

**To** Operations Managers  
Capital Projects Managers

**Cc** Traffic and Safety Manager

**Prepared by** Nigel Lloyd, Bridges & Structures Engineer

**Endorsed by** Dave Bates, National Operations Manager

**Date** 28 October 2008

**Subject** Traversable and Mountable Grates for Precast Concrete Headwalls

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## Highways and Network Operations Technical Memorandum No. TM 4006

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### Purpose

This memo provides details of grates that are acceptable in principle for use with precast concrete headwalls on State Highways to protect the headwalls and vehicle occupants from the effects of vehicle impact.

### Background

There has been a wide range of solutions available for treating the ends of culverts adjacent to State Highways. Whilst some of these have been presented as robust there has been little evidence of any testing to prove the adequacy of the designs under vehicle impact.

A review of provisions for protecting headwall structures against vehicle impact was instigated by Transit New Zealand after discussions with Humes Pipelines Systems. Humes were planning to bring a precast headwall to the market for pipe sizes between 225mm and 450mm and wanted to ensure that their product met Transit's requirements.

Transit commissioned Northern Civil Consulting Engineers Ltd (NCCE) of Whangarei to investigate what products were available in NZ; to see what details are available overseas, primarily in the US but also Austroads; and to produce suitable standard solutions including the derivation of suitable loading requirements. Opus International Consultants Ltd of Napier was commissioned to peer review the work undertaken by NCCE.

A headwall and grate were tested by Humes under the loading derived in a manner acceptable to Transit, NCCE and Opus. The test showed that the headwall and grate design and hence the product offered by Humes met the loading criteria and hence was deemed acceptable. Subsequently a headwall and grate produced by Hynds Pipe Systems Ltd to the same specifications as the tested system has been viewed and deemed acceptable.

### Implementation

For each use of a culvert headwall a site specific risk assessment shall be undertaken to determine if the headwall requires protection from vehicular impact, taking account of the requirements of the State Highway Geometric Design Manual. For precast headwalls with side walls up to 600mm apart (generally for culverts to 450mm diameter) where protection is deemed necessary grates in accordance with the attached drawings shall be used. Note that the dimensions on the drawings are generic and care should be exercised in sourcing

appropriate grates, particularly for any retrofitting of existing headwalls. Also note that the fixings are an integral part of the grate and should not be substituted by an alternative product and that the thickness of the side walls to the headwalls shall not be less than 150mm.

A distinction is made between cross drainage structures (requiring traversable grates) and parallel (to the road) drainage structures (requiring mountable grates).

