Concrete Pipe Association of Australasia

# Pipeline

JUNE 2006

News and Information from the Concrete Pipe Association of Australasia

## Concrete Pipes
### The Durable Long Life Asset!

Pipelines are vital to the health and functioning of our communities. A pipeline that is out of service, even for a short period of time, can cause extreme inconveniences and result in expensive consequences. As a result, the design, selection, manufacture and installation of reinforced concrete pipe is vital to ensure that the system performs in accordance to its importance.

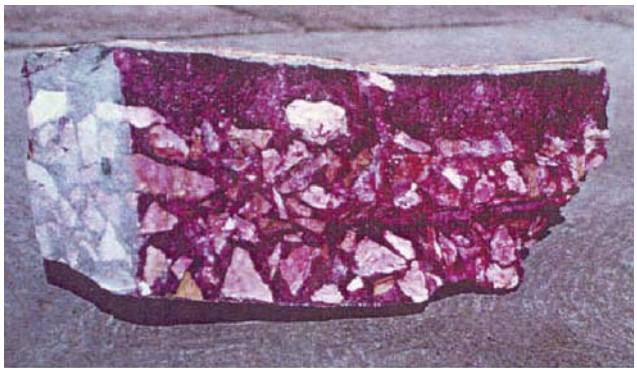
Along with structural and hydraulic capacity, durability of reinforced concrete pipe is an important aspect to consider during the design stage. The principal stakeholders in the drainage infrastructure industry – designers, developers, consultants, manufacturers & installers, together with asset owners & managers, are all responsible for ensuring that reinforced concrete pipe durability is carefully considered with any project.

However, in Australia and New Zealand, the product itself is characterised by quality controlled manufacturers such as CPAA members, who are capable of making a product that has low water/cement content with excellent compaction despite the low workability of the mix. The methods range from centrifugal roller compaction and heavy vibratory methods using dry mixes, to centrifugal spinning with slightly wetter mixes in which the water/cement ratio of concrete is reduced. The water/cement ratio of pipe concrete is usually below 0.4. The combination of high compaction levels and the low water/cement ratio means compressive strengths greater than 60 MPa can be achieved. Thus the pipe is produced using a concrete mix that is highly impermeable to water and exhibits a level of durability unmatched by concrete elements produced in the casting process.

The durability aspects of a reinforced concrete pipe has a dramatic affect on how pipe specifiers and owners look at the design life criteria of reinforced concrete pipeline. In over 90 years of production in Australia and New Zealand there is no known catastrophic failure of a concrete pipe due to a break down in durability. This emphasises the industries support of **100 + year design life** for reinforced concrete pipe designed to Standards and highlights the excellent durability of the product.

The CPAA has a large technical library that provides information to the industry on concrete pipe durability. Contact the CPAA to access this information, or visit their web site at www.concpipe.asn.au

*Reinforced concrete pipe - the 100 year + asset*



*Progress of carbonation in 65 year old spun concrete pipe, exposed to weather. The pink phenolphthalein displays where there is NO presence of carbonation.*

*A reinforced concrete pipe retrieved after 50 years service in the Brisbane River - as sound as a new pipe*

# Advances in Pipeline Inspection

Pipeline inspections with CCTV have undergone significant changes in recent years. Once known for checking what was in a pipe, changes to CCTV technology have had a significant impact on deflection, ovality, and alignment testing. Where deflection or loss of profile is evident, **laser profiling** can now be used to capture an image before software is used to measure the change in shape occurring at the point of the projected laser ring. However, current testing specification details in AS2566.2 "Installation of flexible pipe" are yet to be updated to reflect this.

A laser ring can show areas of significant distortion, particularly in flexible pipe, including crown flattening and vertical and horizontal deflection that may or may not be observed or captured by video inspection alone. The technology can also pick up vertical and horizontal joint offsets and cracking.

An example of how important laser profiling can be to an asset management plan is the following case study. Recently, detailed video inspections were performed on randomly selected flexible pipelines at various sites in Adelaide, South Australia. The inspections were conducted in three phases.

