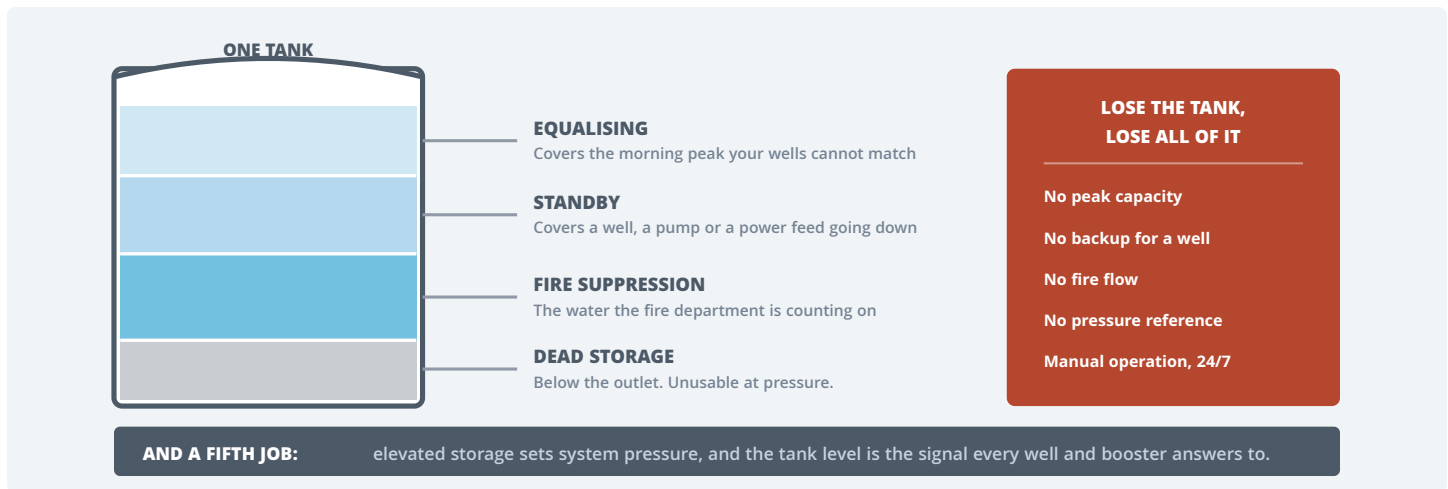


STORAGE, REDUNDANCY, AND WHAT A TANK IS ACTUALLY FOR

Two is one. One is **none**.

Storage is the most misunderstood asset on a small water system. People picture a bucket. It is not a bucket. A tank is doing four separate jobs at once, and a fifth nobody thinks about, and **when a system has only one tank it loses all five in the same minute.**



The reason engineers size storage in layers. Each band is a different obligation, and they are not interchangeable. Standby storage and equalising storage cannot be the same gallons.

What redundancy actually means

Not a spare part on a shelf. It is the ability to keep serving people while one thing is broken, and it takes four pieces working together.

- **Storage.** A second tank, so one failure is an inconvenience.
- **Conveyance.** A second path for water to travel.
- **Pumping.** Capacity that does not all fail at once.
- **Controls.** Something that knows what the others are doing.

Miss the last one and the first three still leave an operator awake for three days flipping switches by hand.

AN EMERGENCY INTERTIE IS NOT CAPACITY

Design standards are blunt about this. An emergency connection to a neighbouring system cannot be counted toward your source capacity, and it only qualifies as emergency capacity if you could already meet demand without it.

Which is the correct rule, and also why a temporary line run overnight to a neighbour's tank is a rescue rather than a plan.

WHY SMALL SYSTEMS END UP WITH ONE OF ANYTHING

A second tank is not a second bucket. It is a site, a pad, a pipe run, valves, controls and a permit, which for a district of a few hundred connections is a capital project on the order of a million dollars. So the district builds one, sized for today, and it works. For fifty years it works.

Nothing about a single tank looks like a mistake until the day it is not there. Which is why redundancy is almost never a local decision about risk appetite. It is a funding question, answered by whether outside capital arrives before the asset does.

4

Jobs one tank is doing at any moment

3 yr

AWWA M42 interval for a full tank inspection

6–8 yr

Interval firms actually report seeing

0

Arizona rules requiring anyone to look inside a tank

THE INSPECTION GAP

Nobody is required to look inside

A comprehensive tank inspection means the tank comes out of service and is drained, or a diver goes in, or a remote vehicle does. Somebody actually looks at the steel: the floor plates, the seams, the roof, the coating, the hatch.

AWWA recommends every three years. When inspection firms report what they actually encounter, the common interval is six to eight years, and a great many tanks have never been inspected at all.

WHO REQUIRES IT

Texas	Annually
Rhode Island	External annual, internal 5 yr
Arkansas	2 yr
Alabama, Missouri, New Hampshire, Ohio, Wisconsin	5 yr
Arizona	No requirement

Most states set no frequency and leave it to the utility.

WHAT INSPECTORS FIND WHEN THEY DO LOOK

One firm covering sixty to seventy-five tanks a year reported serious sanitary defects in **twenty to twenty-five percent** of them. Most originated at roof hatches and vents that no longer sealed.



The top of a steel tank after a failure. A tank gives very little warning from the outside, which is exactly why the inspection interval matters.

GIDEON, MISSOURI · DECEMBER 1993

Contamination entered a municipal storage tank through a gap in the roof hatch frame. Flushing carried it into the distribution system.

Seven nursing home residents died. Roughly six hundred people, about forty-four percent of the town, became ill.

It is the case every storage guidance document cites, and the failure was a hatch nobody had climbed up to look at.

The arithmetic nobody runs

Set the emotion aside and this is a maintenance economics problem with three numbers in it, and they are not close to each other.

An inspection is a small number. Draining a tank, repairing the floor and recoating it is a larger but still modest number, and it can buy another few decades of service life. **Replacing a tank is a number with a comma in it,** and it arrives with no notice, usually alongside an emergency, and always in a year the district did not budget for it.

We have no rule that makes the small number happen. So we keep paying the large one, and we pay it in the worst possible circumstances.

REASONABLE NEXT STEP

A tank inspection requirement with a funded assistance path for systems that cannot afford one. The requirement alone would be another unfunded mandate on a volunteer board. The pair is a policy.

FOR A BOARD MEMBER

Three questions

When was this tank last inspected inside? What did the report say? What is the replacement cost, and is any of it in the reserve? If nobody in the room knows, that is the finding.

FOR AN OPERATOR

Write it down

Photograph the hatch, the vent screen, the overflow and the coating every year. It costs an hour. It is also how you prove later that a failure was unforeseeable rather than neglected.

FOR A POLICYMAKER

Cheapest lever available

Inspection is the least expensive intervention in the whole asset lifecycle and the only one that reliably converts a catastrophic cost into a scheduled one.