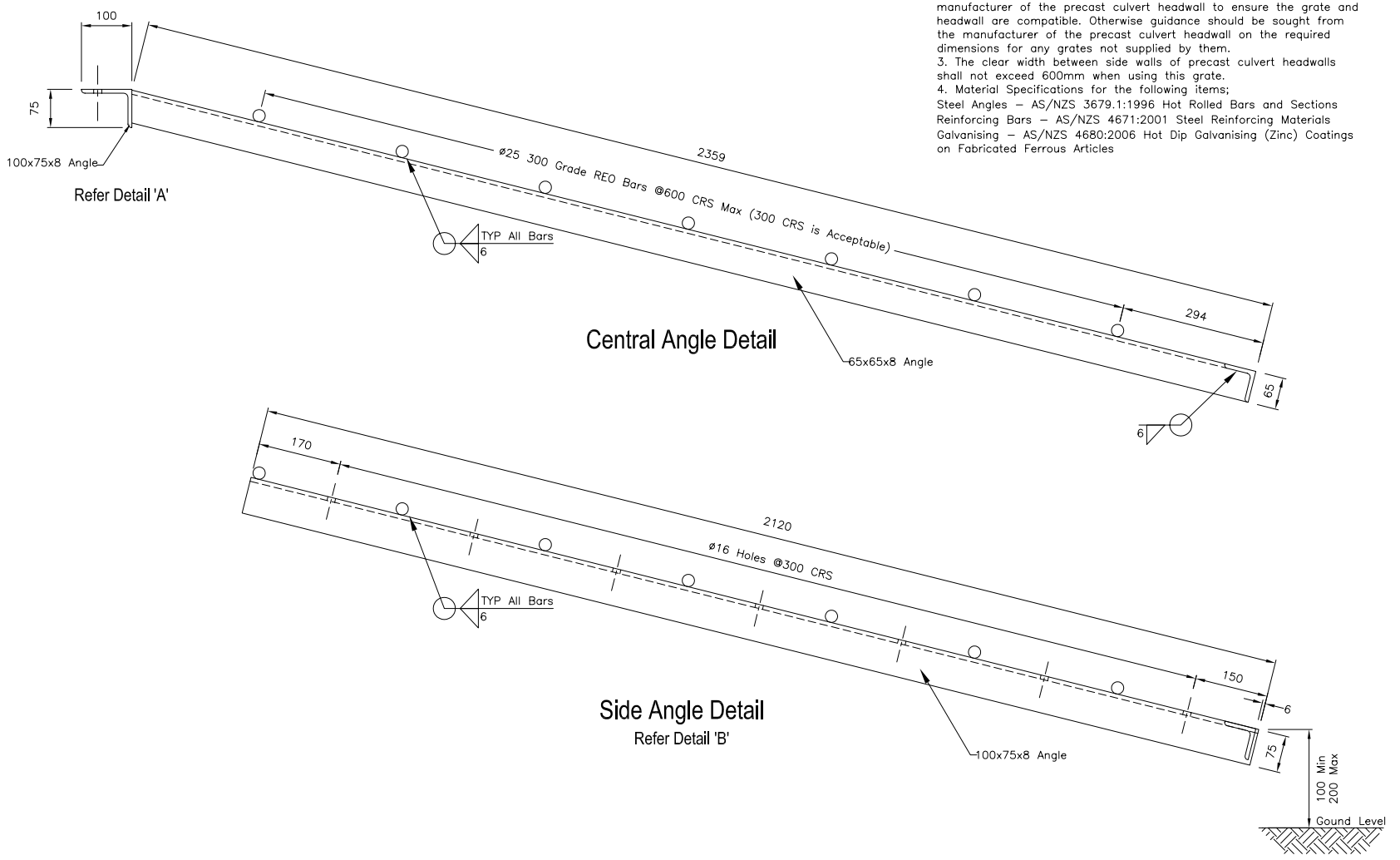
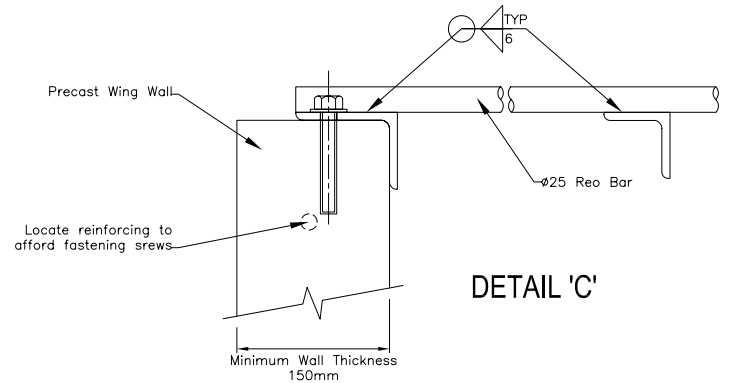
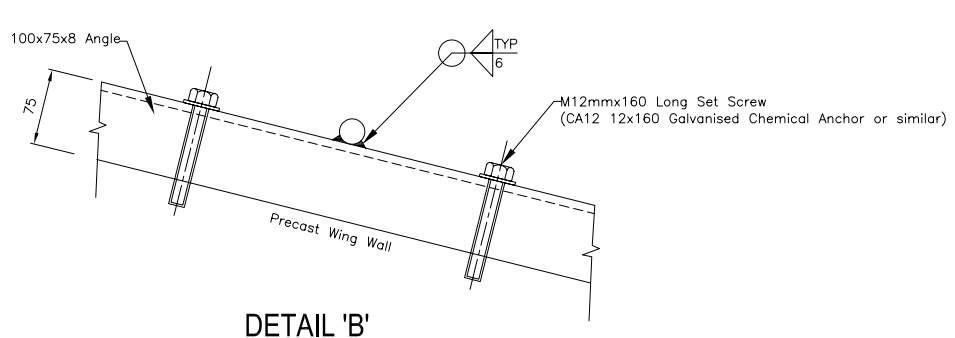
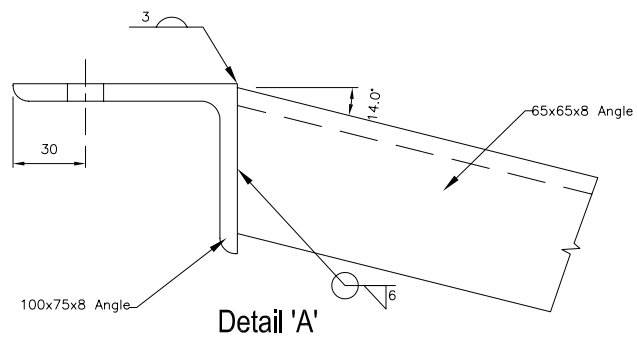
The use of headwalls with epoxied bars spanning between the side walls will no longer be accepted where protection from vehicular impact is required.

