CONDITION ASSESSMENT TECHNIQUES FOR WATER STORAGE TANKS

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ABSTRACT

The majority of water utilities have some form of water storage tanks, most often constructed from steel or concrete. These tanks are an integral part of the potable water distribution network but are often taken for granted from a maintenance and condition assessment point of view.

To ensure they can be adequately inspected and maintained, a condition assessment system must be implemented. The aim of any condition assessment system for water storage tanks is to collect adequate and appropriate data and images that can be compared with each other.

Many condition assessment projects have failed to provide their intended outcomes because the WHOLE process has not been properly thought out - it is no use collecting information if it cannot be processed successfully and stored. It is also a waste of valuable resources if no-one can easily access the information and read the end results.

This paper will outline the important issues in developing an assessment system and will concentrate on most of the external issues relating to steel and concrete tanks. This type of system should be implemented for all internal features as well.

1.0 KEY POINTS OF A CONDITION ASSESSMENT PROGRAM

1.1 Consistency of Data Collection

As previously noted, the aim of any good condition assessment system for water storage tanks is to collect adequate and appropriate data and images that can ultimately be compared with each other. Data fields must be uniform and the images standardised in respect to camera angle and perspective.

With changing personnel and consultants, it is important to collect the same information in the same consistent manner, so that TRUE comparisons can be made over the longer term – this is the only way to maintain consistency when making COF (consequence of failure) projections.

1.2 Data Recording Forms

It is important to design an inspection form that collects data sequentially from start to finish – that way, data entry into the selected storage system is more efficient, with the data entry person not having to chase around on the inspection form for the next piece of information.

Things will not be forgotten, or missed out if the process begins at the front gate (compound), continues around the wall and external ladder areas in a logical order and then finishes up on the roof area (bird proofing).

1.3 Staffing

To maintain consistency, it is better to have one main inspector instead of several persons trying to carry out the same job. This will pick up on repetitive defects - one person seeing something three times means something significant, whereas three people seeing something once, 'rings no bells'.

Don't limit data gathering to just one specific area of interest – make the field trips worthwhile and gather everything available (within reason) – the extra information will come in handy later on as new ideas and requirements evolve.

1.4 Standardise Assessment Terminology & Numbering

Devise a 'cheat sheet' of standardized comments, linked to a number i.e. '*2: There is no secure compound around the tank'* – this saves time when filling out the inspection form. These standardised comments can be reviewed at regular intervals and expanded as necessary to take into account changing or newly relevant information. Remember to leave some spare numbers next to the main areas of interest, so that an additional, relevant comment or two can be inserted into the same area, and not end up on the end of the list where it loses its impact.

1.5 Photos and Naming and Storing Images

Set the digital camera to a sensible resolution and pixel size – anything over 400kb is wasting storage capacity on both the camera and PC system where they will eventually reside. If the images are standardised and detailed, they can be assessed by others with more relevant experience or expertise, who did not take part in the field trip. A report which is restricted to words only can miss out on 'significant impact' if there are no accompanying images.

Renaming of images can be time consuming and often the wrong information is recorded at the expense of the critical stuff. Things like the inspectors name, date, time and job location can all be recorded as a four digit job number, allocated at the commencement of each inspection. A separate job number also allows images with similar file names to be stored within the one folder.

When renaming images, the job number is followed by a concise and standardised description of the image; i.e. '4028 Roof sheeting defect'. If descriptions are kept short and concise, images can then be viewed and read in 'thumb nail' mode, the quickest method of finding areas of interest.

If the main area of interest is presented first (roof), followed by the problem (sheeting defect), then people searching the image files can look alphabetically for all areas of interest i.e. entry hatch, ladder, platform, roof, ventilation etc. It is also practical to link secondary items to the main areas of interest – a tree hazard can be a wall tree hazard or a roof tree hazard – this immediately identifies where the problem is located; wall or roof.

1.6 Certainty of Required Outcomes

Whether an external consultant or in-house inspector is used for this operation, it is important that the client 'adopts' a comprehensive condition assessment system to suit future needs. This becomes the foundation for any 'scope of works' process used in

preparing a condition assessment project and assists in standardising the clients assets. If the client doesn't know what they want, how can the inspector supply the relevant information?

