M+G Consulting

New High School in Bungendore

Majara Street, Bungendore NSW 2621

Structural Schematic Design Report

Issued for SSD

Revision: I

Level 3, 50 Berry Street North Sydney NSW 2060 ABN 65 094 064 990 +61 2 8666 7888

REV.	DATE	ISSUE/ AMENDMENT		INITIALS/ REVIEWED BY	
1	22 March 2021		Schematic	LM	DR/AB
A	08 April 2021		Schematic	LM	DR/AB
B	09 April 2021		Schematic	LM	DR/AB
C	23 April 2021		Schematic	LM	DR/AB
D	07 May 2021		Schematic	LM	DR/AB
E	13 August 2021		Schematic	LM	DR/AB
F	06 July 2021		SSD	LM	DR/AB
G	29 August 2021		SSD	EM	DR/AB
H	06 August 2021		SSD	EM	AB
I	08 September 2021		SSD	SM (M+G)	NN (M+G)

Prepared by:

Date: 8 SEptember 2021

Project No: 5555

Issued for: Review

Discipline: Structural

Contents

1. INTRODUCTION

This Structural Design Report accompanies an Environmental Impact Statement (EIS) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act) in support of an application for a State Significant Development (SSD No 14394209). The SSDA is for a new high school located at Jerrabomberra.
This report addresses the Secretary's Environmental Assessment Requirements (SEARs), notably:

SEARs Requirement	Response
Structural drawings and Report which demonstrates: the foundation design and associated works has taken into appropriate consideration of the rail infrastructure and assets to enable verification of compliance to Tf NSW requirements: any deformation induced by bulk excavation will not have adverse impacts on the rail corridor, rail infrastructure or rail.	An assessment has been undertaken to figure out the impact of proposed development on existing rail corridor. Refer to Meinhardt-Bonacci drawings "BHS-MB-ST-SD-HS-0100-PDF[P5]" & "BHS-MB-ST-SD-HS-0105-PDF[P1]" for documented results of this assessment. Proposed development is not impacting the rail corridor, there is no excavation proposed to the depth of 2m (below the ground level) within 25m of the existing rail corridor.

2. PROPOSAL

The proposed development is for the construction of a new high school in Jerrabomberra. The proposal will meet community demand and to ensure new learning facilities are co-located near existing open space infrastructure. The proposal generally includes the following works:

- Site preparation;
- Construction of a series of buildings up to three storeys including administration/staff areas, library, hall and general learning spaces;
- Construction of new walkways, central plaza and outdoor games courts;
- Construction of a new at-grade car park;
- Associated site landscaping and open space.

The proposal has been designed to accommodate approximately 500 students with Stream 3 teaching spaces, however the core facilities will be future proofed to a Stream 5 to enable possible future expansion to meet projected demand.
The proposal will include site preparation works, such as clearing and levelling to accommodate the proposed buildings and play areas. The proposal will involve the construction of a series of buildings housing general learning spaces, administration and staff wings, outdoor learning areas, a library and assembly hall.

The proposal will include construction of a new driveway and hardstand with access proposed off the northern stub road east of Environa Drive. Pedestrian access is proposed off Environa Drive and the northern stub road.

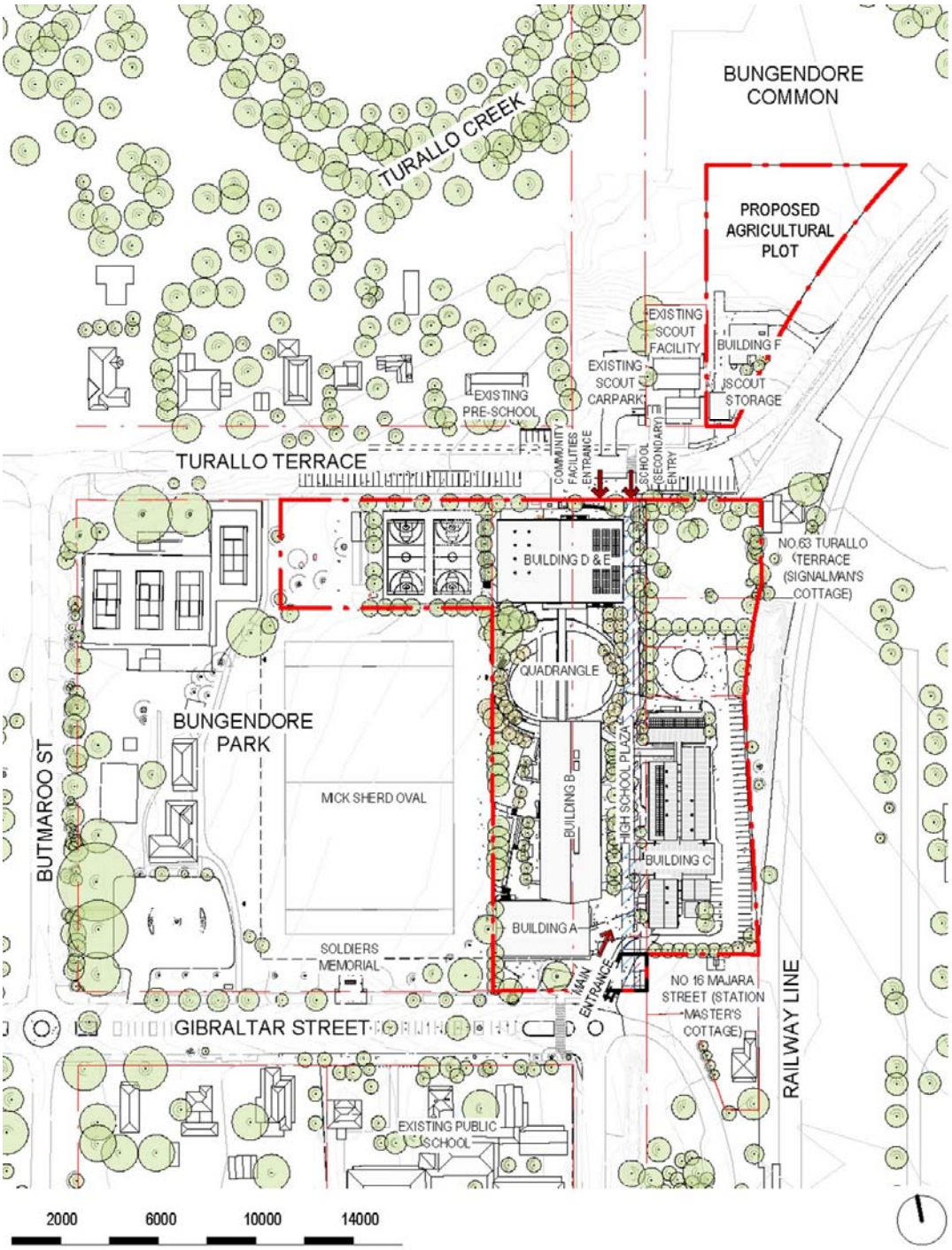


Figure 1: Proposed site plan *Source: TKD Architects*

3. SITE DESCRIPTION

The proposed development is located within the Bungendore Town Centre within the local government area of Queanbeyan-Palerang Regional Council. The proposal involves the use of land which includes Bungendore Park bounded by Gibraltar Street, Majara Street, Turallo Terrace and Butmaroo Street, the existing former Palerang Council site at 10 Majara Street, the Majara Street Road reserve bounded by Turallo Terrace and Gibraltar Streets and Nos. 2, 4 and 6 Majara Street (Refer to Table 1 below).

The site is approximately 29,205m2 in area and consists of a relatively flat topography. It contains part of Bungendore Park, existing Council buildings and maintained public open space areas. The land is mostly cleared of vegetation with some mature trees intersperse throughout subject lots.

The surrounding area generally includes low density residential developments to the north and west, an existing rail line to the east and Bungendore Public School and the Bungendore train station to the south and south west respectively.

Table 1 – New high school in Bungendore legal descriptions

Property Address	Lot Numbers
6-14 Butmaroo Street	Part Lot 701 DP1027107
2 Majara Street	Lot 12 DP1139067
4-6 Majara Street	Lot 13 DP1139067 Lot 14 DP1139067
10 Majara Street	Lot 3 DP830878
Butmaroo Street	Part Lot 701 DP96240
Portion of Majara Street (between Turallo Terrace and Gibraltar Street)	N/A

Figure 2: Site aerial depicting the land subject to the proposed High School.
Source: TKD Architects

a) *Structural Condition*

A portion of site of the new high school is currently used as a public sports oval used for a variety of sports; a public play space and as an exercise/training facility. The site east side is occupied by existing council chambers buildings.

The council buildings are currently used as an office space. Existing structure comprises of slab on ground with steel frame and lightweight steel roof. The plan to change the occupancy types of the building to include various utilities for educational usage must therefore be considered in the design process. There are records "tender" drawings available of the existing Council building dated 17 March 2006. For a copy of the existing structural drawings, refer to "Appendix A – Record Structural Drawing of Council Building - BHS".

b) *Site proximity to Rail Corridor*

The Bungendore Stationmaster's Cottage along with the Bungendore Railway station and yard are heritage listed and within close proximity to the development site. Proposed development is understood to have no impact on rail corridor and associated infrastructures.

An assessment has been undertaken to figure out the impact of proposed development on existing rail corridor. Refer to Meinhardt-Bonacci drawings "BHS-MB-ST-SD-HS-0100-PDF[P5]" & "BHS-MB-ST- SD-HS-0105-PDF[P1]" for documented results of this assessment. Proposed development is not impacting the rail corridor, there is no excavation proposed to the depth of 2m (below the ground level) within 25m of the existing rail corridor.

4. STRUCTURAL SYSTEM

This report illustrates the current proposed structural system for the school. Structural system for the New High School in Bungendore comprises of DFMA superstructure fabricated off-site & conventional reinforced concrete footing system completed as part of early construction works.

DFMA guideline prepared by SINSW is the benchmark document for design and detailing of the DFMA modules. Where there is any deviation from the guideline, relevant consultants are to liaise with appointed project manager/contractor and seek approval from SINSW.

The final structural systems not only should be cost effective and complying with the NCC- National Construction Code- performance requirements- i.e. fire rating and acoustic- but also consider the site- specific constraints.
As per SINSW instructions the project would be delivered as a DfMA - designed for manufacturing and assembly off site- meaning that the superstructure would be manufactured off site in a factory and then delivered to site and craned into the final location. The proposed system for this project is volumetric modular construction.

4.1. Footing Options

The geotechnical report prepared by Douglas Partners have been utilised for preliminary design of footings. As stated in the geotechnical report, depending on the depth of bulk excavation required, pad or strip footings or bored piers may find on future controlled fill, suitable natural soils or in situ rock.

Proposed school structures are low rise buildings (1-3 storeys). Therefore, to accommodate the volumetric modular construction pile footing to bear on rock has been nominated as the ideal option all across the site. Where it is necessary to avoid overloading the in-ground services, pile footing to be installed. Also, at the location of lateral bracing bays, piles would be recommended to resist the additional upwards and downward loading due to lateral loading. Pad footing can be utilized where the bedrock is shallow. Slab on grade (natural ground or compacted engineered fill) is proposed for construction of on ground slabs.

All footings must be found within a uniform bearing stratum of suitable strength/material, below the zone of influence of any uncontrolled fill (if left in place), service trenches, backfill zones, retaining walls or underground structures. Masonry walls should be articulated in accordance with current best practice.

It is recommended that either bored piers or pad footings founding on rock would provide the most robust footing system to support columns, especially for two to three storey structures. Footings to rock would minimise total and differential settlements as it allows a strong uniform bearing stratum to be utilised. Bulk earthworks in areas of structures could then be treated as form fill as the structural loading would be transferred to the rock stratum. It should be noted that suitable compaction of the form fill still needs to be applied as the

fill would be required to support services (i.e. piling rig, plant etc.). This should be to a Level 2 standard as defined in AS3798:2007.