### **For Your Action**

Please disseminate this Technical Memorandum to appropriate staff and apply the advice given above to current and new State Highway contracts.

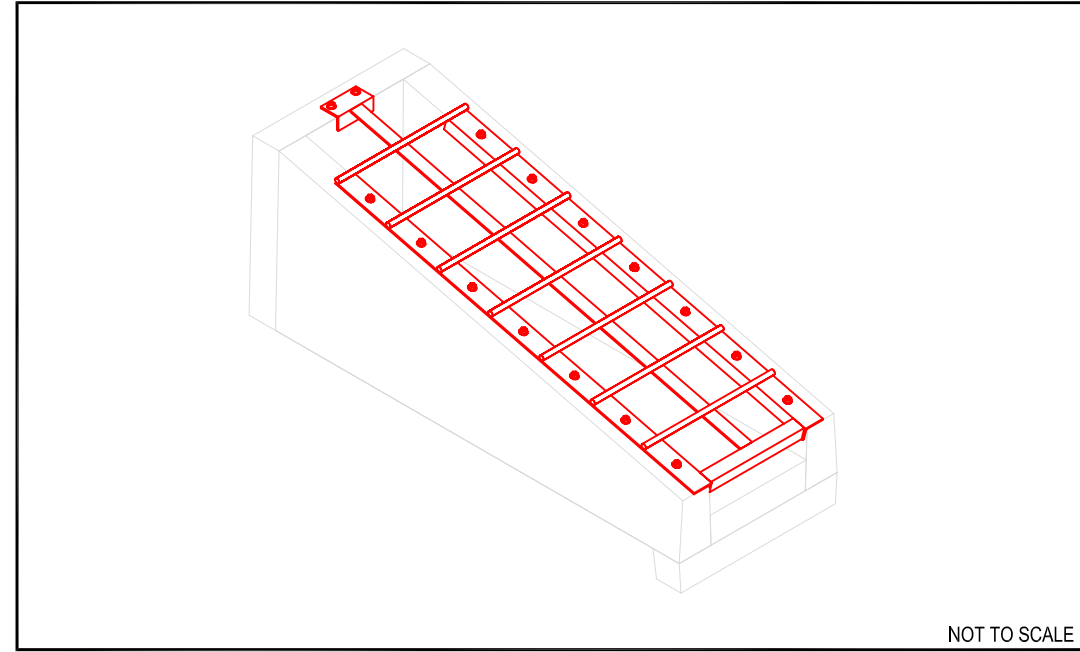
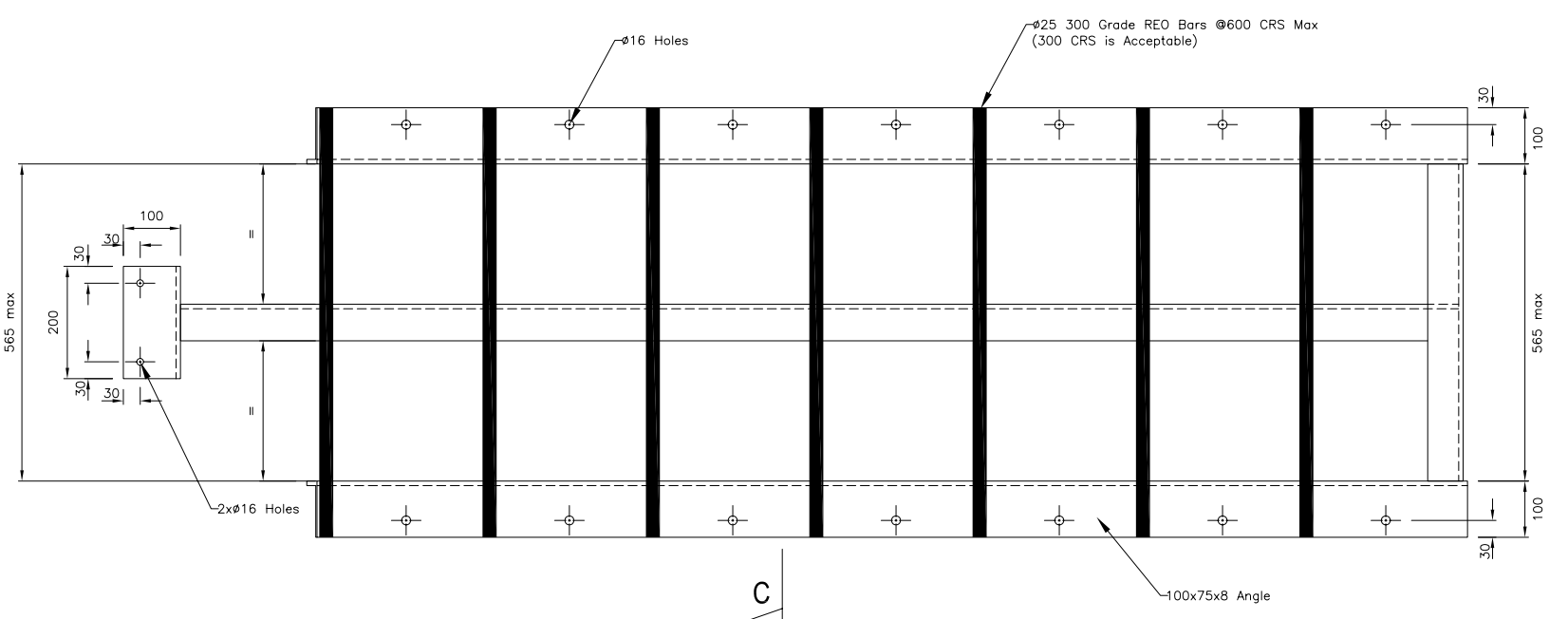
Any questions/comments can be directed to:

Rudolph Kotze, NZ Transport Agency National Office  
Nigel Lloyd, NZ Transport Agency National Office



**NOTES.**

1. The dimensions for the grate on this drawing are indicative only.
2. Its is recommended that grates are sourced from the manufacturer of the precast culvert headwall to ensure the grate and headwall are compatible. Otherwise guidance should be sought from the manufacturer of the precast culvert headwall on the required dimensions for any grates not supplied by them.
3. The clear width between side walls of precast culvert headwalls shall not exceed 600mm when using this grate.
4. Material Specifications for the following items;  
Steel Angles – AS/NZS 3679.1:1996 Hot Rolled Bars and Sections  
Reinforcing Bars – AS/NZS 4671:2001 Steel Reinforcing Materials  
Galvanising – AS/NZS 4680:2006 Hot Dip Galvanising (Zinc) Coatings on Fabricated Ferrous Articles

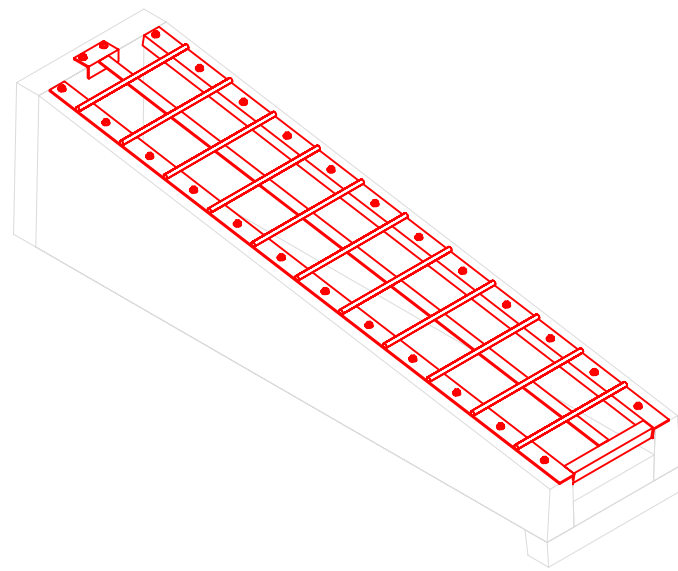
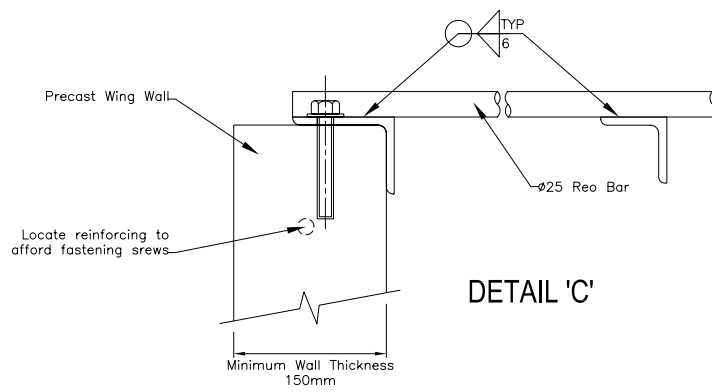
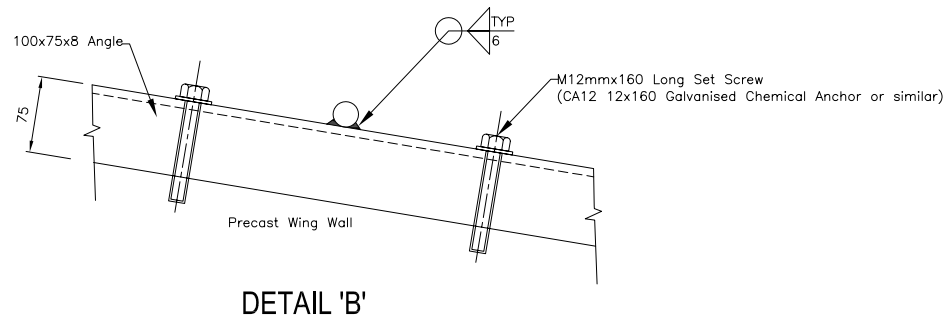
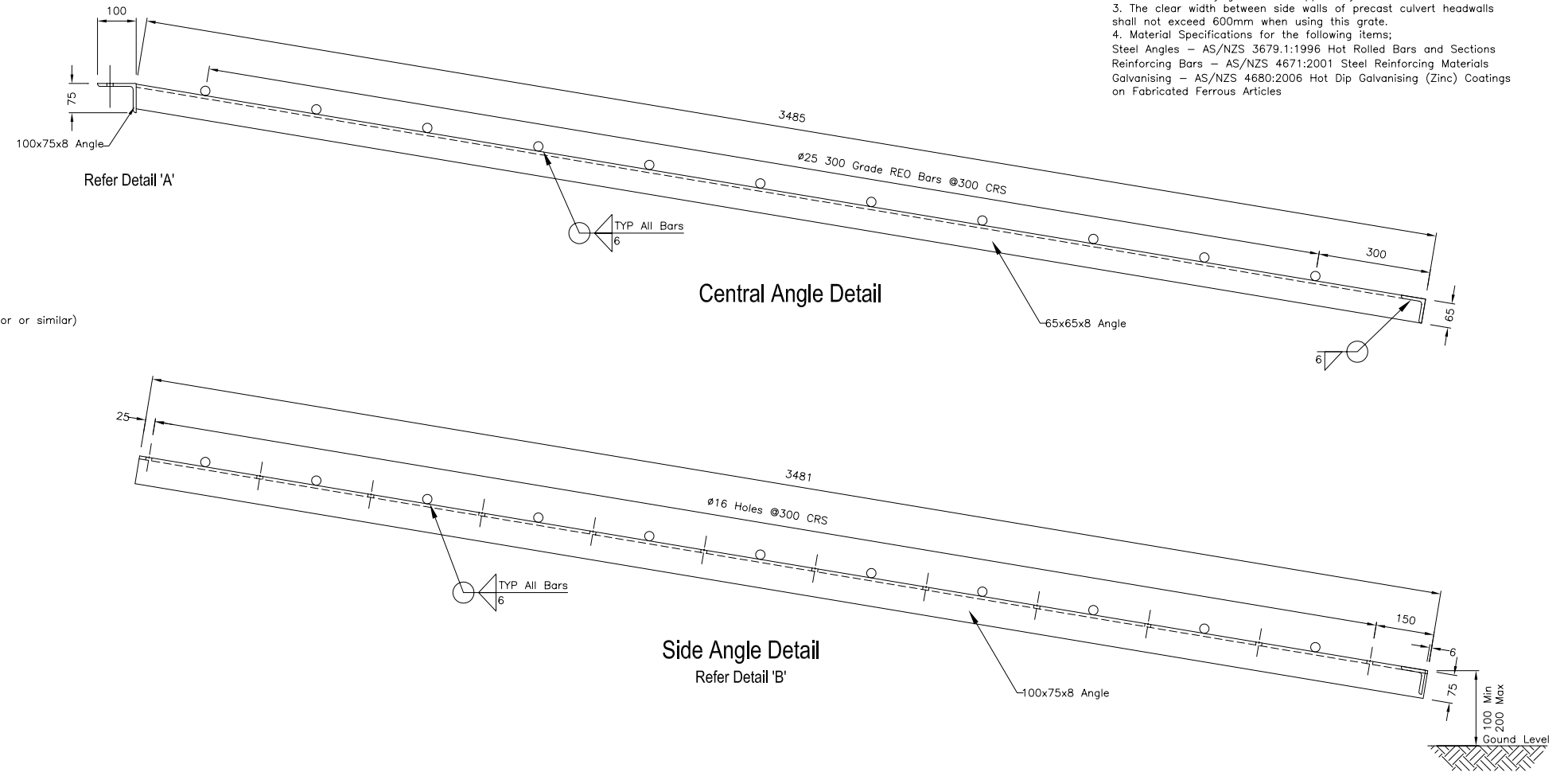
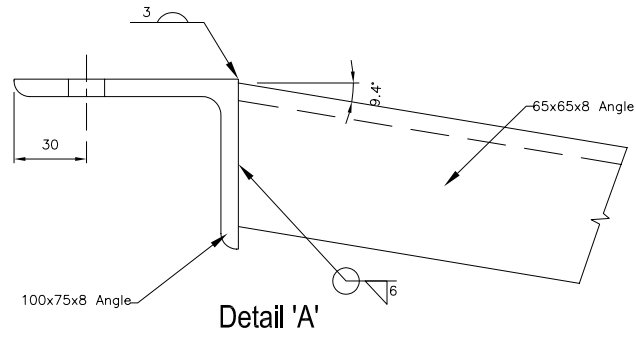


