



NSW Department of Education & Communities

Waitara Primary School Structural Report GHDSUBJECT

December 2017

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1. Design Inputs

1.1 Existing site conditions:

The new building is located at the Northwest corner of the school site where ground falls towards Northeast approximately 3 meters in a distance of 90 meters. This is equal to an average 3% fall that should be levelled by a balanced amount of cut and fill. The lowest floor steps up at one point through a retaining walls to enable ground floor levelling. The building will be in both cut and fill.

Pile foundation extended to bedrock is considered as appropriate foundation according to the findings of the geotechnical report.

1.2 Design Standards:

The following standards and codes will be the basis of design of the new building:

- AS1170.0 Structural Design Actions – General Principles
- AS1170.1 Permanent & Imposed Actions
- AS1170.2 Wind Actions
- AS1170.4 Earthquake Actions
- AS2159 Piling Design and Installation
- AS2870 Residential Slabs and Footings
- AS3600 Concrete Structures
- AS3700 Masonry Structures
- AS4100 Steel Structures
- AS4600 Cold Formed Steel Structures
- AS1720 Timber Structures Design Methods
- NCC 2016, National Construction Code of Australia
- and Educational Facilities Standards and Guidelines (EFSG)

1.3 Design Loads:

The following design loads and criteria have been considered for this design:

- Building importance level: 3
- Building design life 50 years
- Annual probability of exceedance for wind & earthquake 1/1000
- Superimposed permanent load:
 - Classroom and office 1.0 kPa
 - Corridors and stairs 0.5 kPa
- Live load:
 - Classroom and offices 3.0 kPa
 - Corridors and stairs 4.0 kPa
- Wind load criteria:

- Region A2
- Ultimate wind speed 46 m/s
- Serviceability wind speed 37 m/s
- Terrain category 3
- Earthquake load criteria:
 - Probability factor 1.3
 - Hazard factor 0.08
 - Site sub-soil class B
 - Earthquake design category III
 - Structural ductility factor (μ) 2
 - Structural performance factor (S_p) 0.77

1.4 Lateral Stability System:

Lateral stability of building is provided by a combination of concrete frame action and concrete shear walls. The lift core is also part of the stability system. The system has been examined in a three dimensional computer model of the building and the walls and foundation piles have been designed according to the design actions in every individual elements due to the earthquake and wind loads.

1.5 Fire Resistance:

The fire resistance of the structure has been defined by the NCC, National Construction Code of Australia. The fire resistance level of structural elements is determined using Building Regulation Consultant's report, the information shown on the architectural drawings and the alternative fire engineering solutions. The following table will be updated upon receiving the final version of such information from related disciplines.

Building Element (FRL Required for Class 9b)	Fire Resistance Level (minutes) Structural adequacy/Integrity/Insulation
External wall (including any column and other building element incorporated therein) or other external building element, where the distance from any fire source feature to which it is exposed is	
<i>For loadbearing parts</i>	
Less than 1.5m	120/120/120
1.5 to less than 3m	120/90/90
3m or more	120/60/30
<i>For non-loadbearing parts</i>	
Less than 1.5m	-/120/120
1.5 to less than 3m	-/90/90
3m or more	-/-/-
External column (not incorporated in an external wall)	
For loadbearing columns	120/-/-
For non-loadbearing columns	-/-/-
Common wall and fire walls	120/120/120
Internal walls	
Fire resisting lift and stair shafts	

Building Element (FRL Required for Class 9b)	Fire Resistance Level (minutes) Structural adequacy/Integrity/Insulation
<i>Loadbearing</i>	120/120/120
<i>Non-loadbearing</i>	-/120/120
Bounding <i>public corridors</i> , public lobbies and the like	
<i>Loadbearing</i>	120/-/-
<i>Non-loadbearing</i>	-/-/-
Between or bounding <i>sole-occupancy units</i>	
<i>Loadbearing</i>	120/-/-
<i>Non-loadbearing</i>	-/-/-
Ventilation, pipe, garbage, and like shafts not used for the discharge of hot products of combustion	
<i>Loadbearing</i>	120/90/90
<i>Non-loadbearing</i>	-/90/90
Other loadbearing internal walls, internal beams, Trusses and columns	120/-/-
Floors	120/120/120
Roofs	120/60/30

Note the following concessions:

- Floors laid directly on the ground do not need an FRL.
- The roofs do not require an FRL if the roof covering is non combustible.
- Internal columns in the storey immediately below the roof do not need an FRL if the roof covering is non combustible.

1.6 Geotechnical Condition:

According to the geotechnical engineering report prepared by PSM the ground consists of:

- Wearing course
- topsoil
- Natural soil;
- Bedrock.

