



ELECTRICAL ENGINEERING CAPITAL RENEWAL AND MODERNISATION PROJECT (EEB-CRM) Structural Engineering Report For SSD Report

for UNSW Australia

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Taylor Thomson Whitting (NSW) Pty Ltd Consulting Engineers ACN 113 578 377
48 Chandos Street St Leonards NSW 2065 PO Box 738 Crows Nest 1585
T 61 2 9439 7288 F 61 2 9439 3146 ttwsyd@ttw.com.au www.ttw.com.au

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1.0 STRUCTURAL OVERVIEW OF THE EXISTING BUILDINGS

The Electrical Engineering building consists of the North Block and the South Block, linked by a narrow “knuckle” section containing a corridor and lift.

The entirety of the South Block and levels Ground, 1, 2 and 3 of the North Block were constructed circa 1961. Various levels and parts of levels were added to the North block over the years.

Both North and South Blocks have concrete encased steel columns supported on pad footings on shallow rock. The floors are typically reinforced concrete plates but the North Block Level 4 floor and roof consists of primary and secondary steel beams supporting reinforced concrete slabs. The 1961 era floors have sloping soffits.

Both lift cores are of steel framed construction, with concrete encasement to the steel beams and brickwork infill walls.

Reinforced concrete shear walls give the buildings lateral stability in the transverse direction and frame action provides lateral stability in the longitudinal direction of each block.

A number of reinforced concrete retaining walls internally and externally take care of the varying ground levels.

2.0 PROPOSED WORKS

2.1 Strengthening of Existing Columns

The existing columns are not only subject to vertical forces from the slab dead weight and floor live loading, but are also subject to bending actions from wind and earthquake forces in the longitudinal direction of each block due to there being no shear walls in this direction. The analysis of these combined actions is complex and we have found that some of the building columns are already overstressed when analysed to current code conditions. In addition to this there are additional roof loads which result in the requirement to strengthen a proportion of the building columns.

The number of columns to be strengthened on each floor generally increases towards the top of the building as the upper columns see a proportionally greater increase in load from the new roof functions. It is proposed that the columns will be strengthened by welding new plates to the existing columns after removing the existing finishes.

2.2 New Roof Steelwork

The North Block will house a variety of plant such as cooling towers, compressors and water tanks.

A draw tower situated on Level 4 will also pass through the roof and will have a protective building envelope at roof level.

The South Block will have an arrangement of platforms which will support experiments.

We have carried out preliminary design of steelwork for both the North and South Block roofs. In both cases we have avoided putting any additional loads on the existing roof slabs and beams which have been shown to have insufficient strength to support the proposed loading. Instead we have positioned new stub columns over the existing columns below. We have detailed a composite concrete floor to the plant areas on the North Roof in order to facilitate easier and safer maintenance of the plant. The

South Block has one area of gridmesh supported on a steel beam grillage and a second area of beams only, in order that gridmesh can be added as required.

2.3 New External Riser

A new external riser will be constructed from clad steelwork. A concrete floor will be constructed at Level 1 to be used as a store room. The riser roof will be lightweight metal roofing.

2.4 Slab and Wall Penetrations

Major penetrations will be required to the existing floor slabs and knuckle shear wall to accommodate mechanical ducting. Concrete will be saw cut and removed.

Minor penetrations for services such as hydraulic pipework and electrical cabling can be accommodated by diamond coring walls and slabs after radar scanning to determine reinforcement positions.

2.5 New Goods and Passenger Lifts

New goods and passenger lifts are proposed to the knuckle area between the North and South Blocks.

The horizontal loadings advised by the Lift Consultant will require the existing steelwork dividing beam at each floor level to be removed and replaced by a stronger beam. The lift pit will also require steelwork strengthening beams due to the vertical loads imposed by the new lifts.

2.6 External Area Adjacent to the Rex Vowels Theatre

The existing concrete roof between the South Block and the Rex Vowels theatre will remain. This will form a breezeway which will access the current area which currently houses mechanical plant. This plant will be removed and the area will be terraced to become an outdoor learning space. We will design the external retaining structures required to form the terracing.

3.0 BUILDING STRUCTURAL INTEGRITY

The structural integrity of the building will not be adversely affected by the structural works. The design of the works will be in accordance with the following Codes of Practice.

AS 3600 Concrete Structures

AS 4100 Steel Structures

and the structure would be sufficient to carry the relevant loads specified on our drawings and in

AS 1170.0 Structural design actions – General principles

AS 1170.1 Structural design actions – Permanent, imposed and other actions

AS 1170.2 Structural design actions – Wind actions

AS 3826 Strengthening existing buildings for earthquake

Prepared by:
**TAYLOR THOMSON WHITTING
(NSW) PTY LTD**



MARTIN ROGERS
Associate Director

Authorised by:
**TAYLOR THOMSON WHITTING
(NSW) PTY LTD**



RICHARD GREEN
Director

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