

Neville Brown

From: Tracy Morrah
Sent: Monday, 23 April 2012 9:26 a.m.
To: Neville Brown; Greg Orchard
Subject: FW: Basin Reserve Museum Grandstand
Attachments: 5C1964.00 CL Museum Stand condition assessment.pdf

Good morning

In advance of tomorrow's discussion, I thought it useful to pass on the report and Carl's musings (in his email below).

Note the rough figures below are cumulative. They do not include s112 requirements such as universal access and fire systems. The building is almost entirely bereft in this regard so the anticipated costs are large. Also, project management / architect / regulatory consent / heritage fees are not included (for this additional work).

The costs could easily equate to \$6m. And the building may still only good for another 30 years (at best) and achieves 40-50% NBS and may still need to be demolished after an earthquake.

On the upside, it's not a threat under ordinary gravity loadings.

Richard Hardie has a copy of this, so the BRT is likely to receive it also.

Cheers
Tracy

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From: Carl Ashby [mailto:Carl.Ashby@opus.co.nz]
Sent: Friday, April 20, 2012 4:13 PM
To: Tracy Morrah
Subject: Basin Reserve Museum Grandstand

Tracy

Please find attached the OPUS central Labs report on the condition of the stand.

The main findings are as follows

Main Stand – Concrete Base

24/04/2012

- The Museum Stand is 88 years old and is in a state commensurate with its relatively advanced age.
- The concrete used in construction is not of high quality and there are some clear construction deficiencies with regard to consolidation during placement and achieved covers.
- Carbonation of the concrete is well-established and it is probable that near-systemic reinforcement de-passivation exists throughout the structure, with a consequent risk of reinforcement corrosion wherever moisture is available and this threat is elevated by variable levels of cast-in chloride contamination introduced through the use of a marine-sourced aggregate in the concrete mix.
- Despite these negative characteristics much of the concrete appears to be in good condition and does not display obvious cracking or spalls that would compromise their functional performance. This is attributed to the majority of these elements being located within the protected interior of the stand, where predominantly dry conditions effectively suppress the rate of reinforcement corrosion, irrespective of the actual passivation state of the bars.
- Serious deterioration of the structure is primarily restricted to the Sussex Street façade where water leakage in combination with poor covers has produced severely compromised reinforcement and significant concrete spalling.

However, the deterioration is largely a cosmetic issue and an on-going maintenance nuisance, rather than a threat to the integrity of the structure – i.e. it is not likely to collapse in the immediate future under gravity due to these defects (without further deterioration).

The Museum Stand Roof

The Museum Stand roof and supporting structural steelwork were reconstructed in 1984 but are again in need of major maintenance.

In particular,

- The roof lining and fasteners are badly corroding and need replacement and this is also likely to be true of the roof cladding.
- The protective coating on the steel lattice columns supporting the front of the roof is in poor condition and requires remediation.
- Also in need of addressing are the structural deficiencies created by the deteriorating connection between the secondary roof support beams and the concrete columns on which they terminate.

Rough order of Cost for Budget Purpose for roofing replacement and steel repair and repainting is \$350 to \$450 K

Current Service Life

On the basis of the observed concrete condition, age and current deterioration, it is suggested that the Museum Stand has a residual life of approximately 25 to 30 years, if appropriate maintenance is carried out.

To achieve this life, the following immediate remedial work is recommended. [Note that this list is presented as guidance regarding the likely quantum of work required; it is not intended to be a definitive scope or specification.]

- Remove the window frames from the Sussex Street elevation. Reconstruct the walls between

existing columns as necessary to ensure that all steel showing loss of section is replaced, and recast in new concrete.

- Excavate the Sussex Street elevation below grade and install a tanking membrane, or other suitable waterproofing system, to eliminate leakage through the concrete wall to the interior of the Stand.
- Repair any spalls to the other elevations using conventional concrete patch repair techniques. Remove any areas of unsound or drummy exterior plaster and reinstate.
- Reconstruct the kerb beam of the northern stand access stairs using conventional patch repair.
- Once repairs of any spalling or unsound plaster are completed, waterproof the exterior of the Stand (i.e. the currently plastered and painted surfaces). This should be achieved by application of a high quality vapour-permeable elastomeric coating, specifically formulated for crack accommodation in concrete and masonry structures, with a finished dry film thickness in excess of 400 µm.
- Address spalls to the riser beams on both the exterior tiered seating surface and underside in the interior of the Stand using conventional patch repairs techniques.
- Apply a silane-based impregnant to the exterior unpainted surfaces of the tiered seating to provide a hydrophobic (water-repellent) surface.
- Replace the metal roof cladding and soffit linings.
- Address the coating deficiencies on the roof columns.
- Breakout the bases of the lattice work columns, where they are embedded into concrete pedestals, blast clean and epoxy coat the steel for 400 mm below the concrete surface to inhibit further corrosion, and reconstruct the pedestals.
- Reconstruct the tops of the concrete columns on the north and south elevation wall ends and provide a structurally-sound detail for connection of the secondary roof columns.