The description of these layers are given as in the following table:

SUMMARY OF INFERRED SUBSURFACE CONDITIONS ENCOUNTERED IN PSM BOREHOLES

INFERRED UNIT	ENCOUNTERED DEPTH TO TOP OF INFERRED UNIT (m)	DESCRIPTION
WEARING COURSE	0.0	Existing asphalt/concrete – typically up to 0.1 m thick
TOPSOIL	0.0	TOPSOIL; Sandy CLAY; dark brown, low to medium plasticity, fine grained sand, firm consistency, dry, rootlets down to depth of 0.1 m.

INFERRED UNIT	ENCOUNTERED DEPTH TO TOP OF INFERRED UNIT (m)	DESCRIPTION
NATURAL SOIL	0.0 to 0.1 m	CLAY; grey, brown and orange, low to medium plasticity, firm to hard consistency, dry to moist, a trace of organics.
BEDROCK	0.7 to 2.5	SHALE; brown and grey, extremely weathered to highly weathered, extremely low to very low strength

The depth and level of the layers are given in the below table:

DEPTH BELOW GROUND SURFACE OF TOP OF INFERRED GEOTECHNICAL UNITS ENCOUNTERED IN BOREHOLES

BOREHOLE	DEPTH BELOW GROUND SURFACE OF TOP OF INFERRED GEOTECHNICAL UNITS (m)				
	WEARING COURSE	TOPSOIL	NATURAL SOIL	BEDROCK	END OF HOLE
BH01	0	N.E.	0.1	2.0	4.0
BH02	N.E	0	0.1	0.7	3.6
BH03	N.E	0	0.1	1.5	3.8 ^R
BH04	0	N.E	0.05	1.8	3.5 ^R
BH05	N.E	N.E	0	2.1	2.9 ^R
BH06	N.E	0	0.1	2.4	2.9 ^R
BH07	0	N.E	0.02	2.5	3.0 ^R
BH08	0	N.E	0.08	2.0	2.6 ^R

Note: N.E. = Not Encountered
R = TC bit practical refusal

No free groundwater was observed and the ground is classified as non-aggressive.

The foundation design parameters indicate a poor shallow condition and strong bedrock. This makes a pile foundation under the multistorey building a suitable foundation.

ENGINEERING PARAMETERS OF INFERRED GEOTECHNICAL UNITS

INFERRED UNIT	BULK UNIT WEIGHT (kN/m ³)	SOIL EFFECTIVE STRENGTH PARAMETERS		ULTIMATE BEARING PRESSURE UNDER VERTICAL CENTRIC LOADING (kPa)	ALLOWABLE BEARING PRESSURE UNDER VERTICAL CENTRIC LOADING (kPa)	ELASTIC PARAMETERS	
		c' (kPa)	φ' (deg)			YOUNG'S MODULUS (MPa)	POISSON'S RATIO
NATURAL SOIL	18	2	28	400*	150*	10	0.3
BEDROCK	22	N.A.	N.A.	3000	700	50	0.25

Note: * Minimum horizontal dimension of 1 m and embedment depth of at least 0.5 m
N.A. = Not Available

Maximum foundation design parameters driven from Geotechnical Report

2. Design Outputs:

2.1 Design Report

Will set forward the design parameters and design assumptions that have been adopted in design.

2.2 Drawings

Drawings will include:

- General notes
- Foundation plan and details
- Ground floor slab plan and details
- Upper floors slab plan and details
- Stair and lift sections and details
- Column schedule and details
- Roof steel plans, sections and details
- Miscellaneous objects

2.3 Specifications

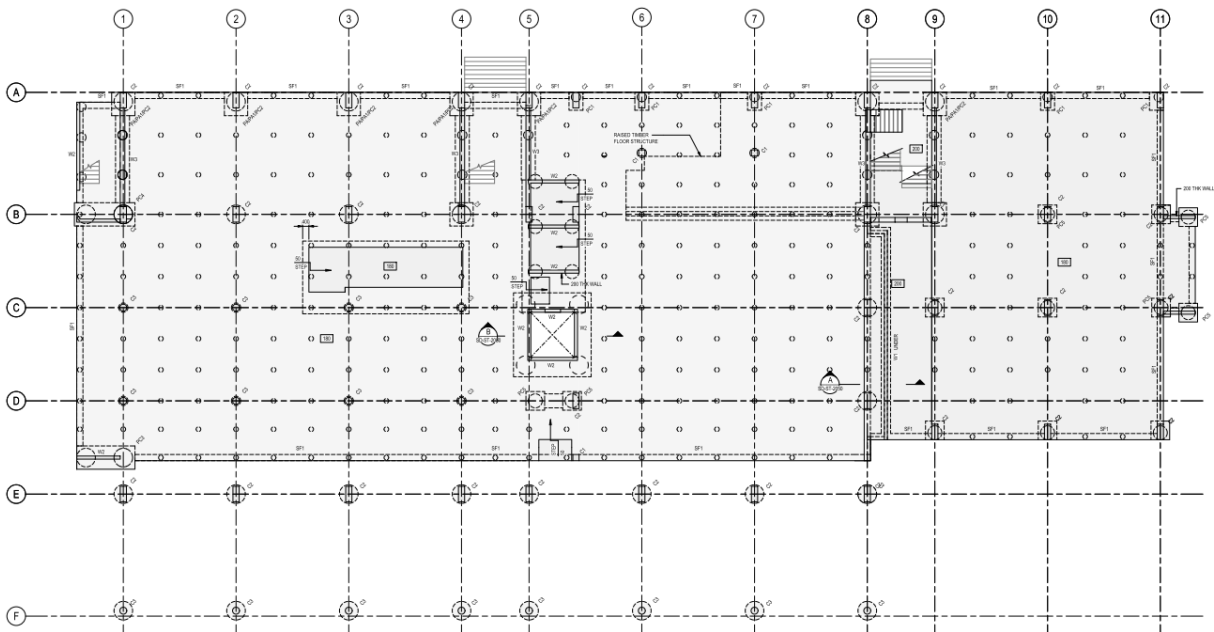
This will include detailed specification of various materials and methods of work that are adopted in the design.