4.2. Superstructure

Volumetric modular construction is proposed for the majority of the buildings in this project. This includes floor cassettes out of steel joists supported by steel ring floor beams as floor and ceiling joists supported by module ceiling ring beam. The ring beams will be supported by a combination of temporary and permanent steel posts.

The modules will be connected to each other on site using fasteners in corners. Detail varies between manufacturers and will be confirmed at design development stages.

The modules will be cross braced down to the footing level to provide lateral stability. If needed proper connections would be provided to the stair and lift cores to provide additional lateral stability.

The NSW Schools DfMA System comprises various parts that work in synergy with each other and allow each project to use the system to meet varying spatial and programmatic needs. The system aims to standardise certain aspects of spatial planning and componentry but allows each project to be creative to assemble an architecture of its place and to meet its needs.

The system comprises:

- Framework
  - The framework to enable a standardised layout that is future flexible to easily convert spaces to different uses
- Structural System
  - The beams, columns, floor system i.e. Timber frame, concrete, steel, volumetric or hybrid
- Space types
  - The classrooms, support spaces, practical activities areas, specialist spaces etc
- Components
  - Façade, walkway, roof, stairs, joinery, finishes, furniture

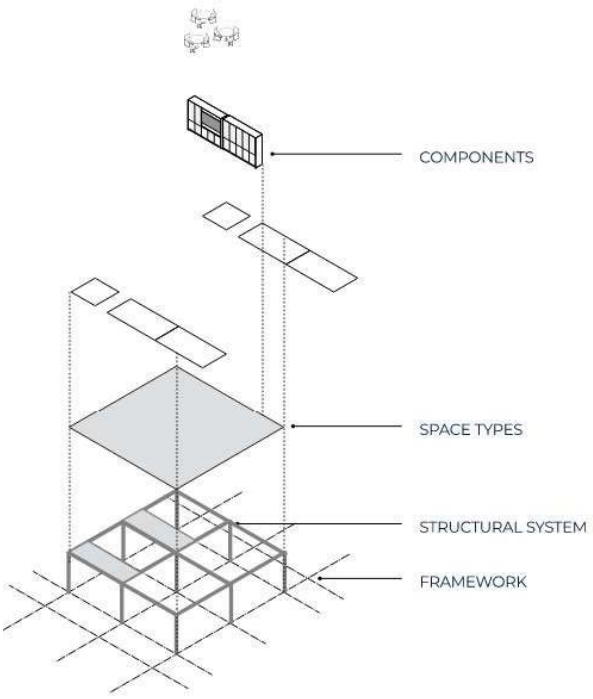


Figure 5 - Components of DFMA system (Extracted from SINSW DFMA Guideline)

4.3. Steel Superstructure

The steel system is composed of the following, refer to Figure 5:

- Steel Columns spaced at 9m x 7.5m on the 9m framework set up by the planning system.
- Primary steel beams spaced 9m apart on the 9m framework
- Secondary steel beams spaced 7.5m apart
- Steel bracing system on the facade
- Steel cassette floor sitting within the framing system
- All steel structure and floor members require fire protection according to BCA subject to fire engineer's advice.

Fire resistant treatment or enclosure is required for the steel structural system. The following fire- resistant systems are available with Pros/Cons for each one:

Intumescent Paint

- Difficult at junction
- Regular maintenance is required
- Easy to be damaged
- Wet Trade

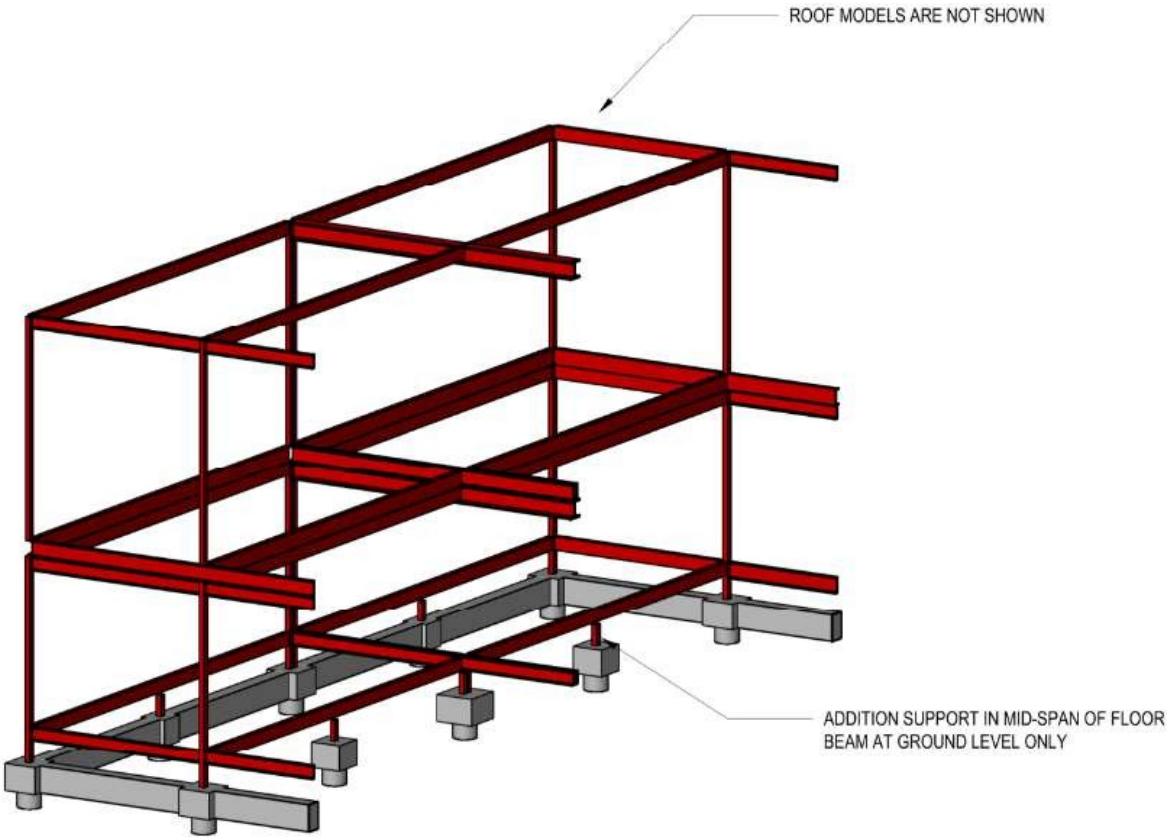


Figure 6 – Steel framing system – Two storey

Prefabricated, Pre-finished component including junction

- Connection between panels needs to be detailed
- Maintenance - visual access behind panels

Boxed

- System needs to be assembled and finished on site, not DfMA

The RCP in Figure 7 details the structural component sizes for the steel structure system. Disclaimer:

- All structural element sizes are indicative only, they are high level figures for the purpose of this report.
- The column sizes are to be designed for the right number of stories in the building.

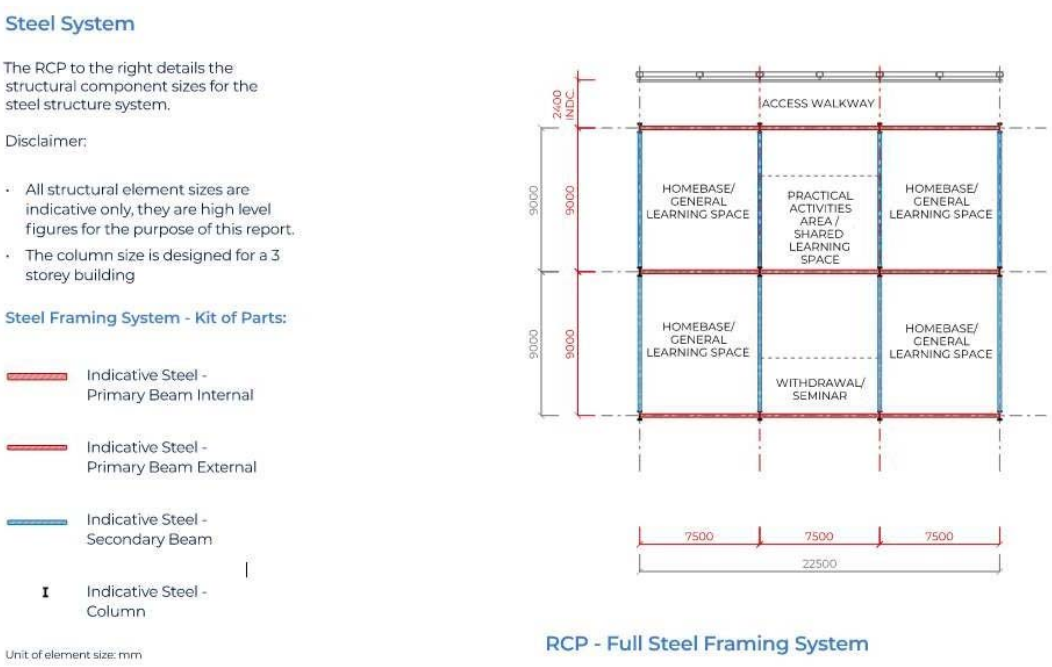


Figure 7 – Reflected ceiling plan (Extracted from SINSW DFMA Guideline)

The diagrams in Figure 8 indicate the specific zones allocated to services. The steel structure has been designed to allow easy maintenance and access to all services.

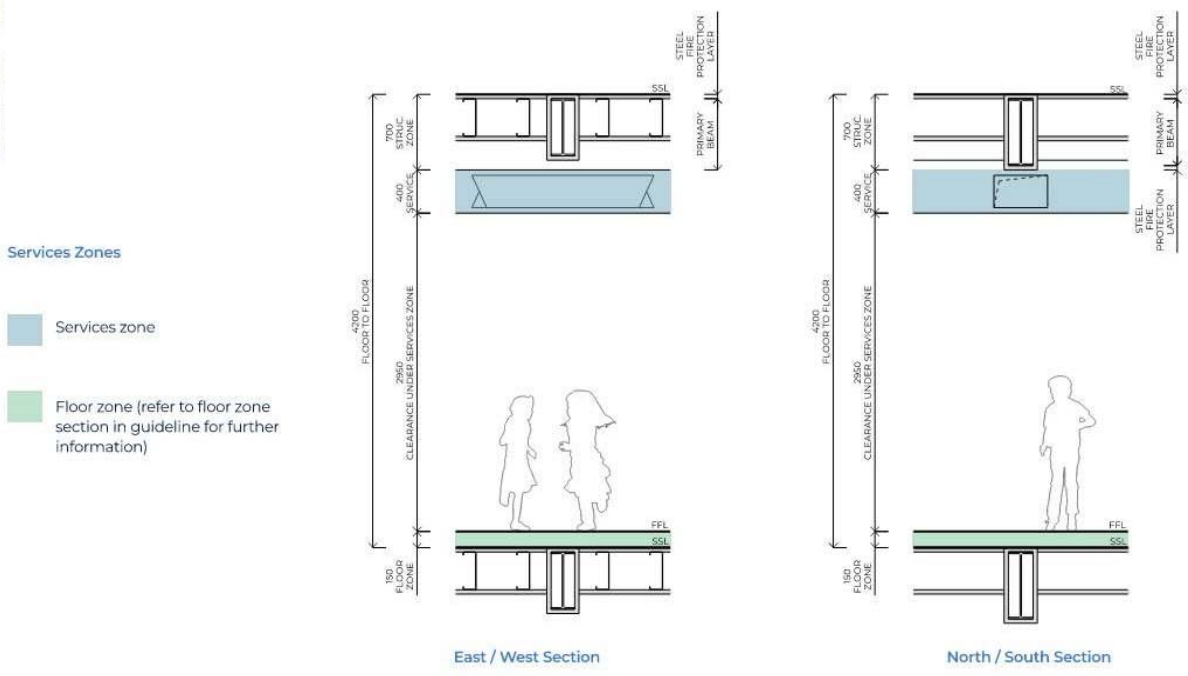


Figure 8 – Services zone in ceiling (Extracted from SINSW DFMA Guideline

4.4. Roof

The roof either will be a separate roof module or will form part of the top floor modules. Following loads and environmental impacts are to be considered in design of roof system, refer to Figure 9.

