STRUCTURAL DESIGN REPORT

UNIVERSITY OF SYDNEY F23 ADMINISTRATION BUILDING

Prepared for:

THE UNIVERSITY OF SYDNEY

Job No. 3161

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DOCUMENT DETAILS

REVISIONS

Date	Issue	Status	Revision Description	Prepared By	Reviewed By	Reason for Revision
15/02/2016	A	Draft	Issued for Information	B.K	D.T	
18/03/2016	B	Final	Minor Updates	B.K	D.T	DA Issue

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1. PROJECT DESCRIPTION

1.1 General

The project will involve the construction of a multi storey administration building with 2 basement floors, a ground floor, 4 levels of administration floors and a plant floor.

1.2 Design Life

The structure is to be designed for 100 year design life.

2. SCOPE OF WORK

2.1 Design and Documentation of the following:

- Piled Footings;
- Lift and stair cores from basement to roof;
- Shoring walls;
- Cast-In-Situ Columns;
- Slab on ground (Level B2);
- Basement post tensioned car park slab (Level B1);
- Post tensioned floor slabs (Levels 1 to Level 6);
- Structural steel roof;
- Masonry and lightweight walls; and
- Misc items.

3. CODES

The structural design of the project will be carried out in accordance with the following Australian Standard Codes of Practice.

- Building Code of Australia
- AS 1170 Part 0 General Principles
- AS 1170 Part 1 Permanent, imposed and other actions
- AS 1170 Part 2 Wind actions
- AS 1170 Part 4 Earthquake actions in Australia
- AS 3600 Concrete Structures
- AS 3700 Masonry Structures
- AS 4100 Steel Structures Code
- AS 4600 Cold-Formed Steel Structures

4. BCA CLASSIFICATION

- Class(es) of Building:
  - Class 5 Office Building
  - Class 6 Café
  - Class 7a Car Park
- Type of Construction: A
- FRL of Building Elements: 2 hrs

5. LOADING CRITERIA

5.1 Vertical Loads

- **Basement Car Park B1 and B2**
  - Carpark & Bicycle Parking — 0.25 kPa Superimposed dead load; 2.5 kPa live Load
  - Plant Rooms — 2.5 kPa Superimposed dead load; 5.0 kPa live load
  - Car Ramps — 0.25 kPa Superimposed dead load; 2.5 kPa live load
  - Store Rooms — 0.25 kPa Superimposed dead load; 5.0 kPa live load
  - End of Trip Facilities — 2.5 kPa Superimposed dead load; 3.0 kPa live load

- **Level 1**
  - Lobby & Symposium — 2.75 kPa Superimposed dead load; 5.0 kPa live Load
  - Café & Kitchen — 2.75 kPa Superimposed dead load; 5.0 kPa live load
  - Waste Room — 0.25 kPa Superimposed dead load; 5.0 kPa live load
  - Amenities — 2.5 kPa Superimposed dead load; 3.0 kPa live load
  - Plant Rooms — 2.75 kPa Superimposed dead load; 5.0 kPa live load
  - Comms Room — 0.25 kPa Superimposed dead load; 5.0 kPa live load

- **Levels 2 to 5**
  - Offices — 0.75 kPa Superimposed dead load; 4.0 kPa live Load
  - Plant Rooms — 2.5 kPa Superimposed dead load; 5.0 kPa live load
  - Corridors and Stairs — 0.75 kPa Superimposed dead load; 4.0 kPa live load
  - Amenities — 3.5 kPa Superimposed dead load; 3.0 kPa live load
  - Terraces — 1.5 kPa Superimposed dead load; 4.0 kPa live load

- **Level 6**
  - Plant — 2.5 kPa Superimposed dead load; 5.0 kPa live Load or plant weight if greater than 5.0 kPa

- **Roof**
  - Roof Steel — 0.60 kPa Superimposed dead load; 0.25 kPa live Load

5.2 Wind Loads

Wind loads will be assessed in accordance with AS 1170 Part 2, using the following parameters:

- Region A2, V_u = 46 m/second (importance level 3)
- Return Period = 1:1000
- Terrain Category 3
- Topographic multiplier 1.0
- Shielding multiplier 1.0

5.3 Earthquake Loads

Earthquake Loads will be assessed in accordance with AS 1170.4-2007, NCC-BCA 2016 & AS 1170.0 – 2002, based on IL=3, 1:1000 return period.

- Design Parameters

Site Sub-Soil Class	Be
Hazard Factor	0.08
Probability Factor	1.3
EDC	II
Sp/μ	0.38

6. DEFLECTION CRITERIA

6.1 Lateral Deflection

Interstorey drift due to earthquake – 1.5% storey height.

Interstorey drift due to wind – storey height/500 (serviceability)

6.2 Vertical Deflection

• All floors	Total Deflection:	span/250 and less than 25mm
(area with masonry partitions)	Incremental Deflection:	span / 500

7. GEOTECHNICAL CONDITIONS

The geotechnical parameters noted below can be found in the Douglas Partners geotechnical investigation report, Project 84897.02 dated July 2015.

7.1 Piles

Material Description	Ultimate Pressures (kPa)		Serviceability Pressures (kPa)	
	End-Bearing	Shaft	End Bearing	Shaft
Medium Strength Rock	30,000	600	3,500	300
High Strength Rock	80,000	1,000	6,000	500

7.2 Ground Anchor Bond Stresses

Extremely low to low strength rock	100 kPa ultimate
Medium strength rock	500 kPa ultimate

7.3 Shoring Walls

Material	Bulk Density (kN/m^3)	Coefficient of Active Earth Pressure (K_a)	Coefficient of Earth Pressure at Rest (K_o)	Ultimate Passive Earth Pressure (kPa)
Filling	18	0.4	0.6	-
Soil	20	0.3	0.45	-
Extremely low to very low strength rock	22	0.2	0.3	750
Medium strength rock	24	0	0	1000

7.4 Ground Water

Groundwater was not observed in any of the bores while auguring. Based on this, water is not expected to be a significant issue and may be controlled using sub-floor drainage and a collection system in the lower basement level if required.

8. MATERIALS

8.1 Concrete

Concrete shall have river gravel or crushed basalt aggregate (no slag aggregates)

All concrete slabs are to be cured with applied curing compounds compatible with floor finishes.

8.2 Reinforcing Steel

Reinforcement shall be Grade 500 MPa, ACRS Certified

8.3 Structural Steel

All structural steel supplied to the project shall be manufactured by an ACRS certified manufacturer.

9. WATERPROOFING

All exposed slabs to be waterproofed with an applied waterproof membrane in accordance with architectural specifications. The post tensioned slabs shall not be designed as watertight or be relied upon to act as waterproof elements.

10. STRUCTURAL FRAMING SYSTEM

10.1 Foundations

The Douglas Partners geotechnical investigation report (Project 84897.02, July 2015) shows fill material to depths of between 0.4 and 2.5m overlaying silty and shaly clays to depths between 1.0 and 5.5m overlaying laminate or shale rock. Rock strength initially is extremely to very low strength and increases to medium strength between 5.5 and 9.2m.

The foundations will consist of bored piers founded on medium strength rock.

10.2 Load Bearing Elements

All suspended floors will be post-tensioned banded slabs supported on concrete columns and the lift and two stair cores.

10.3 Lateral Load Resisting Elements

The lateral wind and earthquake forces will be resisted by the northern lift and stair cores and the southern stair core. The cores will be in-situ reinforced concrete and will be founded on a piled base below the lowest basement level.

The ground floor slab will restrain the top of all perimeter shoring walls.