2.4 QA Forms

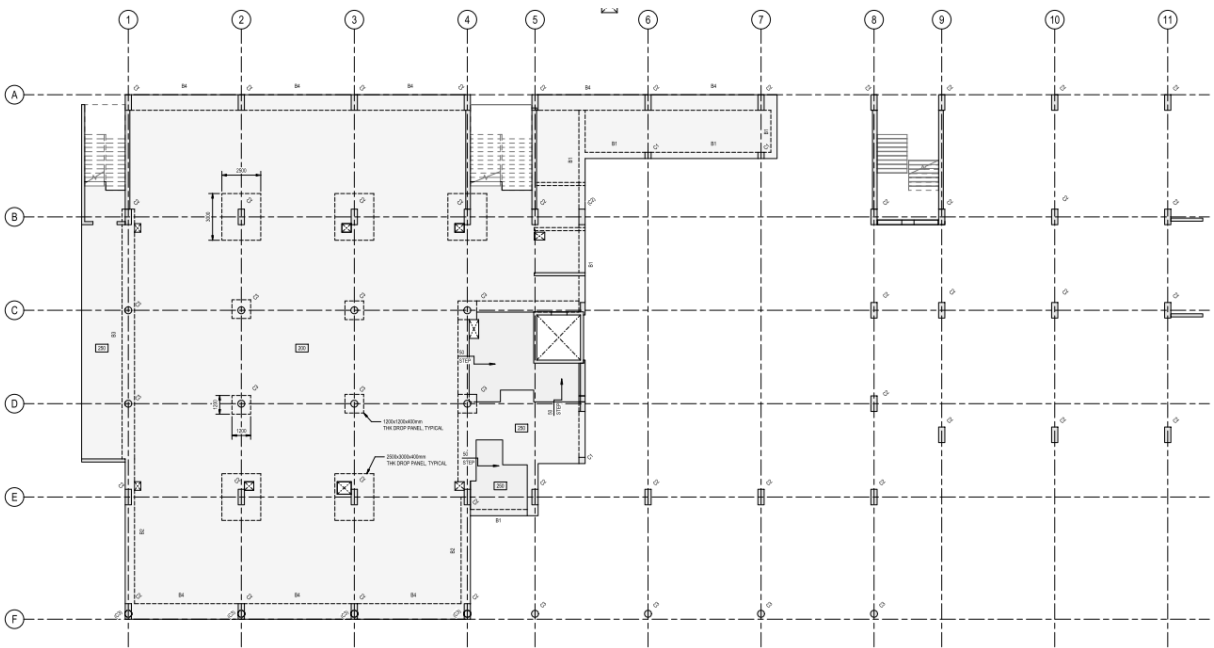
This will include all reviews and quality assurance forms that support the design, calculations and drawing checks.