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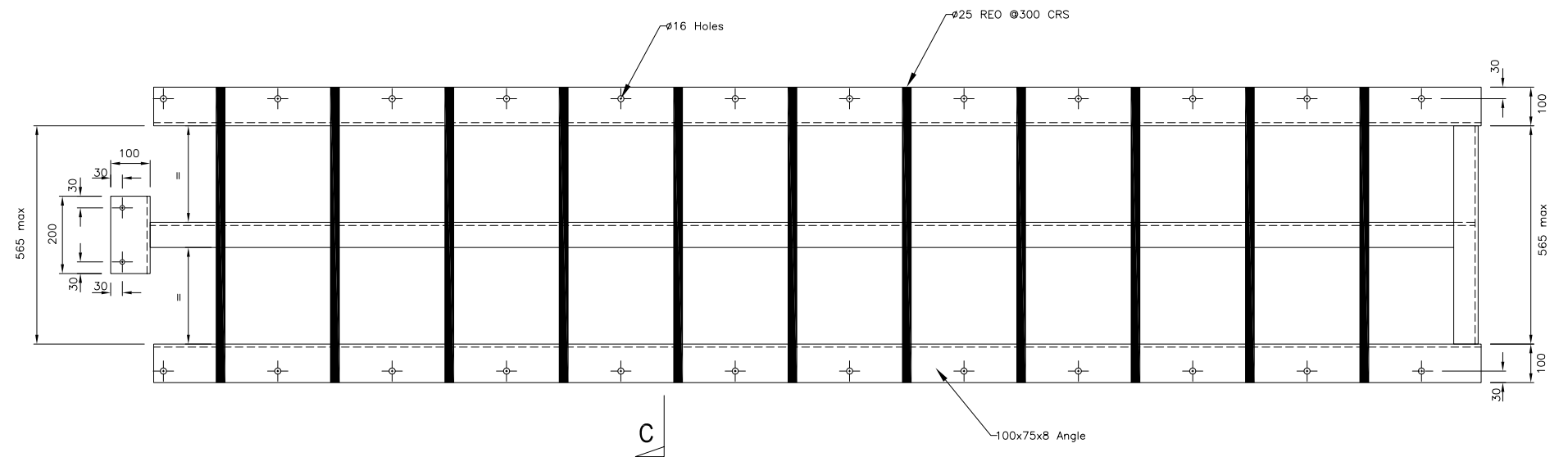


TITLE: Traversable Grates for Precast Headwalls 255mm - 450mm Culvert Sizes NZ Transport Agency TYPICAL DETAILS		JOB:	
SCALE: NOT TO SCALE		CAD: Headwall Grates	
ORIGINAL PAPER SIZE A3		CLIENT REF: NA	SHEET NO: 1 of 1

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ORIGINAL PAPER SIZE A3		CLIENT REF:	NA
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