Current Service Reservoir flood testing methods are misrepresenting reality?

Realistic flood testing must be completed with the normal operating loads on the structure.

Over the past 20 years Panton McLeod have supported various initiatives in the UK water industry to develop the best practice methodology for Service Reservoir (SR) flood testing. Significant emphasis on the subject has emerged over the last 24 months as regulatory pressure on finding and preventing ingress has intensified for all water providers in the UK.

We propose that the vast majority of current SR flood testing methodology, on tanks that are empty, are misrepresentative of the day to day situation for one significant reason. The enormous loads placed on a full tank will open (and perhaps even close) cracks, joints and other structural flaws in the structure. Removing that heavy load from the tank by draining it before flood testing will change the integrity of the tank. Flood testing while in that empty state does not properly represent the state of the structure when it is full of water.

Some of the current methodologies for emulating heaving rainfall or melting snow include:

- Brief flooding using the small diameter hosing associated with jetting equipment without any consideration for construction type.
- Engulfment using fire hoses with a manifold to disperse the flow across the whole roof.
- The use of sprinkler systems for extended periods.
- CESWWI type procedures (designed for new build assets) where 100mm of water is held on the roof.

There are numerous pros and cons to all of these as the search for a truly representative replication of natural flooding situations moves forward and it is important that this work is continued. However, even with that achieved, the second important element – the true state of the structure when nature floods it is currently overlooked. **Achieving a 100% representative flooding state is good but it is not enough. The question of the impact of that flooding on ingress (or leakage) will not be effectively answered as long as the structure is tested while outside its true operating situation.**

Add to that the structure's type, age, location, elevation and environment (such as local water table levels) and it is very difficult to predict how each structure is behaving when subjected to this load.

We believe the only truly representative SR flood test is one where the flooding is emulated around an asset that is under normal operating loading and full to its normal operating level.

Panton McLeod Ltd. Amanzi House Block 2 Tweedbank Ind. Est. Galashiels TD1 3RS
T 01896 663 330 F 01896 759 345 E info@pantonmcleod.co.uk W www.pantonmcleod.co.uk
VAT Reg. No. 634 973411 Company Reg. No. 151720

Does this mean flood testing a "live asset" and what are the implications of that?

- Yes, and we understand that water companies struggle with the idea of a "live" flood test, even though this is simply representing what is already happening to the asset. Regular heavy rainfall is a reality in most parts of the UK and ingress of that water when it happens is already going into a "live" asset. Our view is that it is better to find that out quickly rather than delay that by setting up a drained test with false loadings on the tank.
- **However - if a tank can be drained, then by default, it can also be isolated.** We therefore propose isolating the asset from supply and then flood testing it while it has the normal operating level of water still inside it. If it passes, it can then be put back into supply very quickly.
- Another major advantage of testing with water in place is the saving on time and other complications. After 20 years of confined space entry inspection and cleaning we are very aware of the complications associated with taking an asset out of supply and then draining it. Time, environmental challenges (eg. de-chlorination to waste), pressure on other parts of the system and other complications can all be reduced by removing the need to remove the water at the test stage.

We believe that there is a lot to be gained from this quicker and more realistic testing of assets. It provides faster reassurances when an asset passes and more chance for work to prioritised and planned better and more effectively on those assets that do not.

But how can this be done?

Panton McLeod now have years of experience of operating small robotic inspection vehicles within live drinking water assets. This includes experience already at carrying out "live" flood testing as described above.

What about below the water line testing?

- The vast majority of ingress identified is from the roof, hatches, wall head and ceiling joints, which are all generally above the operating water line and are all subject to movement under pressure.
- By nature of the pressure exerted by the stored water, water passing through wall and floor joints is more likely to be outwards – leakage rather than ingress. Methods exist where very small levels of fully approved die can easily be injected robotically onto suspicious wall and floor joints to visually test for a flow of water in either direction.
- If ingress is unusually happening below the water line, against the internal pressure, then that would perhaps suggest a "floating tank" situation on a high water table. Again an empty tank in that situation is going to behave very differently from a full tank when it comes to flood testing.

So is it time to look at the impact of pressures placed on a structure by water loads when testing the integrity of water storage structures?

To join the debate, get in touch at info@pantonmcleod.co.uk

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