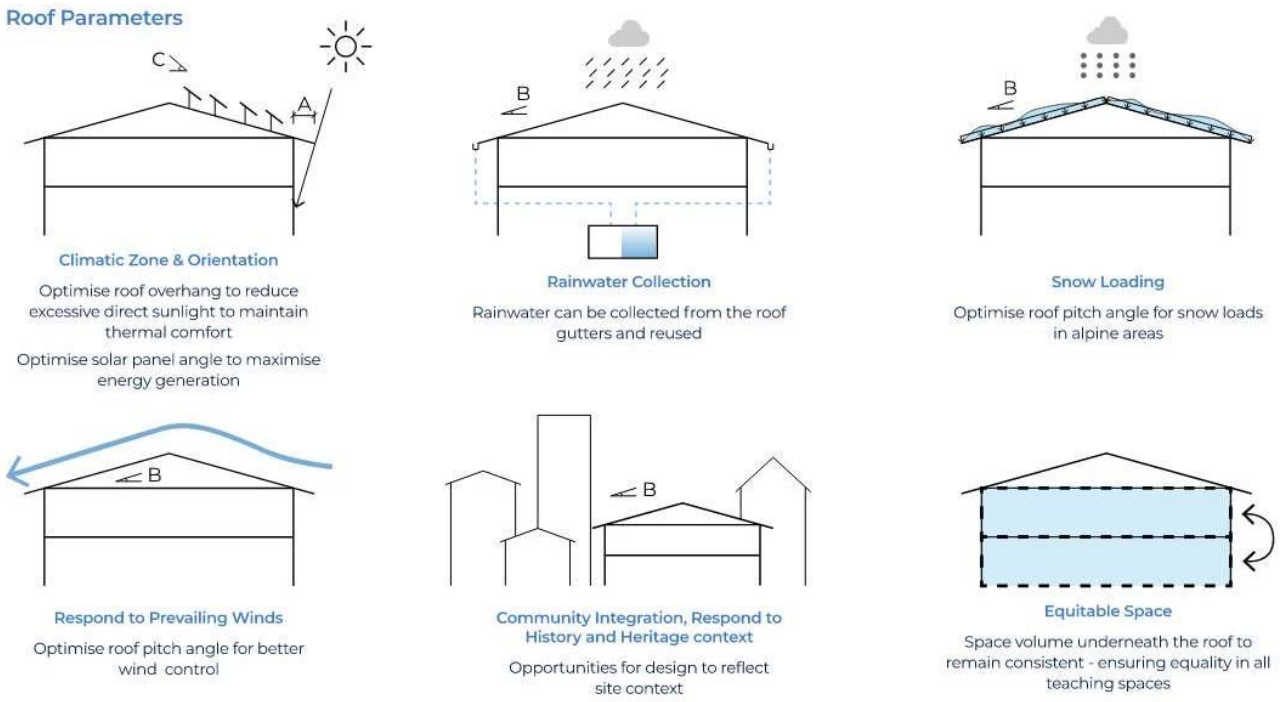


Figure 9 – Roof design considerations (Extracted from SINSW DFMA Guideline)

4.4.1. Roof Form Matrix

The design of the roof provides an opportunity to customise the design system. The approach should take into account and be tailored to respond to:

- Community Integration
- Climate Zone and Orientation
- History and Heritage
- Opportunities for Water Collection
- Energy Generation
- Thermal Performance
- Visual Identity

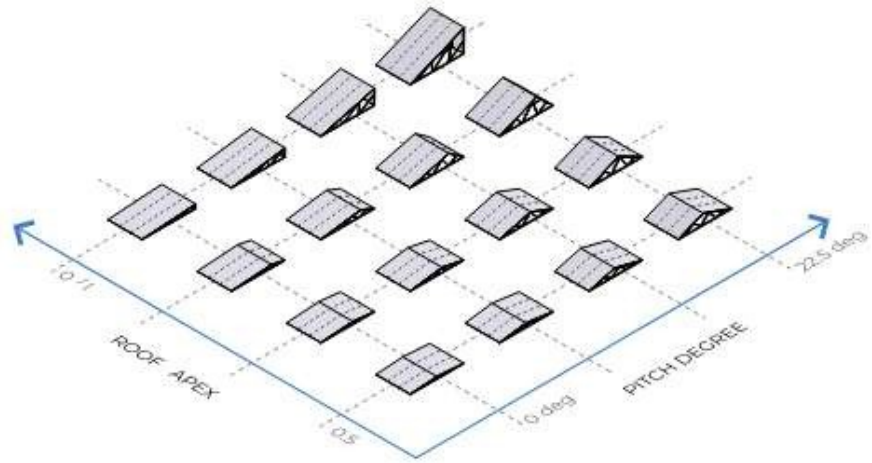


Figure 10 - Roof pitch outline (Extracted from SINSW DFMA Guideline)

4.4.2. Roof – Base Option

The base option of the roof comprises of three main components - Structure, Sheeting and PV Panels. The roof pitch angle is set about 4 degrees to comply with the current EFSG requirements, refer to Figure 11.

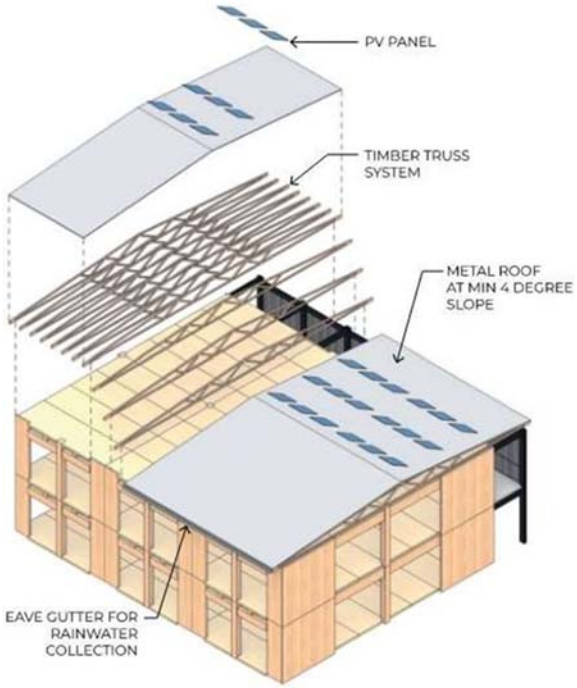


Figure 11 - Roof main components (Extracted from SINSW DFMA Guideline)

4.5. Lateral Bracing System

To provide lateral stability of DFMA units, lateral load bearing system similar to what is shown in Figure 12 to be utilized. Bracing frame to extend from base to roof.

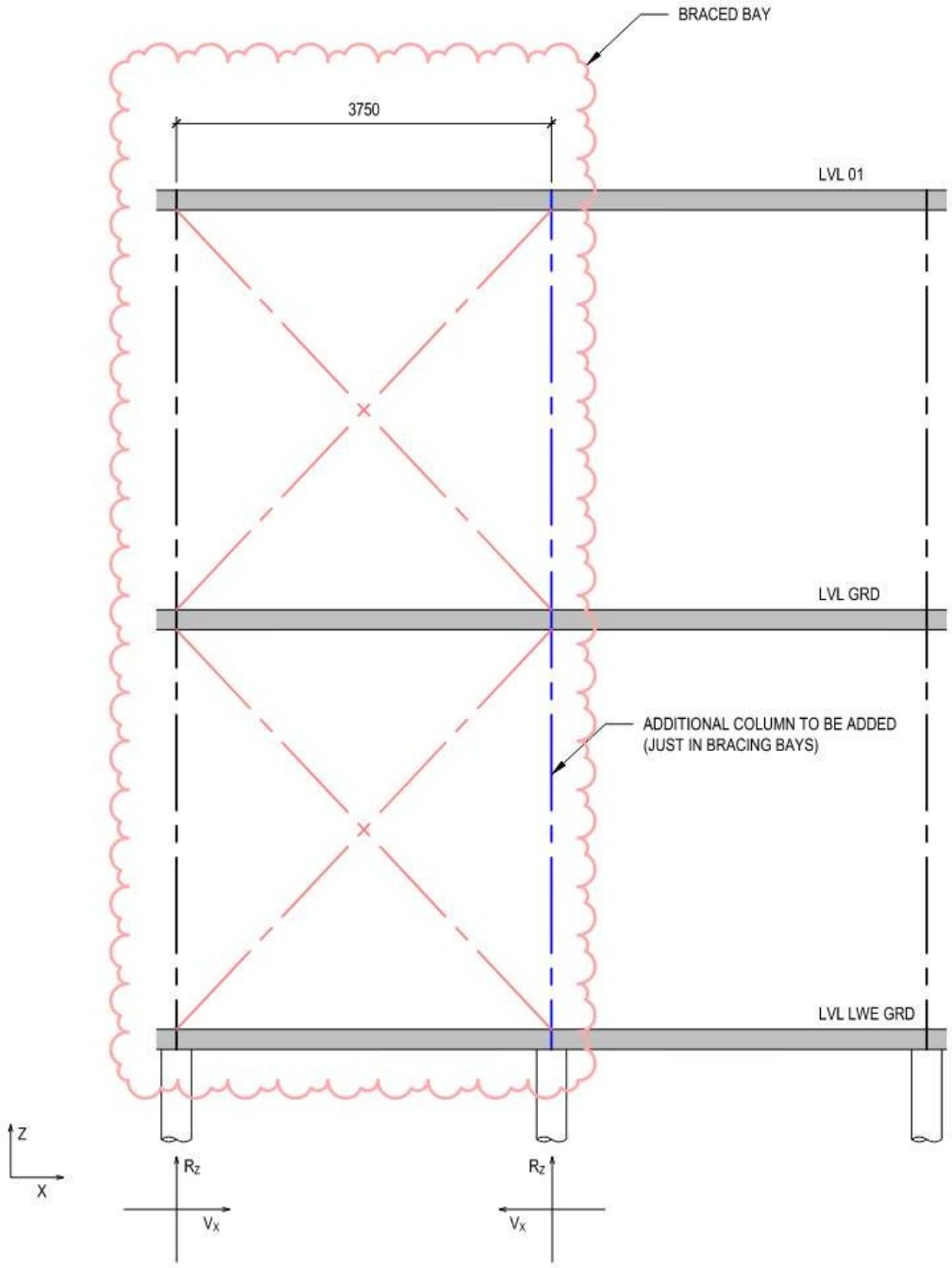


Figure 12 – Lateral Bracing System

5. STRUCTURAL DESIGN

5.1 Australian Standards and NCC

The following Australian Standards in combination with NCC 2019 and EFSG are used in the structural design of this project.

- AS/NZS 1170.0/2002 – Part 0: Structural design actions
- AS/NZS 1170.1/2002 – Part 1: Permanent, imposed and other actions
- AS/NZS 1170.2/2011 – Part 2: Wind actions
- ASNZS 1170.3-2003 – Part 3: Structural design actions - Snow and ice actions
- AS/NZS 1170.4/2007– Part 4: Earthquake loads
- AS3600 – 2018: Concrete structures
- AS4100 – 1998: Steel structures
- AS1720- 2010: Timber Structures
- AS3700 – 2018: Masonry Structures
- AS2159 – 1995: Piling
- AS/NZS4600 – 2001: Cold-formed steel structures
- AS/NZS3828 – Guidelines for the erection of building steelwork

5.2 Site specific information and ground conditions

M+G Consulting Engineers assumes that external reports are professionally prepared by appropriately qualified sub- consultants and reviewed by the SINSW. Meinhardt Bonacci Group (NSW) rely on the information provided in these external reports and will not be held responsible for any of the recommendations or advice contained within these reports.

Geotechnical Report
Douglas Partners have conducted geotechnical study on Bungendore High School site. The results of the site investigations have been summarized in the geotechnical report with Project No. 202107.01 & document No. R.001.Rev1, dated 12th of May 2021.