Appendices

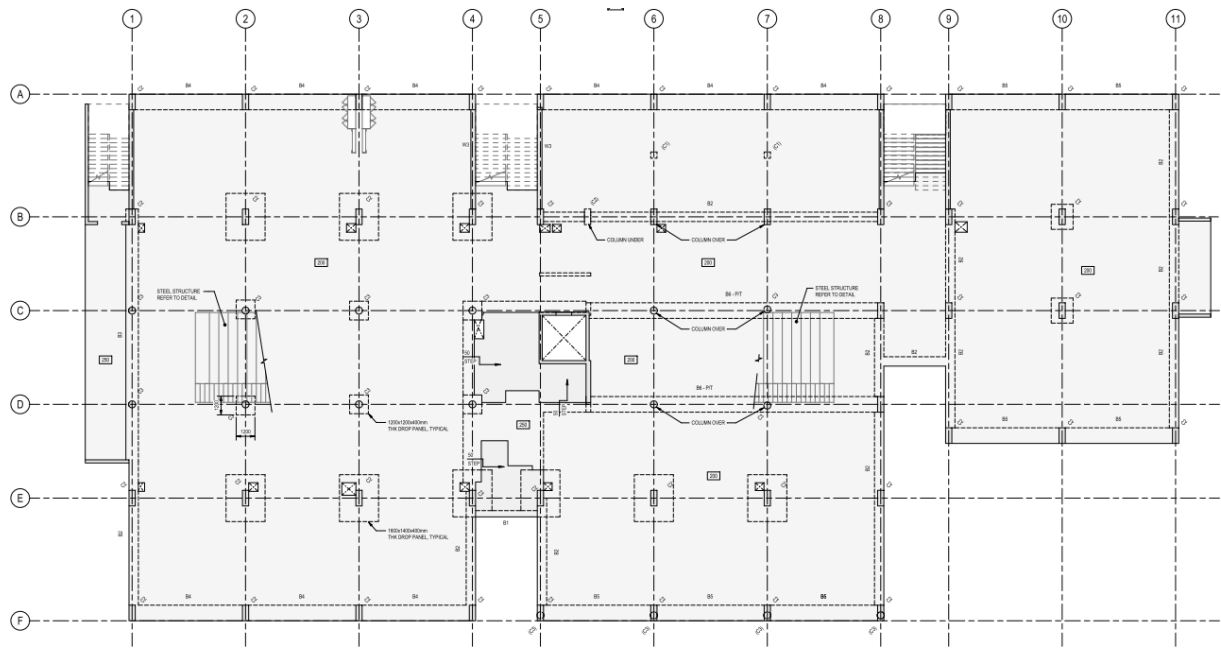
Appendix A - (Schematic Floor Plans)



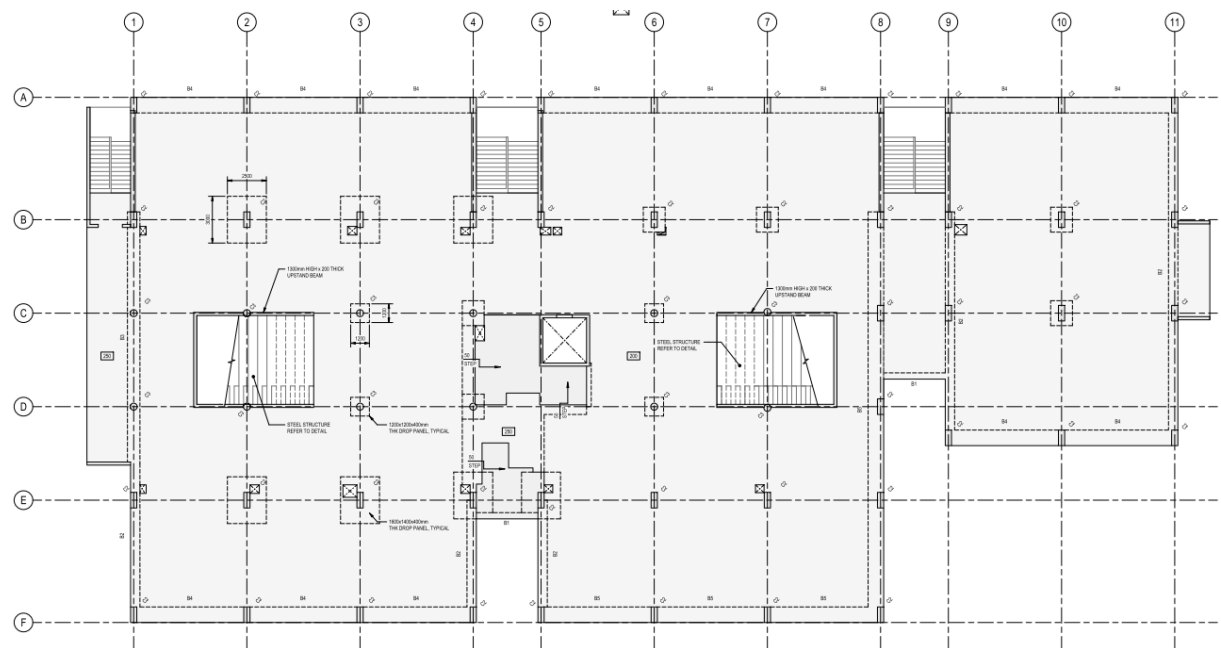
Level 1 Structural Slab Floor Plan



Level 2 Structural Slab Floor Plan



Level 3 Structural Slab Floor Plan



Level 4 Structural Slab Floor Plan

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Revision	Author	Reviewer		Approved for Issue		
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A	Jude Abarca	Massoud Shaban				
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