2.0 DETAILED CONDITION ASSESSMENT PROCESS

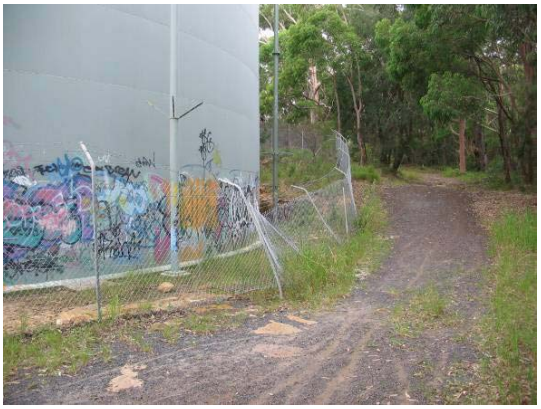
Following are lots of images, both good and bad, to illustrate a detailed condition assessment process from start to finish.

Each item inspected will have 'typical comments' included as a guideline, but these should not limit the everyday variations that may be encountered. And remember; many items inspected will 'overlap' with other features – try to define the main area of interest i.e. Entry hatch, platform, roof, ventilation or bird proofing.

2.1 Compound

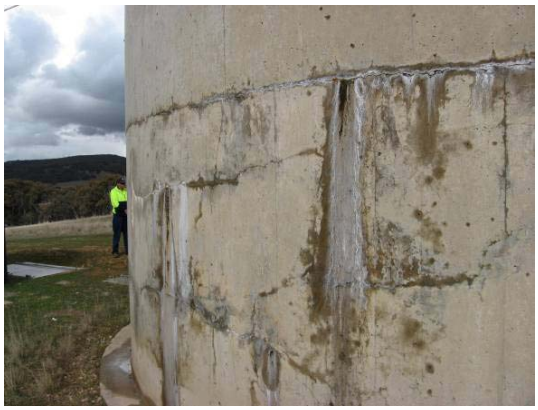
- The compound is not secure, and has no effective locking device.
- The fence has been damaged by a falling tree.
- There are holes in the netting where unauthorised personnel can enter the site.

2.2 Vandalism



- The security fence has been damaged.
- There has been unauthorised entry to the tank site.
- There is offensive graffiti on the wall areas.
- The ventilation mesh has been damaged.

2.3 Walls

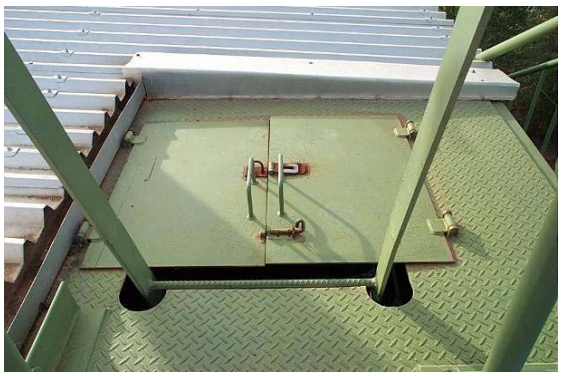


- There are leaks occurring due to cracking.
- There are leaks occurring due to poor construction.
- There is calcification present in the concrete.
- There is corrosion present around the sketch plate area.

2.4 Ladder

- The ladder is unsafe to climb, structurally or design wise.
- The ladder enclosure area is not secure.
- The ladder can be accessed by unauthorised personnel.

2.5 Entry Hatch



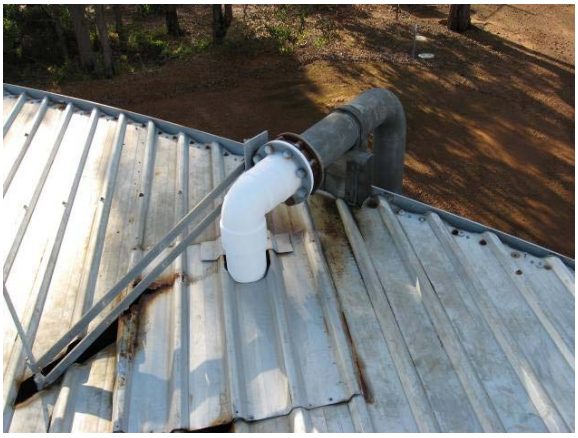
- The hatch cover is not sealed where the ladder styles extend through.
- The hatch cover has no front edge fitted.
- The hatch cover is not bird proof or secure against deliberate contamination being

placed into the tank.

