

## **Sydney Harbour Tunnel – Technical Aspects of Asset Maintenance Strategies for Long Term Serviceability**

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### **ABSTRACT**

The Sydney Harbour Tunnel is one of the largest privately funded infrastructure projects ever built in Australia. Since the official opening of the tunnel in 1992, the primary objective of the asset maintenance strategy has been to ensure that a minimum 100 years of service life can be achieved. This paper examines techniques used in the maintenance program to ensure long-term serviceability.

The submerged section of tunnel under Sydney Harbour comprises eight 120 metre long prefabricated tunnel units and complex concrete transition sections, which were constructed in-situ. The tunnel structure is subject to the aggressive influences of the marine environment. The monitoring and maintenance of the in-situ transition sections is one of the key tasks necessary to ensure the long-term durability of the structure.

A comprehensive inspection program was put into place shortly after completion of construction with a focus on monitoring critical sections of the tunnel. Some state-of-the-art techniques have been employed including the GECOR-6 corrosion meter, impact-echo technique and the installation of reference electrodes for corrosion monitoring. An advanced analytical tool has also been developed for the interpretation of half-cell potential test results. This method has obvious advantages over the assessment criteria in ASTM C876. Another innovative technique, the injection of micro-fine cement grout into concrete cracks, is currently being trialed. The aim is to develop a remediation technique, which reinstates a high pH environment and suppresses corrosion in the concrete crack zone. Laboratory research is also being undertaken to study the behaviour of steel reinforcement near the external surface of the structure. Such behaviour is very difficult to monitor on site as this structure is submerged and buried.

The cooperative effort of an experienced consulting and maintenance team, together with the use of advanced techniques in an ongoing monitoring program, have played an important role in the development of the tunnel's asset maintenance strategy. This has avoided some significant risks and is ensuring the long-term efficiency and serviceability of the tunnel.