Foundation Design and Concepts
All the footings are to be founded on natural ground: the underlying sandstone laminate or hard clays.

Site Retention/ Retaining Walls Including Temporary and Permanent Batters
Minor retaining walls will be required for sub floor areas under modules.

Groundwater Table
No ground water has been identified during the investigation.

Earthquake
The earthquake design will be carried out in accordance with the Earthquake Design Code AS1170.4- 2007.

Wind Tunnel Testing
None carried out by Meinhardt Bonacci Group. None will be required for this project as per wind code requirements.

5.3 Design Loading Information

Loads and their appropriate load combinations will be in accordance with AS1170.0, AS1170.1, AS1170.2 and AS1170.4. The applied loading is summarised in this section of this design brief.

This section is to be read in conjunction with the structural drawings, which will indicate the design loads of each floor on the concrete outline drawing. Note, masonry walls loads are excluded from these loading drawings and should be taken from the relevant architectural drawings.

Self-Weight Loads (SW)
Self-Weight loads shall be calculated as provided for in the current version of AS1170. Part 1: Permanent, imposed and other actions.

Material densities are taken from AS1170.1.

Super Imposed Live and Dead Loads
Live loads are taken from AS1170.
Part 1: Permanent, imposed and other actions. The following table describes the more significant loading on the project, and further clarification of floor loads can be obtained by referring to the loading diagrams in the structural set of drawings.

Pattern Live loads shall be considered if applicable in accordance with Clause 2.4.4 of AS3600. Live load reduction shall be applied to AS1170.1 if appropriate for vertical elements.

5.3.1. Façade Loading
Assumed to be lightweight metal. TBC by architect.

5.3.2. Building Wind Loads
To AS1170.2 for a Region A2 wind and a Terrain Category 3.

5.3.3. Construction Live Loads

5KPa allowance should be made for construction loading on concrete floors/pavements.

5.3.4. Snow Loads

In accordance with AS1170.3 considering that proposed sites are in sub-alpine regions.

5.3.5. Earthquake Loads

Project will be designed in accordance with AS1170.4 - 2007 and the BCA 2015.

Hazard Factor: Z = 0.08

Life Span: 50 years

Site Subsoil To be confirmed.

Probability of exceedance kp = 1.3

Importance Level 3

5.3.6. Robustness Loads

In accordance with the requirements of AS1170.0/2002 Amendment 3 the robustness load is taken as 1.5% of the gravity load (G + ψcQ).

5.3.7. Blast and Impact Loading

It is noted that the design of the building and structure and boundary walls if any has not been designed for any vehicle impact loads (other than car-park barriers load taken from AS1170.1), nor has the building or its structure been designed for any blast/explosion loadings or terrorist induced loading events.

5.4 Limit State Design Criteria for Structural Elements

5.4.1. General Design Approach

The limit state design for strength, serviceability and stability of the relevant structural elements within the building will generally follow the established criteria in the relevant material design codes AS4100 and AS3600 unless noted otherwise below.

5.4.2. Structural Movements

Building Sways (Deflection) subject to service wind loads shall satisfy;

Total lateral deflection to not exceed height/500.

Inter-storey deflection to not exceed inter-storey/500 or 12mm, whichever is lesser.
Floor Deflections to AS3600 and AS4100, limited to span/250 total and span/500 incremental for flexible partitions, and span/500 total and span/1000 incremental for (non-flexible) rigid

partition walls without regularly spaced movement joints. Deflections for transfer elements shall be limited to the lesser of Span/360 or 10mm max total deflection.

5.4.3. Fire Resistance

Fire rating to AS3600/AS3700/AS4100. Generally, the elements are to be designed for a FRL of; 120/120/120 by BCA Consultant

5.4.4. Crack Control

Generally, all internal suspended slabs will be designed for a moderate degree of crack control, except for external roof slabs over living areas where a strong degree of crack control will be adopted. For Post tension slabs, this will result in a minimum post tension stress of 1.4MPa and 2.0MPa for moderate and strong degree of crack control, respectively.

Pour strips or Temporary Movement Joints (TMJs) will be introduced where appropriate to minimise the long-term creep and shrinkage effect of the concrete and these will be coordinated with the builder construction program.

5.4.5. Minimum Connection Requirements and Ties

All connections, including but not limited to beam/slabs to columns/wall, precast, etc, shall be designed to clause 6.2.3 AS1170.1 for the transfer of the lateral loads and robustness.

5.4.6. Durability

Durability to be to AS3600/AS4100/AS2311 / 2312. Maintenance levels and design life are to be nominated by the client with regard to surface coatings.

5.4.7.

Floors shall be designed to ensure that there are only slight perceptible vibrations under footfall effects, or from other internal or external sources.

Floors shall be designed to ensure they comply with the recommended acceleration and velocity limits in the relevant standards. The R value method outlined in Annex A of AS2670.2 and Appendix A of BS6472 will be used. A dynamic assessment shall be undertaken in accordance with SCI p354 Design Guidelines or approved equivalent. The floor structures shall be designed to achieve a maximum "Multiplying Factor" R value as appropriate.

The following parameters shall be used for the analysis:

- Weight of 1 person 746N (76kg x 9.81)
- Dynamic Concrete Modulus – of 1.2 x Ec as provided in AS3600 is to be used

Floors are not designed for vibration emanating from plant equipment, ducting, fans etc. All vibrations from *plant are to be isolated at the source with dampers and vibration isolation devices.*

5.5 Structural Steel Design Criteria \

Vertical Deflection Criteria
The design criteria for vertical deflections of structural steel rafters and beams are as follows;

Total Deflection (after pre-cambers)	
Self-Weight and Dead Load:	Span/300 or 20mm
Self-Weight, Dead Load and Short-term Live Load:	Span/250 Incremental
Deflection Short Term Live Load or Wind Load:	Span/200 or 30mm
Ceiling Dead Load only:	Span/500

Incremental and Total Deflection criteria are based on AS1170.0:2002 Table C1 for Rippling, sagging and cracking limit requirements for hung ceilings

Incremental deflections to rafters and primary beams can be additional and consideration of suitable deflection heads to walls is required.

It is assumed that appropriate movement and expansion joints are installed into brittle ceiling finishes and fixtures to assist in controlling cracking from the roof deflections described above.

For Cantilever beams and rafters, the deflection limit at the ends of the cantilevers is based on the above limits but with the span being equivalent to twice the distance from the support to the end of the cantilever.

5.6 Construction Material: Codes, Properties and Construction Practices

Concrete
The design, material properties and construction of all reinforced concrete elements shall comply with the provisions of AS3600 and any other relevant reference noted in this brief
For detailed information on the specification of concrete elements refer to the Concrete Specification.

In particular take note of the curing requirements within the specification to prevent shrinkage and drying shrinkage cracking.

5.6.1. Structural Steel

The design, material properties and construction of all structural steel elements shall comply with the provisions of AS4100 and any other relevant reference noted in this brief
For detailed information on the specification of steel elements refer to the Structural Steel Specification.

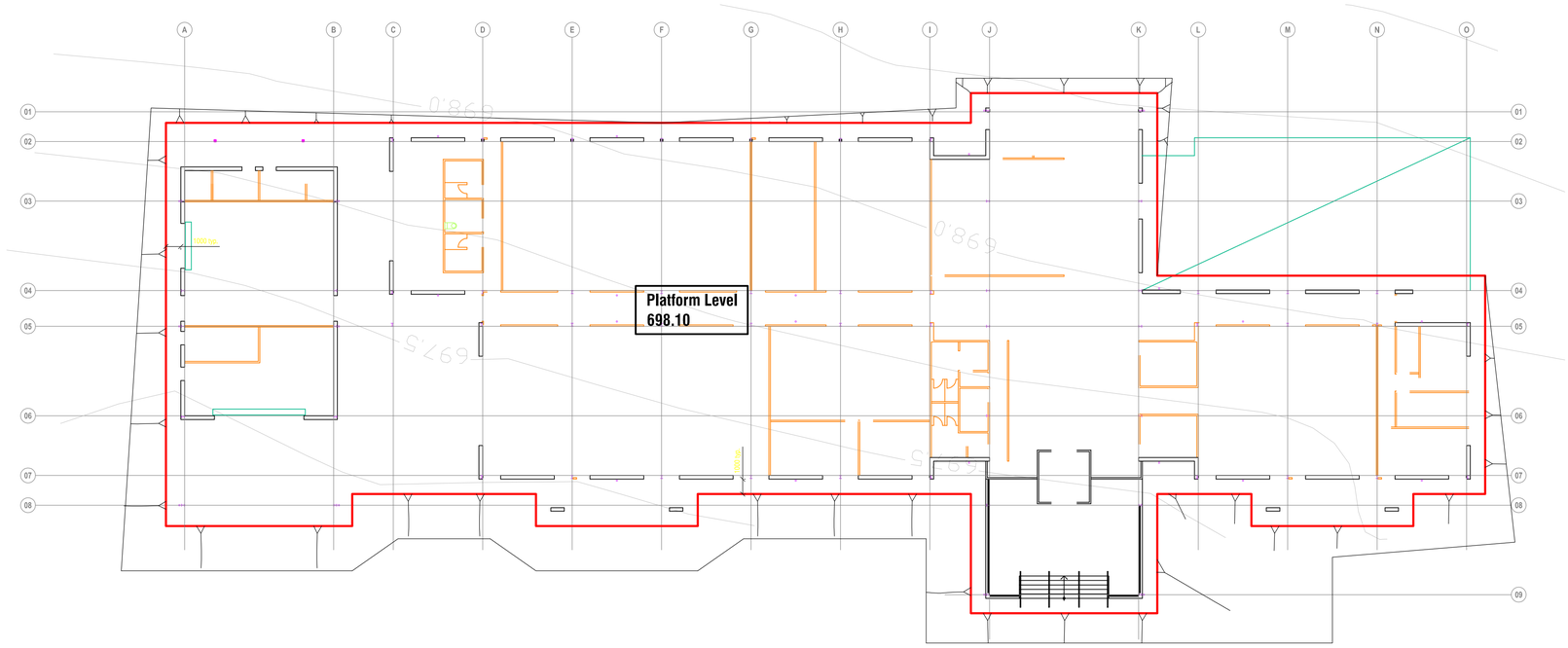
5.7 Design Certification by Others

All the structural items are to be certified by relevant qualified designer.

5.7.1. Design and Certification of Waterproofing

All roofs, retaining walls, hydrostatic basement slabs, and balconies that require waterproofing will not be structurally designed to be watertight. It is not intended to rely on the inherent crack resistance of the reinforce/post-tensioned slabs and walls to resist water ingress. The crack control measures adopted for these concrete elements cannot be solely relied upon for water tightness. As such, the water tightness of the slab shall be achieved through the application of appropriate waterproofing membranes that are applied, designed, specified, and certified by another consultant.

6. Appendix A – Record Structural Drawing of Council Building - BHS



Bulk Earthworks Plan

BULK EARTHWORKS

1 Refer to the Geotechnical Investigation Report on the site prepared by ACT Geotechnical Engineers Pty Ltd dated December 2005.

2 Remove existing topsoil, organic material and fill beneath the building platform.

3 Batter temporary banks at an angle that will be stable throughout construction. Obtain advice from the geotechnical engineer if necessary.

4 Refer to clause 5.3 in the Geotechnical Investigation Report for re-use and treatment of excavated materials. Import fill when excavated material is unsuitable or insufficient.

5 Imported fill properties
- Passing 50mm sieve 100%
- Passing 75micron sieve < 25%
- Plasticity index < 15%

6 Place fill in layers and compact in accord with clause 5.4 in the Geotechnical Investigation Report.

7 Provide certification by a registered geotechnical engineer that the quality of materials and levels of compaction in the completed building platform comply with the recommendations in the Geotechnical Investigation Report.

