Actions Since Subdivision Audits

- Joint Research Project between BCC / Pipe Manufacturing Industry (CPAA) completed September 1998
- BCC / Pipe Manufacturing Industry Working Group formed to
  - Investigate appropriate design aids
  - Facilitate changes to Australian Standard
  - Formulate "Accept/Reject" criteria for pipes

Attended Standards Committee November 1998 to Lobby for:
- greater awareness of Construction Loads
- simplification of Backfill Conditions
- BCC Representative appointed to Standards Committee WS/6 for AS3725
- Presentations in Australia and New Zealand

Comparison Loading Charts
Reinforced Concrete Pipe W7 vs Smooth Drum Vibrating Roller

<table>
<thead>
<tr>
<th>Load Type</th>
<th>Smooth Drum Vibrating Roller</th>
<th>For Steel Reinforced Concrete Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel Load</td>
<td>16 kN</td>
<td>Load Type</td>
</tr>
<tr>
<td>Bearing Width</td>
<td>2.4 m</td>
<td>Wheel Load</td>
</tr>
<tr>
<td>Load Factor</td>
<td>2.4</td>
<td>Bearing Width</td>
</tr>
<tr>
<td>Load Factor</td>
<td>2</td>
<td>Load Factor</td>
</tr>
</tbody>
</table>

Comparison Loading Charts
Reinforced Concrete Pipe W7 vs Excavator Compaction Wheel

<table>
<thead>
<tr>
<th>Load Type</th>
<th>Excavator Compaction Wheel</th>
<th>For Steel Reinforced Concrete Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel Load</td>
<td>20 kN</td>
<td>Load Type</td>
</tr>
<tr>
<td>Axle Width</td>
<td>2 m</td>
<td>Wheel Load</td>
</tr>
<tr>
<td>Load Impact Factor</td>
<td>1.5 (assumed)</td>
<td>Axle Width</td>
</tr>
<tr>
<td>Load Factor</td>
<td>2.4</td>
<td>Load Impact Factor</td>
</tr>
<tr>
<td>Load Factor</td>
<td>2</td>
<td>Load Factor</td>
</tr>
</tbody>
</table>

Changes made to Facilitate Asset Management
- Class 2,3,4,6,8,10 RCP
- Class 1,2,3,4 FRC
- Delivery at Specified Age
- Load Test Results
- Pipes Marked Appropriately
- No Crack Policy
- Design Aids

Supply Contract for Reinforced Concrete Stormwater Pipes
- $20 million of donated asset
- $21 million BCC constructed
- Contract to Supply of pipes for 2 years
- Awarded in March 1999
The Cracking of Stormwater Pipes & the Significance of Construction Loads

Examples of Computer Based Design Aids

10 Copies from each Supplier

Conclusions

- The Problem:
  - There is a proven link between the premature cracking of small diameter concrete stormwater pipes and construction loading.

- This link is being recognised in the revision of AS3725 Loads on Buried Concrete Pipes.
  - Construction loads will be addressed both in the body of the code and in the proposed commentary.
  - The commentary will be published within the main body of the standard and not as a separate document.

Conclusions

- The significance of this cracking will be debated continually.
  - How long do you expect storm water pipes to last?
  - How will cracked pipes be affected by acid sulphate soils?
  - Are you prepared to risk these cracks?
  - Brisbane City Council is not.

- If pipes survive construction without cracking then they must have a higher probability of lasting their normal service life (80-100 years).

Conclusions

- The design and selection of pipe class must consider the construction loadings.
  - For small diameter pipes (≤ 900 mm) these loads may be the critical load case.

- Greater communication is required between Designer and Constructor.
  - To identify construction method.
  - To convey design assumptions.

- Video inspection essential to confidently certify as constructed condition.

Conclusions

- It’s Not My Job!

Brisbane City Council’s Backfill Method
The Cracking of Stormwater Pipes & the Significance of Construction Loads

Examples of Design Aids - CPAA Design Charts

Examples of Design Aids - CPAA Design Charts (Cont.)

Examples of Design Aids - CPAA Design Charts (Cont.)

Examples of Design Aids - CPAA Typical Long. Section

The Cracking of Stormwater Pipes and the Significance of Construction Loads

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