New Australian Standard for Reinforced Concrete Box Culverts

The Australian Standard for small reinforced concrete box culverts has been revised for the first time since 1974. AS1597.1-2010 "Precast reinforced concrete box culverts – small" is soon to be released to the industry following a detailed development process. The document has been completed under the new Australian Standards committee – a driven pathway providing a far more efficient process by which to review and finalise the standard. In addition to this the Concrete Pipe Association of Australasia worked with Standards Australia providing time, resources and personnel to assist with the process, and ultimately, the release of an up-to-date specification to benefit the construction industry in Australia.

The new Standard includes many additions not previously found in the 1974 version, along with a number of changes to the old code. The most significant changes that have been included in the new Standard are:

- Materials used for small box culvert manufacture are now referenced to the current material Standards.
- Performance test loads have increased and are based on AS3600 and AS5100 requirements.
- Nominated internal dimensions for culvert units to increase manufacturing efficiency.
- A sampling scheme for routine testing which now includes alternative acceptance criteria based on numbers produced.
- The four culvert types currently manufactured in Australia, including link slabs, are now covered by the Standard.
- Durability requirements have been updated to align with AS5100 and to reflect current design requirements. This includes:
  - Specification of durable concrete materials (e.g. aggregate durability, restriction on chemical content, use of blended cement)
  - Exposure classifications, concrete strength and cover to reinforcement
  - Minimum curing requirements for various methods (e.g. time, maturity, concrete strength)
- An installation section which details the requirements for excavation geometry, foundation preparation, placement of precast units, compaction, backfilling, and construction loads.

With the introduction of a new Standard a reasonable period of time is required to phase out previous manufacture and specification methods. CPAA members will be working diligently to update quality processes and manufacturing requirements to comply with the new version of AS1597.1. It is expected that specifiers and contractors throughout Australia will also amend current practice to comply with the latest requirements outlined in the Standard.

Standards Australia are now reviewing the large box culvert standard AS1597.2-1997 and expect to see the revised version of this document available in the early stages of 2011.

The latest version of AS1597.1-2010 "Precast reinforced concrete box culverts – small" is expected to be available through SAI Global www.saiglobal.com by the middle of August 2010.

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Version 2.0 of PIPECLASS will be available for download by CPAA members in early August. (see page 4)
How to Specify Concrete Pipe for 100 Years

The reinforced concrete pipe industry is guided by two standards on this basis for manufacture, durability, design and installation:

**AS/NZS 4058 “Precast concrete pipes – pressure and non-pressure”** outlines the minimum requirements for materials and manufacture of precast reinforced concrete pipes. It classifies pipes on the basis of size, strength and application, and sets minimum requirements for sampling and testing. The Standard is the benchmark for concrete pipe manufacturers. This document is also essential for designers and specifiers to ensure that the correct product is selected for each application.

**AS/NZS 3725 “Design for installation of buried concrete pipes”** sets out the methods and data required for specifically calculating working loads on buried concrete pipe, and is endorsed by Austroads. The working load then relates to the correct selection of reinforced concrete pipe, and the specifying details of the installation. The Standard nominates design and installation criteria to ensure a serviceable asset.

Don’t risk designing any other way. To ensure confidence and long term performance, reinforced concrete pipeline should always be specified in accordance to AS/NZS4058 and AS/NZS3725.
The Alkimos Wastewater Treatment Scheme

Client: Alkimos Water Alliance
Consultant: Connell Wagner
Contractor: McMahon Contractors

Alkimos is found 40 km north of Perth in Western Australia and is infamous for the Greek merchant ship that was wrecked off the coast in 1963. It is also expected to experience rapid population growth over the next 20 years that requires the construction of considerable infrastructure including a wastewater treatment plant that includes a main gravity sewer, a treatment plant, and an ocean outfall.

The Alkimos Project required a significant number of pipes for the gravity main sewer that were expected to meet extremely high durability benchmarks. Concrete pipe was considered the most suitable material available to achieve these high durability requirements.

This gravity main sewer, constructed at a grade of 1:1800 and expecting volumes of 20 megalitres per day initially, included 3.8 km of 2000 mm diameter concrete jacking pipe and 1.4 km of 1950 mm diameter concrete pipe to be placed in open trench. The open trench pipe in particular presented a number of challenges to the Alkimos Water Alliance and the CPAA members company who supplied the reinforced concrete pipes.