DESIGNED by: MJJ DRAWN by: MR VERRIFIED by: x

PRELIMINARY

ISSUE	AMENDMENT	DATE
A	TENDER ISSUE	23.03.06
1	PRELIMINARY.	09.02.06

1:200 @ A1 0 2 4 6 8 10

Australian Consulting Engineers
Success is our business

ARCHITECT
colin stewart architects
wetlands house dairy road fyshwick act
po box 3469 manuka act 2603
ph 02 6228 1200 fax 02 6228 1499
e-mail csa@csarchitects.com.au
primary nominee:
colin sydmouth stewart
act 834, nsw 3119

PROJECT
PALERANG COUNCIL OFFICES
MAJARA STREET BUNGENDORE

PROJECT NUMBER: 922

DRAWING TITLE
BULK EARTHWORKS

NORTHROP
Consulting Engineers
Canberra Sydney Newcastle
15 Altree Court
Phillip ACT 2606
PHN (02) 6285 1822
FAX (02) 6285 1863
A.B.N. 82 064 775 088

JOB NUMBER
CB050308

DRAWING NUMBER
C01 A

NUMBER IN SET : ?

GENERAL NOTES

1 Read drawings and notes in conjunction with specifications and other consultants' drawings.

2 Specification: NATSPEC Site & Structure UNO.

3 Refer discrepancies to the Architect before proceeding with work.

4 Do not scale drawings.

5 Ensure work quality, testing, materials and verifications are in accordance with the specifications and current applicable SAA codes.

6 Install proprietary items specified in accordance with the manufacture's written specification.

7 Install and maintain temporary bracing and support to ensure structure is stable at all times during construction.

8 All architectural fitments such as glazing, partitions, ceiling, etc. should allow for the short and long term movement of structural elements. Allow for movement of 20mm unless specified or agreed otherwise.

EARTHWORKS

1 Remove existing topsoil, organic material and fill beneath building platforms.

2 Batter temporary banks at an angle that will be stable throughout the construction period. Obtain advice from the geotechnical engineer if necessary.

3 If earthworks extend beyond the site boundary, obtain appropriate approvals and reinstate on completion.

4 Import fill when excavated material is unsuitable or insufficient.

5 Imported fill properties
- Passing 50mm sieve 100%
- Passing 75micron sieve < 25%
- Plasticity index < 15%

6 Place fill and sub-base in layers not exceeding 200mm and compact to at least 95% MMDD.

7 Backfill against retaining walls with granular materials and compact with hand operated equipment.

8 Provide certification that the quality of materials and levels of compaction comply with the drawings and specification.

CONCRETE

1 Carry out all work in accordance with AS3600 and NATSPEC Concrete.

2 Concrete properties UNO
- Grade N25
- Max. Aggregate Size 20mm
- Slump 80mm

3 Obtain approval for the following:
- Curing procedures (PVA membranes not permitted)
- Stripping and back propping procedure (Refer AS3600 Section 19.6)
- Detail and location cast in services and fitments
- Conduits and penetrations
- Construction joints not shown on the drawings
- Set downs and falls not shown on the drawings

4 Lap reinf. in accordance with AS3600 Section13.

5 Clear concrete cover to reinf. UNO
- Columns 30mm to ties
- Interior (protected from weather) 20mm
- Exterior 30mm
- In contact with ground (unformed) 50mm

6 Formwork Class (AS3610)
- UNO 3
- Exposed concrete walls 2
- In ground footings 5

7 Consolidate concrete by vibration.

8 Sample and test concrete in accordance with AS3600 Section 20.7.
Project assessment of strength grade unless instructed otherwise.

9 Surface Finishes
- Columns, beams, walls & stairs off form
- Floor slabs UNO machine float & fine steel trowel
- Areas to have other applied finshes screeded

10 Surface tolerances
- UNO class B
- Exposed concrete walls class A

11 Cure finished concrete surfaces for at least 5 days.

12 Masonry anchors
- UNO Ramset truebolts (longest version). Use stainless steel where exposed to the weather or joining non-ferrous or pre-painted members.

MASONRY

1 Carry out masonry construction in accordance with AS3700.

2 Minimum characteristic unconfined compressive strength of the masonry units
- Clay bricks 20MPa
- Concrete blocks 15MPa

3 Bed units in freshly prepared uniformly mixed mortar M3

4 Reinforced block work
- Ensure starters are correctly located in footings
- Use E shaped blocks in the bottom course to clean cores and tie reinforcement
- Clean out cores after each day's laying

5 Grout
- Compressive strength 20MPa
- Maximum aggregate size 10mm
- Slump 250mm

6 UNO on drawings use galvanised steel lintels
- 10 thick flat bar for maximum spam 900
- 100 x 10 EA for maximum span 2100
- 150 x 100 x 10 UA for maximum span 3000
To support stud walls over masonry
-100 x 10EA for maximum span 2400
-150 x 100 x 10UA for maximum span 3600

7 Use medium duty masonry ties UNO.

8 Where masonry joins structural steel or passes a return wall on the inner skin, provide medium duty galvanised ties at 300 max centres. Shot fix or spot weld ties to steelwork. If shot fixed, ensure nails concealed.

9 Provide control joints at max 8m spacing generally and 4m from return walls or other restraints.

10 Do not cut, chase or rake joints more 5mm deep unless approved for every location.

11 Top load bearing walls with:
- For clay bricks and grout filled blocks, 2 layers of "Alcor" or similar over level render
- For hollow blocks 6mm compressed fibre cement sheet and one layer of "Alcor"

12 Finish non-load bearing walls 20mm below slab soffit and fasten to the soffit using MFA-4 sliding ties at max 500mm centres.

13 Masonry anchors in cored masonry
- Ramset "Hollow block studs with sleeve" or approved equivalent. Anchors exposed to weather galvanised.

PRECAST CONCRETE

1 Where applicable, carry out work in accordance with "Recommended Practice Design and Detailing Precast Concrete" published by Concrete Institute of Australia.

2 Reinforcement shown on structural drawings is the minimum required for in service conditions. If necessary, provide additional reinforcement for handling and transport loads.

3 Details on drawings show one possible method of supporting the precast elements. Alternative methods can be used if they conform with the required concrete outlines and are structurally sound.

4 Prepare detailed drawings of precast elements and their connections. Include chamfers, drip grooves, rebates for windows and flashing, etc and structural details. Submit for approval.

5 If necessary, submit shop drawings to the Building Authority and obtain the necessary approvals.

6 Submit colour and finish samples for approval before casting.

7 Formwork UNO Class 2

8 Finish UNO off form

9 Provide adequate notice of fixing details which may affect the construction of other parts of the structure, eg inserts in beams, holes in structural steel members, etc.

STRUCTURAL STEELWORK

1 Fabricate and erect structural steelwork in accordance with AS4100 and AS4600.

2 Provide holes, cleats and fixing for timber framing, finishes etc. shown on architectural drawings.

3 Prepare shop drawings and submit for review before fabrication starts.

4 UNO, use
- 10mm plates
- M20 8.8/S bolts
- 6mm continuous fillet welds
- E48XX mild steel electrodes
- Category SP welds

5 Install bolts with one hardened washer under the turned part.

6 Cold formed sections
- Minimum yield stresses purlins and girts 450MPa, other sections 250MPa
- Surface treatment hot dipped zinc coating, at least 200g/sqm
- Laps, bridging, brackets and purlin bolts in accordance with manufacturer's specifications

7 Surface treatment UNO
- Protected from weather, class 1 clean (Mechanical wire brush acceptable) with 70 microns of zinc phosphate primer (SP1-C in AS2312)
- Exposed to weather, class 2.5 blast clean with 70 microns of inorganic zinc silicate paint (MP01-A in AS2312)

8 Unless otherwise detailed, provide 100x100x1.2 angle or C10012 trimmers, screw fixed to purlins or steel framing, to support edges of sheeting at hips, valleys, penetrations, etc.

9 Typical steelwork connections UNO
- Column base plates, 20 base plate, 4M16 holding down bolts to footing or slab
- Beam to top of column, cap plate, 2 or 4 bolts
- Beam to side of column, fin plate, 2 bolts
- Beam to side of beam, end plate or fin plate, 2 bolts
- Column to top of beam, base plate, 2 or 4 bolts or site weld
-Beam to precast concrete, end plate, 4M12 chemset anchors

TIMBER

1 Carry out work in accordance with AS1720 and AS1684.

2 Supply timber with certified stress grade clearly identified.

3 All exposed timber durability class 2 or better

4 UNO use
- M16 4.6/S bolts with 55dia x 3.0 washers under head and nut
- M16 4.6/S coach screws with 55dia x 3.0 washers
- 10g Type 17 screws with at least 30mm penetration
- 3.15dia nails
- Connector plates complying with AS1649
- All bolts, nuts, washers, screws, nails, etc to be galvanised

5 Protect timber from the elements during fabrication and erection.

6 Re-tighten accessible bolts as close to completion as possible.

7 Install bracing and hold down in accordance with the details in AS1684.

DESIGN LOADS

1 Wind loads
- Basic wind speed Vu(max.) 45m/s
- Structure importance multiplier 1
- Terrain category 3
- Internal pressure coefficient 0.3

2 Earthquake loads
- Acceleration coefficient 0.08
- Site factor 1.0
- Structural importance factor 1.0

3 Floor live loads
- Allowance for partitions etc 1.0kPa
- General live load 4.0kPa
- Plant rooms 5.0kPa

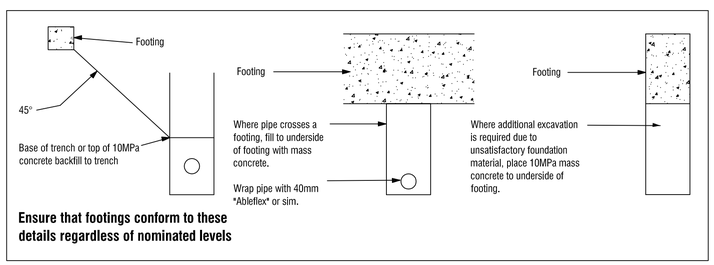
4 Roof live load 0.25kPa

FOOTINGS

1 Refer to the report on the geotechnical investigation of the site prepared by ACT Geotechnical Engineers Pty Ltd dated December 2005.

2 Allowable bearing capacity UNO
- Pad footings 150kPa
- Strip footings 100kPa

3 Ensure foundation material at base of footings is approved before proceeding with construction.



Ensure that footings conform to these details regardless of nominated levels

DRAWN MR JDL MJJ VERIFIED MJJ JM MJJ

ISSUE	AMENDMENT	DATE
A	TENDER	17.03.06
B	AMENDED AS CLOUDED	31.03.06

CLIENT

Australian Consulting Engineers
Success is our business

ARCHITECT

colin stewart architects
wetlands house dairy road fyshwick act
po box 3469 manuka act 2603
ph 02 6228 1200 fax 02 6228 1499
e-mail csa@csarch3bcts.com.au
primary nominee:
colin sydmouth stewart
act 834, nsw 3119