1. A detailed video inspection of the pipeline was conducted using a CCTV inspection camera with high intensity lighting.

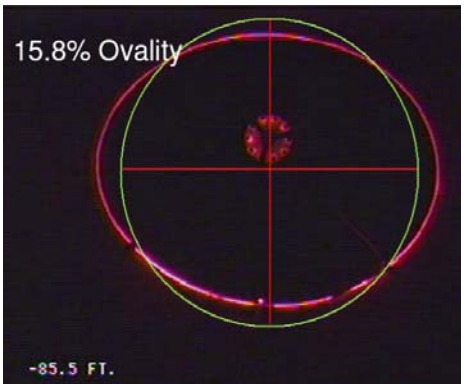
2. A laser profiling attachment was added to the camera. The laser ring significantly shows areas of pipe distortion such as cracking, crown flattening, vertical and horizontal deflection that may not be observed or captured by video inspection alone.

3. A detailed evaluation of the laser profiling data using the software was produced.

One test involved a 900 mm diameter HDPE flexible pipe drainage system installed underneath a main suburban road. The pipeline was constructed in early 2005. The camera progressed for 148 metres through the pipeline before the test was abandoned.

It was found that the pipeline had deflected at 5% or greater of the original diameter at an average of every 9 metres – and less than 12 months after it was installed! How will this pipeline perform structurally and hydraulically in the long term? That is something for the consultants to determine, but using CCTV laser profiling has at least alerted the asset owners to the problem well before a catastrophe occurs!

*Deflected flexible pipe profile*




*Example of the laser profile showing the deflection (red) and the original (green)*

The **American Concrete Pipe Association** reports that the trend towards improved deflection testing specifications has begun in the USA. As a result, a number of governing authorities have altered their specification for testing, specifying a maximum deflection limit of 5%. These include:

- **Florida Department of Transportation (DOT)** asks to provide the engineer a video DVD and report using video equipment with laser profile technology for inspecting pipe. Pipe that indicates deflection that appears to be in excess of that allowed by Specification, the Engineer may require further testing of the pipe. Remove, replace and retest pipe failing to meet the specific deflection requirements for the type of pipe installed, at no cost to the Department.
- **Kentucky DOT** reduces contractor payment for pipe by up to 50% where incorrect installation causes the pipe to deflect beyond 5% deflection limit.
- **North Carolina DOT** requires inspection after approximately 600 mm of backfill is in place, at 30 to 45 days, and at 11 months after completion of the project. Maximum deflection must not exceed 5% of the nominal diameter. Failure to pass the deflection test will result in the pipe being removed and replaced with new pipe at no expense to the owner within 30 days.
- **Illinois DOT** requires testing after 30 days and that any pipe over 5% deflection (not meeting the specification requirements), be replaced.

# A unique stormwater project in the scenic south

It is easy to summon staff enthusiasm to work in a pristine corner of the world. One CPAA member company found this out recently when they supplied pipeline and precast products and expertise for a project in the picture postcard region of the Queenstown Lakes area in New Zealand's South Island.

The location was the picturesque township of Wanaka, one of the high-growth towns in the area and a destination popular amongst both urbanites relocating away from the city and international investors and immigrants.

With residential and commercial development at an all time high in Wanaka, the emphasis is on enhancing the town's infrastructure and, just as importantly, protecting the clear, clean waters of nearby Lake Wanaka.

The Queenstown Lakes District Council's latest step was the construction of a new stormwater outfall that skirts around the base of the adjacent mountains and through the Wanaka township.

This project was unique because, due to the contours of the landscape, the natural drain for stormwater run-off is the lake. However the pipeline design needed to redirect the water flow away from the lake and township into the Cardrona River, some 2.5kms away from the town boundary.

Another factor was the extreme climatic conditions found in this part of New Zealand – dry and warm with no rain through to high intense rainfall, with huge volumes of water falling in a short period of time.

