



## BRIDGE TECHNICAL DIRECTION BTD2007/09

### ***SOIL-ARCH STRUCTURES***

#### **Background**

Structural failure occurred in the bridge-sized concrete soil-arch structure over Allens Creek Tributary on Picton Road near Wilton. The backfill material was shale with a plastic index (PI) higher than provided for by the specification, and may have deteriorated with time and exposure to moisture.

The cost of rectification, because the structure is large and under deep fill, was of the order of several hundred thousand dollars. The possibility of collapse of such structures has implications for public safety.

The soil-arch structure was supplied as a proprietary design, without independent verification, which has been a common method of procurement from the first steel soil-arch structures dating from the 1950's.

Because the design and drawings produced for soil-arch precast components were considered to be the intellectual property of the manufacturer, no drawings and/or design calculations for these items were normally made available to RTA.

#### **Information**

Until now RTA has purchased the design and supply of soil-arch structures as a proprietary item. Because the tools for analysing such systems were not readily available and drawings were not supplied, RTA relied on the supplier's design methods, quality system and processes to assure the reliability of such structures.

The failure at Wilton highlighted the need for independent proof checking of proprietary bridge sized soil-arch structures, including the approval of non-conforming fill materials.

RTA policy is that the drawings for all bridges and bridge size structures must contain details of all structural components including those that are produced as proprietary items. This information is essential for the ongoing management and maintenance of RTA's bridges and structures.

#### **Bridge Technical Direction**

The following is required:

- I. The supplier shall provide evidence of independent proof checking of the design of soil-arch structures for RTA and those that will become property of RTA:
  - a) For all construction contracts that include soil-arch structures;
  - b) For all supply contracts for soil-arch structures prior to manufacture of structural components.

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2. Any proposal submitted for approval to use non-conforming fill shall be submitted to the proof checker as well as the designer for acceptance.
3. A full set of detailed drawings for the proprietary soil-arch structure components shall be provided for each RTA soil-arch structure, including those that will become the property of RTA. In recognition of the commercial sensitivity of such drawings, whilst the drawings must be included in the Schedule of Drawings on the cover sheet, the soil-arch component drawings may be supplied separately from the set of contract drawings and will be stored separately and treated as commercial-in-confidence by RTA.

This bridge technical direction supersedes BPC2002/04.

**Reference:** BPC2002/04

**Effective date:** 17/12/2007

**Approved:** Wije Ariyaratne  
Principal Bridge Engineer

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