Sewage waste water can be particularly harmful to concrete due to hydrogen sulphide gas (H₂S) and other aggressive contaminants that may evolve. Initially the durability specification for the concrete pipe was based on typical concrete technology. This contradicted the requirements of the performance based standard specific to concrete pipe, AS/NZS4058 “Precast concrete pipe”. By using the standard appropriately the high durability requirements were met in accordance with AS/NZS4058 and to the client’s satisfaction.

To achieve this the manufacturer was instructed to make Class 4, 1950 mm diameter pipes with extra concrete cover to the steel reinforcement along with an internal HDPE lining. A number of Class 6, 1200 mm diameter pipes were also required with the internal HDPE lining.

To ensure that the pipes met the strict benchmarks put in place, a number of tests, conducted at the precast yard, were specified – all in accordance with AS/NZS4058. These included cover checks due to the increased depths specified, increased water absorption tests, ultimate tests on site and at the factory, one in ten pipes hydro tested to 90 kPa, and joint tests.

A further challenge was the transportation of these large concrete pipes from Perth to the north of the city. Purpose made steel bolsters, involving the transport contractors, Brookes Transport, meant that the pipes were delivered to the remote location safely and efficiently.
Standards set the benchmark

Standards Australia (SA) and Standards New Zealand (SNZ) were both born on the back of the need for consistent and appropriate standards in the construction and building industry in each country. In those formative years of standards development the concrete pipe industry was an innovator when it came to the adoption of benchmarks for the design, manufacture and installation of concrete pipe, box culvert, and associated materials. In 2010, nothing has changed.

As active participants on the Standards committees for pipe (of all materials) and box culverts the CPAA and its members are proud of the contribution the Association has made to the construction industry. Now, following recent changes to the structure of SA and the processes required to revise or introduce standards, the CPAA intends to further this contribution by providing more experienced personnel and resources to the development of these documents.

The CPAA has always been, and will continue to be, committed to the use of Australian and New Zealand Standards to produce quality concrete pipe. Designers of concrete pipeline systems can be confident, knowing that by using the appropriate standard to design and install pipe, that the high quality that industry demands, will be achieved!

Courses in designing concrete pipeline systems

Drainage infrastructure is important. If it goes wrong, it can be costly and damaging to the community. Concrete pipe drainage systems require an in depth knowledge of the appropriate standards to ensure the most efficient design, and subsequently, the right class of pipe, is used. Cement Concrete Services (CCS) offer Australia’s ONLY full day design course on concrete pipeline systems, focusing on how best to use AS/NZS4058 and AS/NZS3725, and what design criteria is needed to accomplish your objectives.

Dates and venues for the 2010 courses are found below. Don’t miss out as these are the only concrete pipeline design courses to be held in 2010.

Contact Joanne at info@cementandconcrete.com to register in 2010. Contact Joanne at info@cementandconcrete.com to register your interest or to book a place on the course!

Brisbane
August 19, Mercure Hotel, Brisbane

Sydney
August 26, Stamford Hotel, North Ryde

Perth
September 13, Comfort Inn Wentworth Plaza

Melbourne
September 30, Hotel Grand Chancellor

Time for a Change

Regular readers of Pipeline will notice that the format has changed quite significantly from the former look. Well, the changes don’t end here. On 1st August 2010 the CPAA will launch its new website, showing off a cleaner, crisper look. The new site will make it easier for users to find and download the technical information you need on all things concrete pipe.

Furthermore, during August PipeClass v2.0 will be released. The upcoming version of the free concrete pipe design software is still in complete accordance with AS/NZS3725 and AS/NZS4058 and with all the previous features. However, there have been some significant additions. These include flexible pavement design options, better clarity on the effect of construction loads, improved installation specifications, engineered drawings and more detailed reports at the completion of designs.

But wait, there’s more! The CPAA will be making further changes and amendments to current documents, as well as introducing new publications, to provide industry with the most up-to-date and relevant information on concrete pipe, box culverts and associated products. Stay tuned!