The project timeframe was tight: just 26 weeks from start to completion. With this in mind, all partners to the project – Opus Design Christchurch, Fulton Hogan Central, Queenstown Lakes and the manufacturer - worked together to ensure maximum efficiency and effectiveness in planning, product design and pipe supply.

The stormwater pipeline design featured some very deep excavation, with trenches up to 7 metres deep required in some places to cut through the terminal moraine of the ancient glacier that carved out Lake Wanaka. In response, head contractor to the project, Fulton Hogan Limited, put in a team of well-qualified pipeline construction crews to handle the complexities the terrain provided.

The pipeline was 2.5km in length and products used in the project included - DN1200, DN 750, and DN 350 Class Z (Class 4) concrete spun pipes, as well as DN 2050 concrete reinforced manholes. The large 2050 spun concrete manholes were used as redirection points for the stormwater flow.

So with plenty of public/private cooperation and consultation –and a little bit of foresight– the project ran smoothly through to completion on time. The result? A top quality outcome that will help maintain Wanaka as another must-see destination in New Zealand's scenic south.

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# News and Information from the CPAA

## "How long do stormwater pipelines really last?"

*Rod Kennedy from Logan City Council presenting his paper on "How Long Do Stormwater Pipelines Really Last" in Sydney*

Asset life is a critical issue now faced by all infrastructure owners and designers. How long will stormwater pipelines last? How do the installation methods used to lay pipe affect the life of the asset?

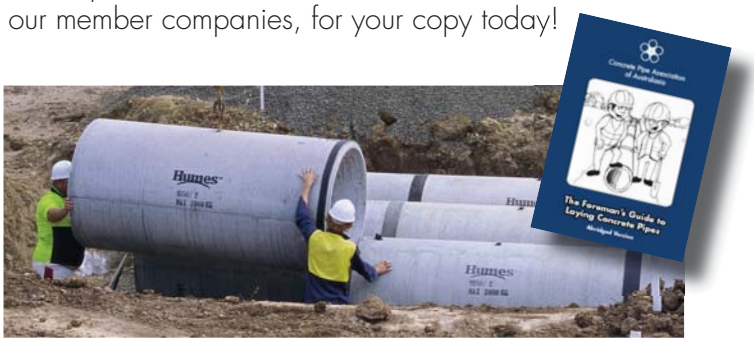
The CPAA have recently run a series of seminars covering the issues that project designers, asset managers, and asset owners must address when nominating pipelines for the infrastructure. The papers presented at the seminars are from independent companies across the industry, covering a number of aspects with respect to design, installation, and asset management, to ensure that your asset choice is correct.

The seminars have been extremely well received by over 250 specifiers, manufacturers, local and state government authorities, and asset managers in Sydney, Brisbane, Melbourne and Adelaide. The seminars will also be conducted in Perth, Auckland, Wellington and Christchurch during 2006.

If you missed out on a seminar in your state, please visit the CPAA web site to download a copy of the papers presented, at www.concpipe.asn.au

## Installation Guideline

As part of the Associations commitment to work practice in the industry, the Foreman's Guide to Pipe Installation was recently released. This document is a pocket-sized guideline for all industry related people, in particular work site supervisors, for maintaining proper installation techniques and on-site behavior. Ask the CPAA, or one of our member companies, for your copy today!




## CPAA = Quality

In today's construction industry, quality control is demanded by all stakeholders. The CPAA is an advocate for a quality controlled and quality assured industry and ensures that its members are certified in accordance with the appropriate quality standards.

As an Association, the CPAA and its members are committed to Australian and New Zealand Standards, and this is emphasised by the quality of the product supplied, as well as the technical knowledge offered, to the industry.


*CPAA Executive Director, David Millar, and the CPAA members!*

## CPAA Member Companies

Australia

Humes™

Rocla Pipeline Products

APP "Solutions Set In Concrete"

New Zealand

HYNDS PIPE SYSTEMS LIMITED

HUMES

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