PROJECT

PALARANG COUNCIL OFFICES
MAJARA STREET BUNGENDORE

DRAWING TITLE

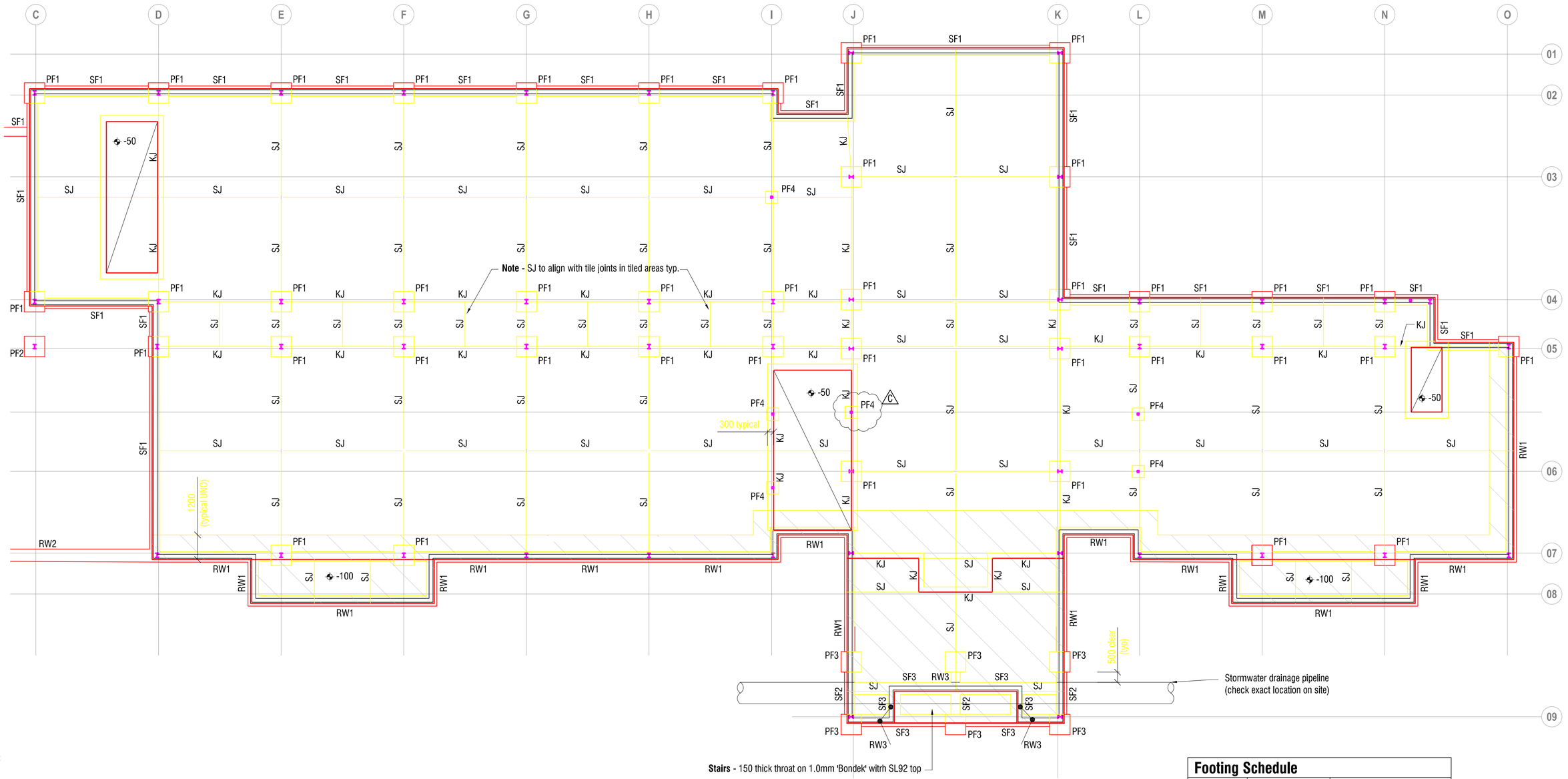
STRUCTURAL NOTES

NORTHROP
Consulting Engineers
Canberra Sydney Newcastle Wollongong
15 Altree Court
Phillip ACT 2606
PHN (02) 6285 1822
FAX (02) 6285 1863
EMAIL canberra@northrop.com.au
A.B.N. 82 064 775 088

JOB NUMBER CB050308

DRAWING NUMBER S00 B

SIZE: A1



Footing & Slab Plan

Slabs UNO
100 thick
SL82 mesh top
0.2 poly membrane
Sand levelling
Compacted subgrade

Hatched Areas
120 thick
SL82 mesh top & bottom

SJ - sawn joint in slab
KJ - keyed joint

Footing Schedule

Pad Footings	Size	Reinforcement
PF1	1000 x 1000 x 400D	6N12 b0th ways bottom
PF2	1000 x 1000 x 800D	Mass concrete
PF3	1000 x 1000 x min 1000D	Mass concrete. Found below invert level of stormwater pipe
PF4	600 x 600 X 400D	Mass concrete
Strip Footings		
SF1	400D x 450W	4-L11TM top & bottom
SF2	600D x 450W	4N16 top & bottom N12 closed ties at 400mm crs
SF3	600D x 600W	5N16 top & bottom N12 closed ties at 400mm crs
RW1	400D x 450W	4-L11TM top & bottom
RW2	300D x 800W	5N12 top & bottom N12 closed ties at 400mm crs

0 1 2 3 4 5m SCALE 1:100 @ A1
0 1 2 3 4 5m SCALE 1:200 @ A3

DRAWN MR JDL MJJ VERIFIED MJJ JM MJJ

ISSUE	AMENDMENT	DATE
A	TENDER	17.03.06
B	AMENDED AS CLOUDED	31.03.06
C	AS NOTED	18.05.06

CLIENT

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE MAKING ANY SHOP DRAWINGS OR COMMENCING ANY WORK.

Australian Consulting Engineers
Success is our business

ARCHITECT
colin stewart architects
wetlands house dairy road fyshwick act
po box 3469 manuka act 2603
ph 02 6228 1200 fax 02 6228 1459
e-mail csa@csarchitects.com.au
primary nominee:
colin sydmouth stewart
act 834, nsw 3119

PROJECT
PALARANG COUNCIL OFFICES
MAJARA STREET BUNGENDORE

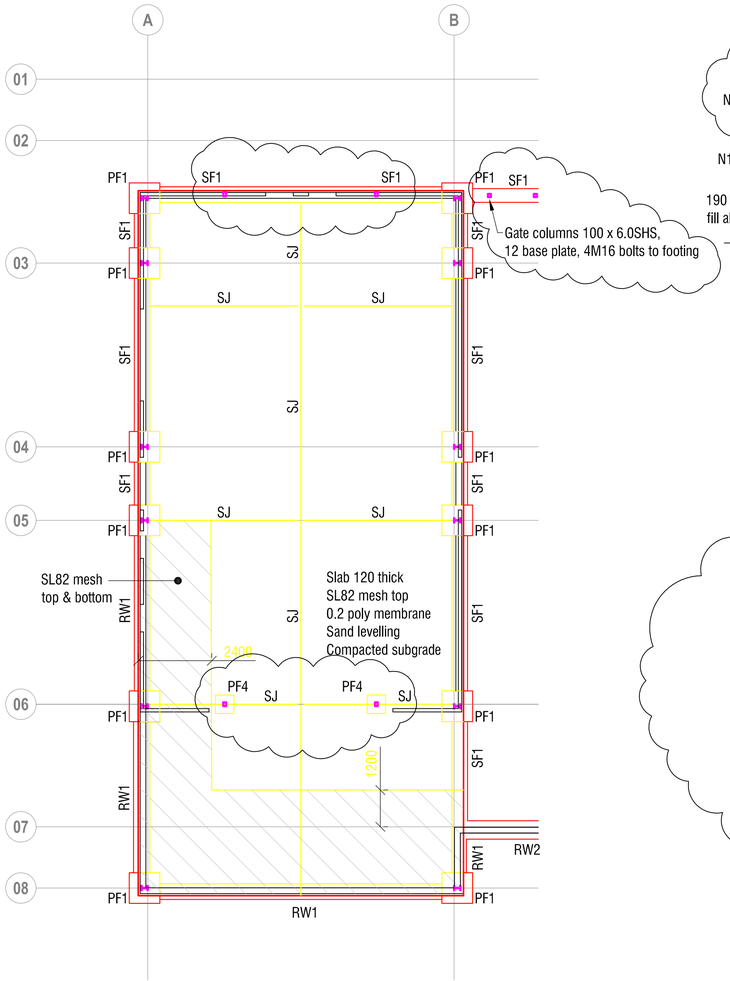
DRAWING TITLE
FOOTINGS & SLABS – SHEET 1

NORTHROP
Consulting Engineers
Canberra Sydney Newcastle Wollongong
15 Altree Court
Phillip ACT 2606
PHN (02) 6285 1822
FAX (02) 6285 1863
EMAIL canberra@northrop.com.au
A.B.N. 82 064 775 088

JOB NUMBER
CB050308

DRAWING NUMBER
S01 C

SIZE: A1

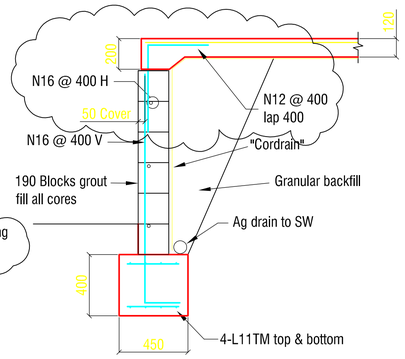


Footing & Slab Plan

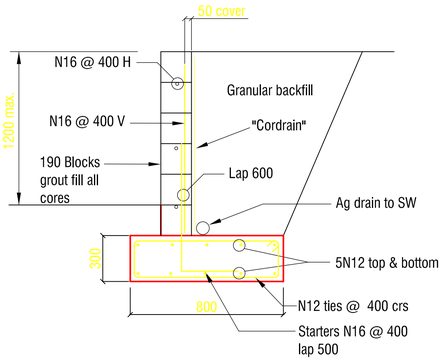
Slabs UNO
120 thick
SL82 mesh top
0.2 poly membrane
Sand levelling
Compacted subgrade

Hatched Areas
120 thick SL82 mesh top & bottom

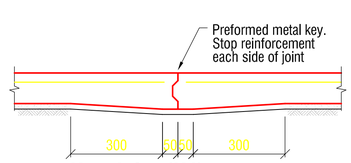
Footing Schedule		
Pad Footings	**Size**	**Reinforcement**
PF1	1000 x 1000 x 400D	6N12 bw. bottom
PF2	1000 x 1000 x 800D	Mass concrete
PF4	600 x 600 x 400D	Mass concrete
Strip Footings		
SF1	400D x 450W	4-L11TM top & bottom
RW1	400D x 450W	4-L11TM top & bottom
RW2	300D x 600W	4N12 top & bottom N12 closed ties at 400mm crs



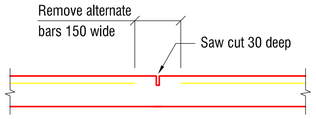
Typical RW1 Detail
RW3 Similar



Typical RW2 Detail

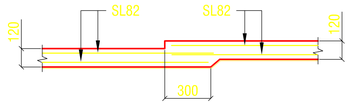


Key Joint (KJ)

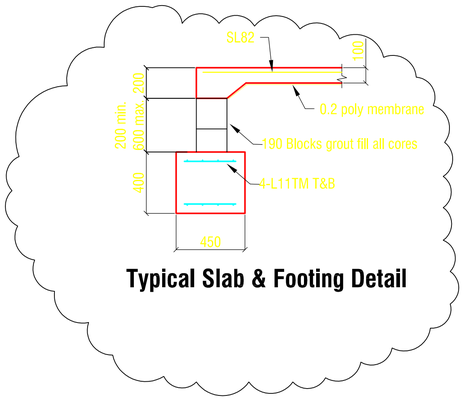


Slab Joint (SJ)

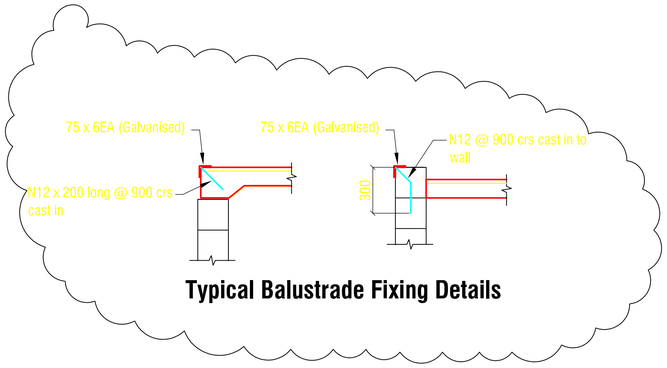
Saw joint as soon as concrete has hardened sufficiently that it will not be damaged. Fill with elastomeric sealant at least 30 days later.



