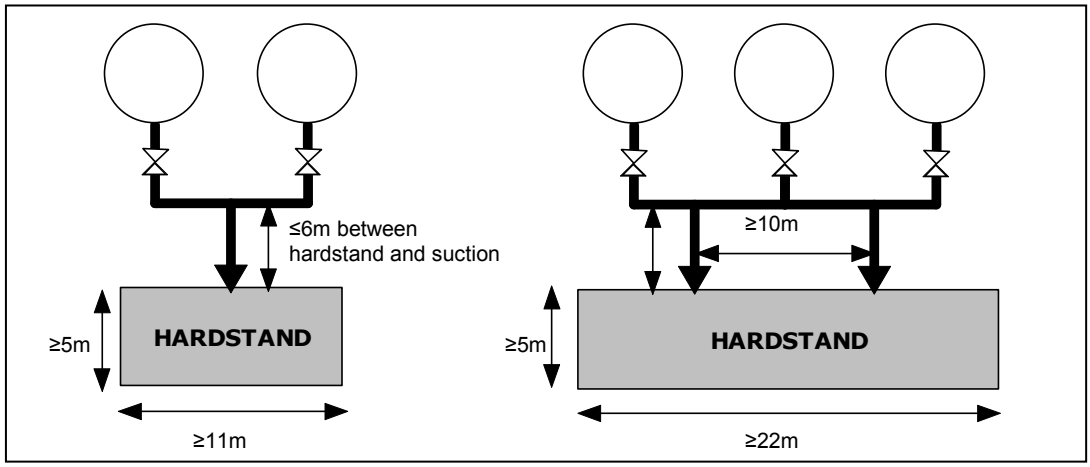

Figure 7 - Acceptable hardstand arrangements for fire service pump appliances.