

Thursday, 19 March 2020

Our Ref: 640008-LTR-01

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██████████
Technical Office Engineer – Structures
Fletcher Acciona Joint Venture
Puhoi to Warkworth Motorway Project (P2Wk)
██████████

Dear ██████████,

**Peer Review of Precast Panel Planks, Okahu and Puhoi Viaducts,
Puhoi to Warkworth Motorway Project**

1. Background

The Puhoi to Warkworth Motorway project (P2Wk) is an extension to the four-lane northern motorway (SH1) from the Johnstone's Hill Tunnels to a tie-in with the existing SH1 north of Warkworth, a total length of 18.5km. Two main bridges are included in this project, Okahu and Puhoi multi-girder steel viaducts.

In both cases, the superstructure will be comprised of four 2750mm deep steel I-girders which will be continuous across all 6 spans and will act compositely with a 315mm thick concrete deck in Okahu viaduct and 335mm thick concrete deck in Puhoi viaduct.

The I-girders will be equally spaced at 6.75m centres in Okahu viaduct and 7.315m in Puhoi viaduct. The deck will span transversely between the main steel girders and will typically comprise of a 130mm precast section and cast in-situ pours of 185mm for Okahu and 205mm for Puhoi. A series of steel reinforcement trusses will be cast into the precast portion and will provide strength to support the in-situ concrete. The in-situ deck pour provides continuity in both directions.

Acciona has provided the Precast Deck Planks Design Report, prepared overseas, and has requested CaSE to provide a Peer Review of the design of the precast planks in temporary stage in line with applicable NZ Codes of Practice.

2. Reference Documents

- Acciona IFC Drawings - 11-12 Okahu Viaduct Precast Deck Planks Typical Cross Section, sheets 1 to 7 of 7
- Acciona IFC Drawings - 12-12 Puhoi Viaduct Precast Deck Planks Typical Cross Section, sheets 1 to 7 of 7
- Acciona Report - Puhoi To Warkworth Motorway Okahu Viaduct. Puhoi Viaduct. Precast Deck Planks. Design Report. Detailed Design. Rev_1 February 2018
- Acciona Report - Puhoi To Warkworth Motorway Okahu Viaduct. Puhoi Viaduct. Precast Deck Planks. Design Report. Detailed Design. Annex 1. February 2020

3. Peer Review

I hereby certify that the pre-cast deck planks shown on the Acciona IFC drawings listed above have been checked in accordance with the requirements of the relevant Australian/New Zealand Standards, specifically:

- AS/NZ 1170 - 2002 Structural Design Actions
- AS/NZ 4100 -1998 Steel Structures
- AS/NZ 3600-2009 Concrete Design

In checking the system, we have assumed the following as stated on the drawings:

- The self-weight of the planks is based on a unit weight of concrete of 25 kN/m³.
- The short-term Young's modulus of the concrete is 27900 MPa.
- The applied live/material loading of 2kN/m² shall not be applied over the cantilever.

4. Further Observations:

- The drawings advise a load test to be carried out to check deflections. This is highly recommended due to the innate problem of providing precise concrete stiffness.
- The concrete pour is stated as beginning at the centre of the plank and continues to the sides. We note that if the wet concrete is applied over the entire internal span before any load is applied to the cantilever, the cantilever may rotate enough that the outer seal lifts off the beam flange. This may result in grout leakage and damage to the neoprene seal. It may also cause local failure of the R10 linking bars over the supporting flange or the outer girder, although no further consequence is expected to this failure. We would suggest that the results of load tests and deflection measurements should be examined and if necessary, the concrete pour should be defined in more detail. This may involve specifying intermediate pour stages, such as defining strips of slab parallel to the main girders and the sequence in which they should be poured.
- It should be clarified whether the 2kN/m² surcharge may also be applied during concreting, or a reduced value defined.
- The overall strength of the system, even with the lifting-off mentioned above, is adequate.

Yours faithfully,



Principal Engineer
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Chartered Engineer, UK Institution
of Structural Engineers*

Yours faithfully,



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