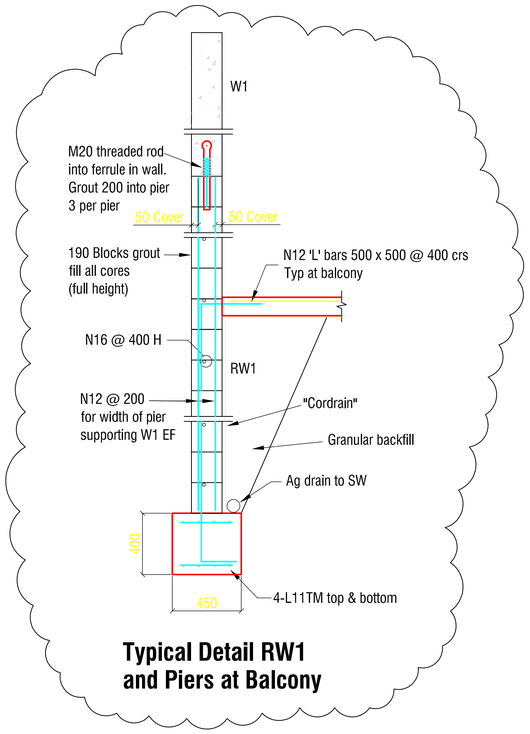
Typical Balcony Slab & Setdown Areas



Typical Slab & Footing Detail



Typical Balustrade Fixing Details



Typical Detail RW1
and Piers at Balcony

DRAWN MR JDL MJJ VERIFIED MJJ JM MJJ

0 1 2 3 4 5m SCALE 1:100 @ A1
0 1 2 3 4 5m SCALE 1:200 @ A3

ISSUE	AMENDMENT	DATE
A	TENDER	17.03.06
B	AMENDED AS CLOUDED	31.03.06

CLIENT

Australian Consulting Engineers
Success is our business

ARCHITECT

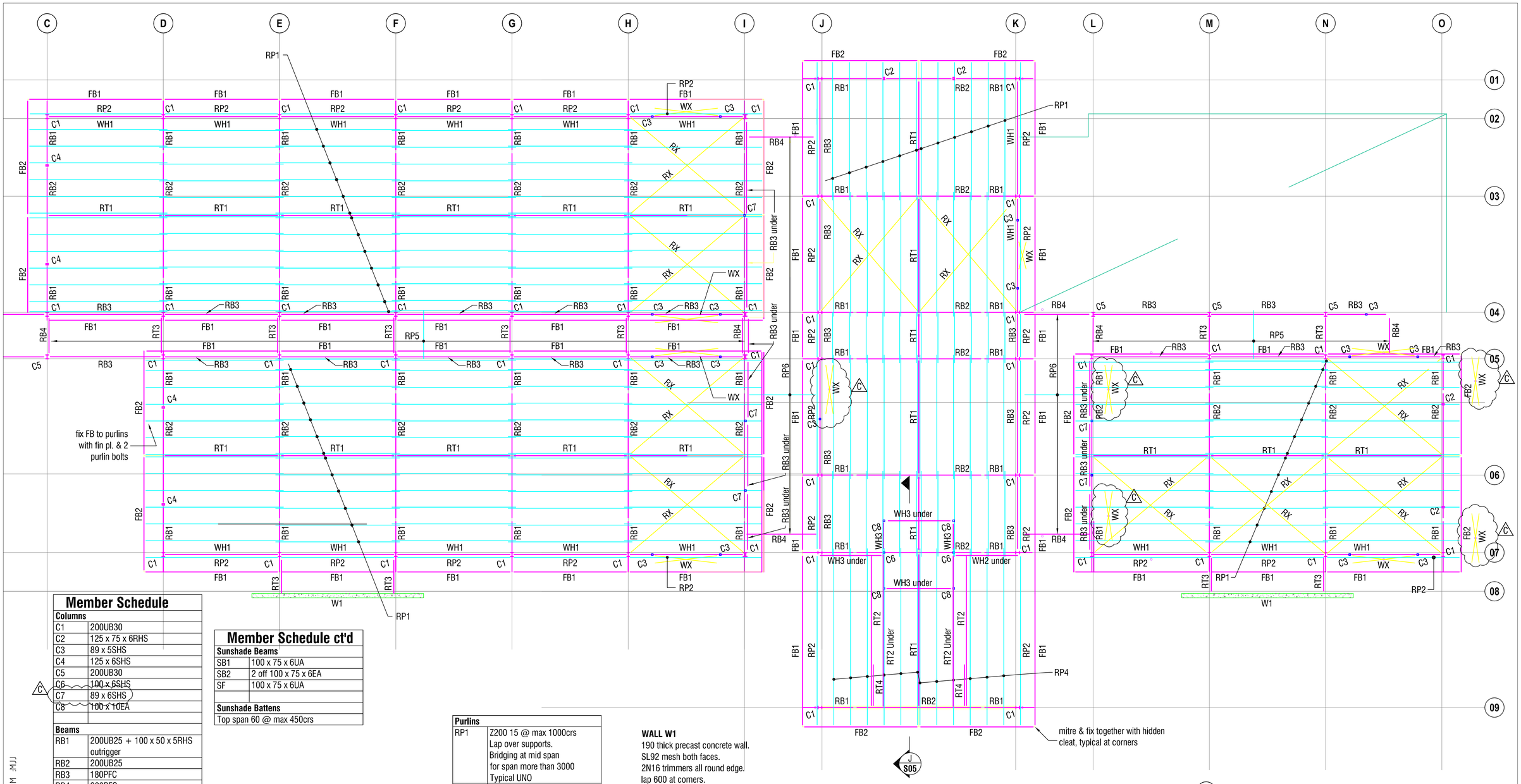
colin stewart architects
wetlands house dairy road fyshwick act
po box 3469 manuka act 2603
ph 02 6228 1200 fax 02 6228 1499
e-mail csa@csarch@hotc.com.au
primary nominee:
colin sydmouth stewart
act 834, nsw 3119

PROJECT
PALARANG COUNCIL OFFICES
MAJARA STREET BUNGENDORE

DRAWING TITLE
FOOTINGS & SLABS – SHEET 2

NORTHROP
Consulting Engineers
Canberra Sydney Newcastle Wollongong
15 Altree Court
Phillip ACT 2606
PHN (02) 6285 1822
FAX (02) 6285 1863
EMAIL canberra@northrop.com.au
A.B.N. 82 064 775 088

JOB NUMBER
CB050308
DRAWING NUMBER
S02 B
SIZE: A1



Member Schedule

Columns	
C1	200UB30
C2	125 x 75 x 6RHS
C3	89 x 5SHS
C4	125 x 6SHS
C5	200UB30
C6	100 x 6SHS
C7	89 x 6SHS
C8	100 x 10EA
Beams	
RB1	200UB25 + 100 x 50 x 5RHS outrigger
RB2	200UB25
RB3	180PFC
RB4	200PFC
FB1	200PFC
FB2	200PFC
FB3	C200 24
Window Heads	
WH1	150PFC
WH2	125 x 75 x 6 RHS
WH3	100 x 50 x 6RHS
WH4	125 x 6SHS
Ties	
RT1	10Ø4.0 CHS
RT2	200UB30
RT3	10Ø4.0 CHS
RT4	10Ø4.0 CHS
Bracing	
RX	Roof cross bracing M16 with turnbuckle
WX	Wall cross bracing M16 with turnbuckle

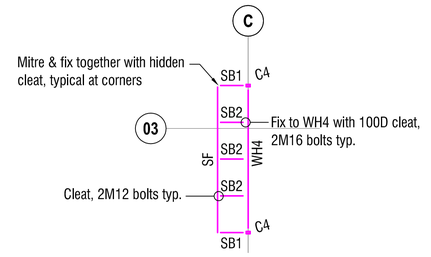
Member Schedule ct'd

Sunshade Beams	
SB1	100 x 75 x 6UA
SB2	2 off 100 x 75 x 6EA
SF	100 x 75 x 6UA
Sunshade Battens	
Top span 60 @ max 450crs	

Purlins	
RP1	Z200 15 @ max 1000crs Lap over supports. Bridging at mid span for span more than 3000 Typical UNO
RP2	C200 24 Bridging at mid span for span more than 3000
RP3	Tee from 200UB18 @max 1000 crs
RP4	Z200 24 @ max 1000crs Lap over supports. Bridging at mid span
RP5	for span more than 3000 C100 15 @ max 900crs Bridging at mid span
RP6	for span more than 3000 C150 15 @ max 900 crs Bridging at mid span for span more than 3000

WALL W1
190 thick precast concrete wall.
SL92 mesh both faces.
2N16 trimmers all round edge.
lap 600 at corners.

Council Offices Roof Framing Plan



PLAN ON SUNSHADE (GRID 'C')
GRID 'D SIMILAR
EAST WALL ENGINEERING STORE SIMILAR

SCALE 1:100 @ A1
SCALE 1:200 @ A3

DRAWN MR JDL MJJ VERIFIED MJJ JM MJJ

ISSUE	AMENDMENT	DATE
A	TENDER	17.03.06
B	AMENDED AS CLOUDED	31.03.06
C	AS NOTED	18.05.06

CLIENT

ARCHITECT
colin stewart architects
wetlands house dairy road fyshwick act
po box 3469 manuka act 2603
ph 02 6228 1200 fax 02 6228 1499
e-mail csa@csarchitects.com.au
primary nominee:
colin sydenham stewart
act 834, nsw 3119

PROJECT
PALARANG COUNCIL OFFICES
MAJARA STREET BUNGENDORE

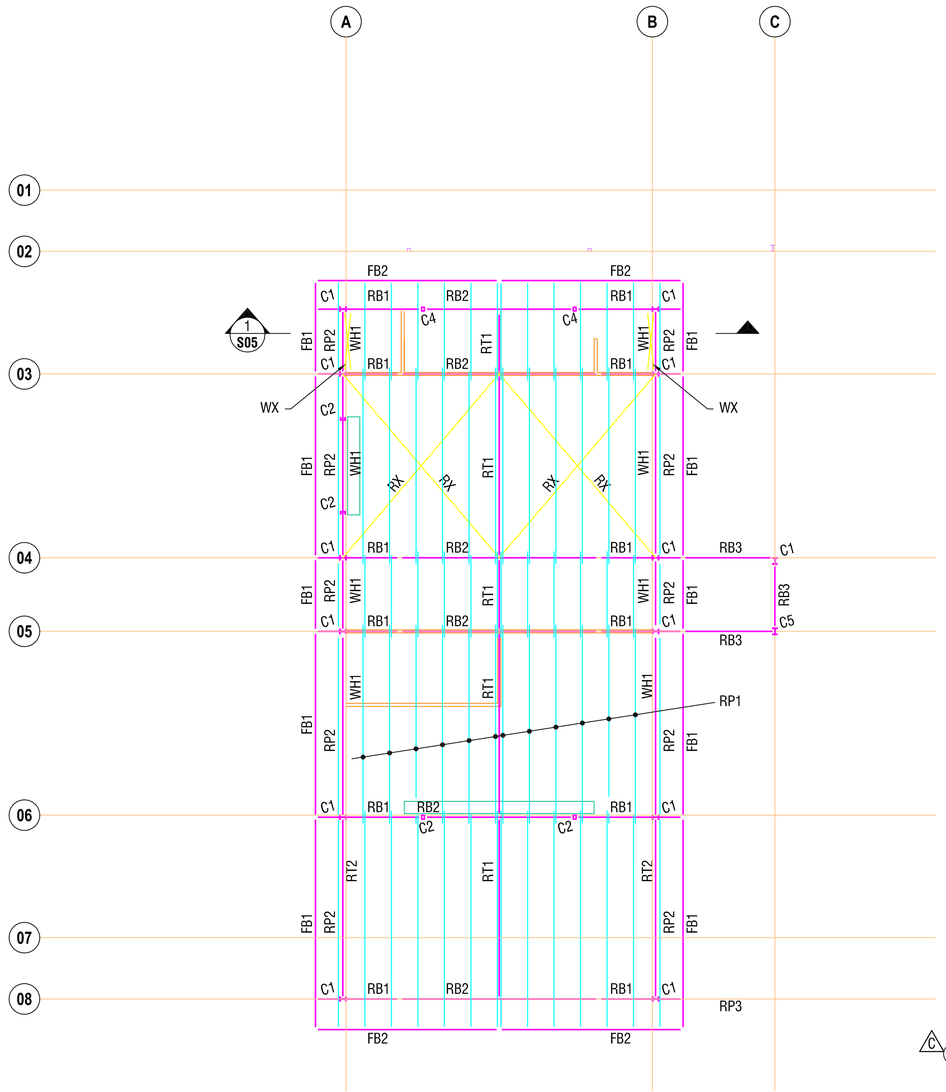
DRAWING TITLE
ROOF FRAMING PLAN – SHEET 1