2.6 Platforms

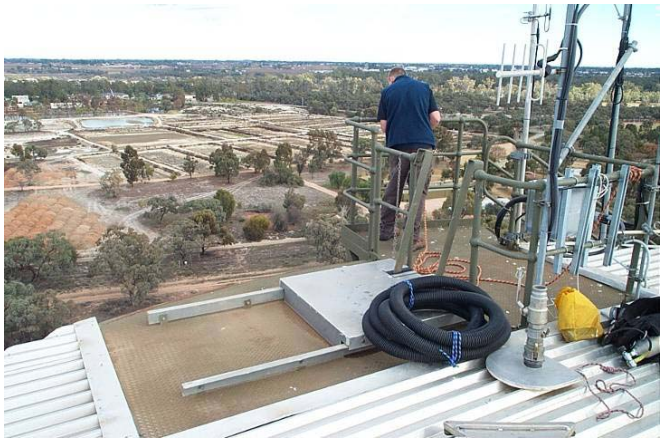
- The platform has no safe working area present.
- The platform area is not sealed against natural or deliberate contamination.
- The platform area has no support for a rescue system.

2.7 Roof



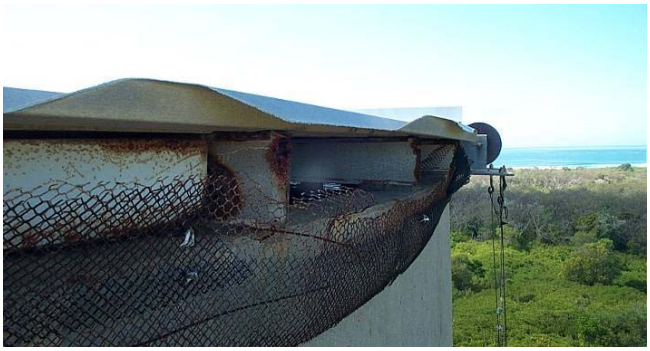
- The roof is unsealed where pipe work enters.
- The roof gutter is corroded through.
- The roof sheets are unprotected.
- Roof caps and flashings are missing.
- The roof sheet edges are not securely fixed.

2.8 Handrails



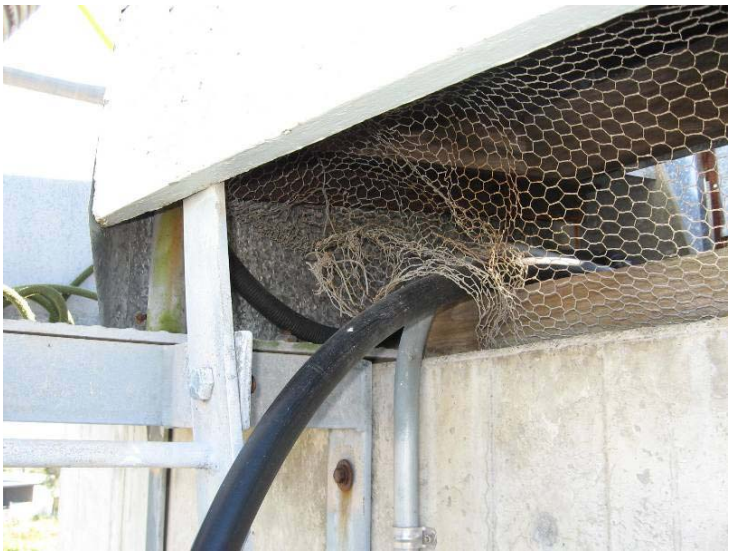
- There are insufficient hand rails present.
- The hand rails are loose and poorly fitted.
- The hand rails are corroded and not safe to use.

2.9 Ventilation



- The ventilation mesh is corroded.
- There are panels of ventilation mesh missing from under the roof area.
- The ventilation mesh has been damaged by vandals.
- The turbine roof vent has frozen and is not bird proof.
- The roof vent is not secured and may fall off the roof area.

2.10 Bird Proofing



- Birds can enter past the defective ventilation mesh.
- Birds can enter the tank from under the level indicator pulley.
- The entry hatch is not bird proof.
- There are holes in the roof where birds are entering the tank.

3.0 CONCLUSIONS

A lot of asset management systems in use today are based on depreciation schedules and untested information. A good condition assessment program should be the 'first link in the chain of responsibility' for quantifying maintenance of our water infrastructure assets.