With regard to maintenance of the concrete, the emphasis is placed upon preserving it in a sufficiently dry state to minimise the corrosion rate of the reinforcement, hence the preference for a high quality external coating.

The report discusses repair methodologies and the advantages / disadvantages but the most cost-effective and technically sound repair strategy for spalling concrete is considered to be conventional best practice-patch repair combined with regular monitoring of the structure to allow timely repair of newly developing defects.

Cathodic protection is not recommended for this particular building as the concrete conditions are not suited to this system and given the high cost there would be little benefit.

Similar considerations (i.e. cost, complexity and limited potential benefit) rule out electrochemical re-alkalinisation or chloride extraction (such as used on the Wellington Carillion) as viable remedial options.

I have done some ball park numbers around sizing of the potential budgets for the repair options above and improving the earthquake strength to above 34% earthquake prone for discussion .

Please note Tracy these should be considered as budgets for sizing the project +/- 30% rather than estimates as I have only received the final report today so the accuracy is limited and it would be worth getting a QS to price these for more robust figures.

For the concrete repairs and maintenance to the concrete the rough order of cost for budget purposes

Concrete Repair Budget break down on unit rates for areas
 Sussex St entrance being a large cost at about \$350 to \$450K
 N – S Exterior Faces and Museum Face \$150K to 200K
 Interior repairs and coatings \$250 to \$300 K
 Bleacher Repairs and Coating \$90 to 150K
 Architectural / Heritage costs \$200 – \$300K

Repair Membrane to Sussex St \$200 to \$250k

Misc Carpentry / Electrical / Services reinstatement \$100k

Consent / Consulting / Project management \$150K

Contingency 30%

So based on this the total rough order of cost for budget purposes for repair of base structure is \$1.5 to 1.8m.

Please Note: this is for the basic concrete repairs that need to be done to extend the building life without improving the building architectural fit upgrade out or amenity and I have not included this or any disable access or lift requirements as these are unknown but could be quite substantial relative to the base structure repair costs depending on the councils requirements.

Strengthening

It is proposed to do the following to improve the building above the 34% threshold to say 40% to 50% NBS at IL3 and add in elements that would prevent catastrophic collapse (but not damage) at a much larger EQ.

Roof (This assumes roofing replacement occurs for access)

- Strengthen the roof by replacing the lattice columns at the front with UC sections
- Installing new lateral beams to improve ductility of the frame at the front
- Install Roof Bracing diaphragm
- Install new wall bracing
- Improve connections to the structure and hold downs to main structural walls

Rough order of Cost for Budget Purpose is \$300 to \$400 K

Stand (This assumes the repairs above are made to enable concrete to be improved and strengthened)

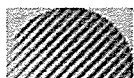
- Remove / demolish all bad concrete and rusting steel to the Sussex St elevation and repair with new concrete and steel reinforcing
- Add structural steel bracing frames strengthening to the Sussex St Elevation (inside the building behind the facade) + Foundation micropile / anchors
- Add structural steel frames to the transverse direction part mid point (Note; frames not in the historic stair area / entrance) + Foundation micropile / anchors
- Add support some discrete steel posts (only) to support concrete beams and mezzanine for life safety support under EQ (does not add EQ strength just supports damaged structure) to historic area
- Add FRP or Carbon Fibre fabric strengthening to Exterior concrete wall to retrofit and improve
- Add structural steel bracing frames strengthening to the Museum (basin reserve) Elevation (inside the building behind the facade) + Foundation micropile / anchors
- Infill openings in concrete walls where possible
- Improve foundations

Rough Order of Cost for Budget Purpose is \$900 to \$1.4M

I hope the above summary and explanation is sufficient and helps understand and size the overall project.

If you have any queries please don't hesitate to call me at your earliest convenience.

Regards



Carl Ashby
Manager Structural Engineering

24/04/2012

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