ENGINEERING AN INNOVATIVE SOLUTION TO WATER TOWER LONGEVITY

More so than in AMP4, with the tightening of the purse strings and the reduced amount approved by OFWAT for expenditure by the Water Companies, we are told that the focus in AMP5 will be on repairs and refurbishment of the industry's assets. As an important part of this asset base, water towers play a vital role in the supply of clean, potable water at the correct pressure, to the wider public. Often water towers tend to be older structures, many with local historical significance. Here Mike Balletta, Infrastructure Manager of Concrete Repairs Limited (CRL) explains how water companies can go about protecting, maintaining and extending the working life of these important structures through the correct technical input and intervention from a specialist contractor.

Water towers are, and were, constructed of various building materials, but from the 1930s with the increased knowledge and progress made in concrete technology, it became common to use conventionally reinforced concrete. Now 80 years later, the very nature of these sites; their use, location and age, make them particularly specialist cases when it comes to repair and maintenance works, as will be seen from the following case study.

As with all water utility assets, water towers are required to be inspected on a regular basis. It is at this stage that the first signs of problems will be noticed. Usually these are not serious enough to shut the water tower down, but it is a message to the asset owner that it is time to start thinking about carrying out some remedial works. At this stage, depending on in-house resources and expertise, it is advisable to bring in either a 'testing' house, a specialist contractor, a material supplier, or all three, who deals with these issues on a regular basis to offer advice on the best way forward. Externally, initially a visual assessment will determine the extent of the repairs or remedial works to be undertaken. However, to further clarify the scope of works, additional hammer testing and additional exploratory surveys will help to formulate an approach to the refurbishment. Internally, due to the critical nature of water towers in the supply process, and the inability to take them out of commission for any length of time, it is more difficult to carry out detailed condition surveys. Where it is possible to carry out these condition surveys prior to works commencing, it is highly recommended, but more often than not, the surveys are carried out only once the towers have been take out of service for the

refurbishment works to commence. At this stage the remedial options can be re-evaluated and the final scope of works defined.

Where repairs are necessary it is vital to ensure that planning and scheduling of works does not compromise the distribution of a supply of safe, clean potable water to the local distribution network.

Timing is a particular issue for water companies considering undertaking work on their towers, along with the obvious impacts on budget and cashflow requirements, the weather plays an integral part in the planning. External repairs/refurbishment can take place at any time of the year, although due to the nature of the material used the winter months are not recommended. Usually the internal works are carried out during the winter months when the demand for potable water is less and there is a much lower risk of water shortages which Britain has experienced in recent years over the summer months. Tackling the internal works in the winter months means that towers can be taken out of commission for a sufficient length of time to enable the optimum type of repairs and refurbishment to be carried out, thus minimising costs and ensuring the correct materials are used to give maximum life. However, due to the location of the water towers, usually at the top of a hill in the middle of nowhere, the weather and climatic conditions during winter generally mean that access to the sites is made more difficult. To overcome these problems, it has become common to install temporary roadways. As with the external repairs, the materials used internally are weather/temperature dependent, but this can be overcome by heating up the bowl of the water tower to the correct temperatures.

This was the case at two water towers owned by Sutton & East Surrey Water. Constructed in the early 1930s from conventionally reinforced concrete, both towers stand on rural land, in fact one being located in a protected woodland setting. This meant that for CRL as the contractor, planning and time management was crucial in order to enable sufficient access to both sites to carry out the auditing, testing and implementation of the repair works that the contract required.

Environmental considerations played a key role in the planning stages. Because water towers tend to be located in rural areas there is a responsibility covering both the client

and contractor to ensure that work scheduling and presence at the sites does not have a negative impact on any indigenous species and even farm animals that could be present on the land surrounding the water tower.

Ultimately the towers for Sutton & East Surrey Water were tackled in four phases. The external works were carried out during the summer months and the internal repairs tackled in the wintertime. As very little maintenance had been carried out on the towers in previous years, the repair works were an important and necessary intervention in the life of the yowers in order to prolong their working life and maximise their operability.

The external works comprised all the exteriors surfaces of both towers, over the roof parapets, the waterproofing over the bowls and included the enclosed area under the bowls. CRL needed to identify and repair all spalled and cracked concrete, prepare all concrete surfaces and apply an elastomeric anti-carbonation coating.

The areas requiring an anti-carbonation coating at each tower were large, and CRL realised that this demanded an innovative approach to ensure application was time and cost effective. After extensive trials of different machines CRL applied over 2,000m^2 in three coats in just 10 days using a spray-application technique. Finally, as part of the external works a WRAS approved anti-slip waterproof membrane was applied ontop of the existing asphalt over the bowl.

For the interior refurbishment of both towers the existing asphalt was removed and repairs to the walls and floor carried out where necessary. All of the surfaces were then grit blasted, levelled using a fairing coat and then relined with a DWI approved polyurea lining system, suitable for potable water structures. Repairs to all spalled and cracked concrete and the application of a protective coating to the internal soffits and beams was also necessary. Finally, to enable easy access and egress to the towers, stainless steel internal access ladders were fitted to both towers.

Simon Thompson was the Project Engineer for Sutton & East Surrey Water on the contract and he is confident that the timely remedials has extended the working life of both towers significantly, “Now that the final phase of these works is completed we are confident that, thanks to the specialist advice we received from CRL, both water towers

will continue to operate safely and efficiently to provide clean, high quality potable water to the local community. The life of both towers has been extended by some 25 years as a result of this work."

When considering any kind of refurbishment with the aim of prolonging the life of a water tower structure, it is advisable to seek input at an early stage in the planning procedure from a specialist contractor knowledgeable in the type of works to be carried out. Key to any work of this kind is the industry's emphasis on hygiene and safety. As a minimum contractors staff also need to be trained to work in confined spaces and certified to work in 'clean' water environments. Therefore utilising a specialist contractor with experience in the water industry in the early stages of the design can help the client to approach water tower refurbishment with these aspects in mind, deploying the latest refurbishment practices consistent with best value solutions.

CRL has been providing UK water and sewerage companies throughout the UK with its expertise for the last 50 years. To find out more visit www.concrete-repairs.co.uk

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