TECHNICAL NOTE

TECHNICAL INFORMATION FROM THE CONCRETE PIPE ASSOCIATION OF AUSTRALASIA

 April 2009 – No.1

# ENVIRONMENTAL CLASSIFICATION OF CONCRETE PIPE

Concrete pipes are usually buried underground. As such the service performance of a concrete pipeline is dependant on what may be found underground or within the pipe, rather than what may be in the air above ground. As such AS/NZS4058 - 2007 "Precast concrete pipes - pressure and non pressure" classifies the environments that concrete pipe can be found in to correspond with these expectations and refers to them as normal, marine and other environments.

A **normal environment** is defined as "an underground environment having negligible influence on the in-service life expectancy of pipe and having a minimum cover to reinforcement complying with AS/NZS4058". Machine made concrete pipe, with a wall thickness greater than 35mm, installed under these conditions is required to have a minimum cover of 10mm.

A **marine environment** is defined as "an underground environment for a pipe where the interior surface of the pipeline is also subject to tidal flow (i.e. not openly exposed to direct wave action or wind driven salt-borne spray)". For concrete pipe expected to be installed in these areas, the minimum cover required in the barrel and socket is 20mm for machine made pipe. AS/NZS4058 also states that where pipes are loaded to less than 50% of the proof load in a marine environment, barrel cover may be reduced to 15mm for machine made pipe.
For both normal and marine environments, the minimum cover specifications apply to pipes with water absorption no greater than 6% when tested in accordance with Appendix F of AS/NZS4058.

**Other environment** is broadly defined in AS/NZS4058. The Standard says that it is "an environment that does not comply with the definitions for either normal or marine environments". To assist with clarification, Appendix E of the Standard provides a guideline for the concentration of typical environmental constituents that concrete pipe may be exposed to, both in soil and in water. Table E1 in Appendix E outlines the concentration limits for chloride, sulfate, acidity and $CO_2$ that are acceptable for concrete pipe to maintain a minimum 10mm cover, and still achieve a 100 year service life. **Other environment** can be defined as any condition where the limits in Appendix E are exceeded, such as above ground salt water exposure with excessive wetting and drying. In these instances, the concrete pipe will require other parameters above the minimum 10mm cover to achieve the expected durability.

When exposed to aggressive condition in **other environments,** the concrete pipe can be designed to include further improvements to provide the expected durability and service life. In order of less critical requirements to the more severe situation, these can include:

- Maintaining a 10mm minimum cover and using a more durable cement in the concrete mix.
- Additional cover to the steel reinforcement (typically in the range of 20 to 35mm) maintaining the use of GP cement.
- Additional cover to the steel reinforcement with a more durable cement in the concrete mix.
- The application of internal coatings or liners for the pipe.

In all instances of **other environments,** consultation with experienced engineers from CPAA manufacturers will assist with specifying the most appropriate concrete pipe for the expected conditions. This will ensure that your concrete pipeline systems is efficient as well as remaining durable throughout it's expected lifetime.

Concrete Pipe Association of Australasia

admin@cpaa.asn.au www.cpaa.asn.au