NORTHROP
Consulting Engineers
Canberra Sydney Newcastle Wollongong
15 Altree Court
Phillip ACT 2606
PHN (02) 6285 1822
FAX (02) 6285 1863
EMAIL canberra@northrop.com.au
A.B.N. 82 064 775 088

JOB NUMBER
CB050308

DRAWING NUMBER
S03 C

SIZE: A1



Engineering Store Roof Framing Plan

Member Schedule	
Columns	
C1	200UB30
C2	125 x 75 x 6RHS
C3	89 x 5SHS
C4	125 x 6SHS
C5	200UB30
C6	100 x 6SHS
C7	89 x 6SHS
Beams	
RB1	200UB25 + 100 x 50 x 5RHS outrigger
RB2	200UB25
RB3	180PFC
RB4	200PFC
FB1	200PFC
FB2	200PFC
FB3	C200 24
Window Heads	
WH1	150PFC
WH2	125 x 75 x 6RHS
WH3	100 x 50 x 6RHS
WH4	125 x 6SHS
Ties	
RT1	10210ø4.0 CHS
RT2	200UB30
Bracing	
RX	Roof cross bracing M16 with turnbuckle
WX	Wall cross bracing M16 with turnbuckle

Purlins	
RP1	Z200 15 @ max 1000crs Lap over supports. Bridging at mid span for span more than 3000 Typical UNO
RP2	C200 24 Bridging at mid span for span more than 3000
RP3	Tee from 200UB18 @max 1000 crs
RP4	Z200 24 @ max 1000crs Lap over supports. Bridging at mid span
RP5	for span more than 3000 C100 15 @ max 900crs Bridging at mid span
RP6	for span more than 3000 C150 15 @ max 900 crs Bridging at mid span for span more than 3000

DRAWN MR JDL MJJ VERIFIED MJJ JM MJJ

0 1 2 3 4 5m SCALE 1:100 @ A1

0 1 2 3 4 5m SCALE 1:200 @ A3

ISSUE	AMENDMENT	DATE
A	TENDER	17.03.06
B	AMENDED AS CLOUDED	31.03.06
C	AS NOTED	18.05.06

CLIENT

Australian Consulting Engineers
Success is our business

ARCHITECT

colin stewart architects
wetlands house dairy road fyshwick act
po box 3469 manuka act 2603
ph 02 6228 1200 fax 02 6228 1499
e-mail csa@csarchitects.com.au
primary nominee:
colin sydmouth stewart
act 834, nsw 3119

PROJECT

PALARANG COUNCIL OFFICES
MAJARA STREET BUNGENDORE

DRAWING TITLE

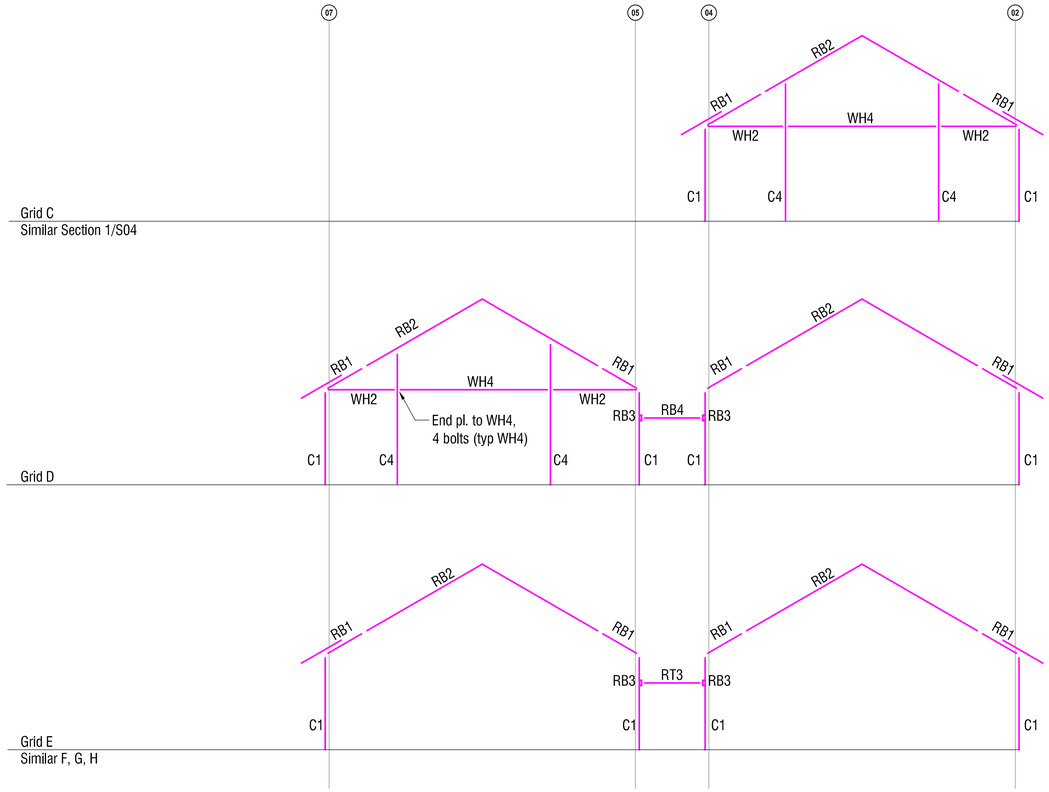
ROOF FRAMING PLAN – SHEET 2

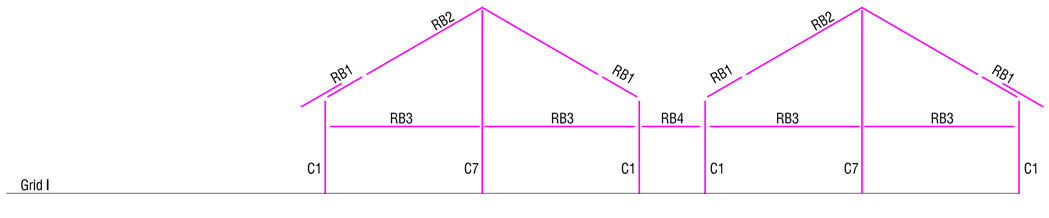
NORTHROP
Consulting Engineers
Canberra Sydney Newcastle Wollongong
15 Altree Court
Phillip ACT 2606
PHN (02) 6285 1822
FAX (02) 6285 1863
EMAIL canberra@northrop.com.au
A.B.N. 82 064 775 088

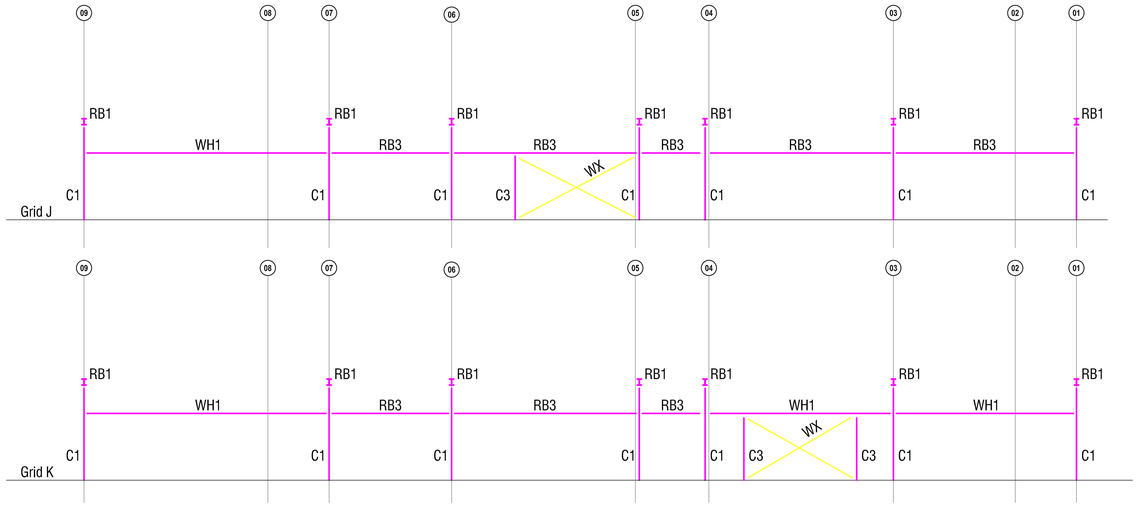
JOB NUMBER CB050308

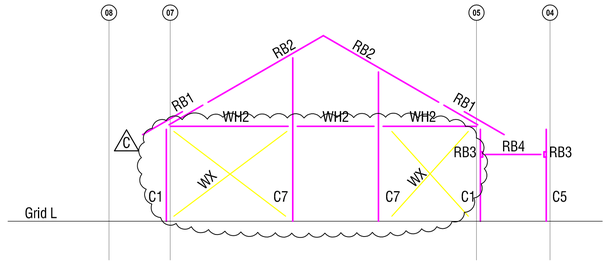
DRAWING NUMBER S04 C

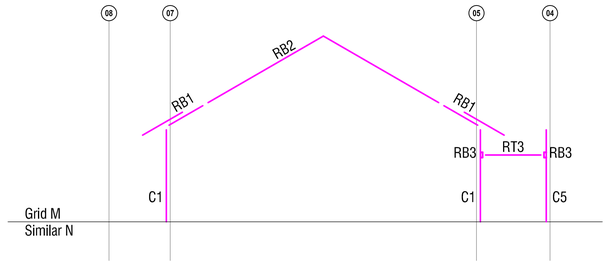
SIZE: A1

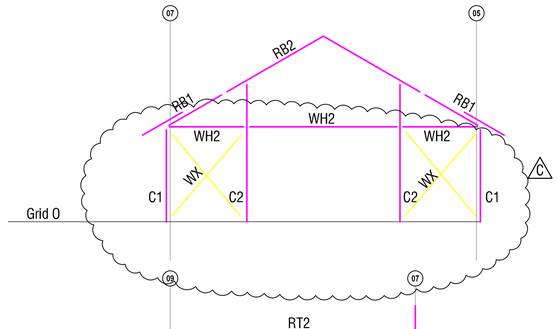


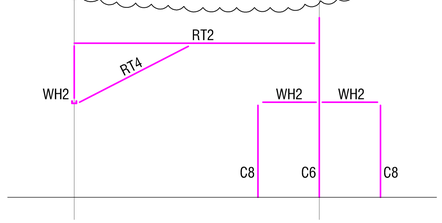




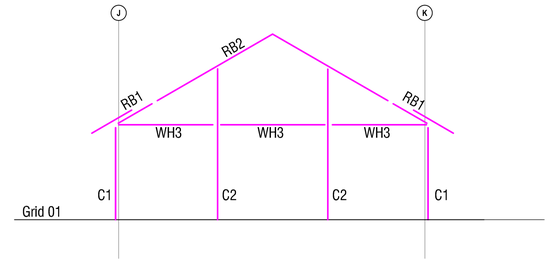


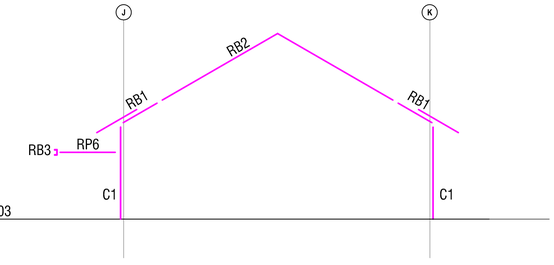


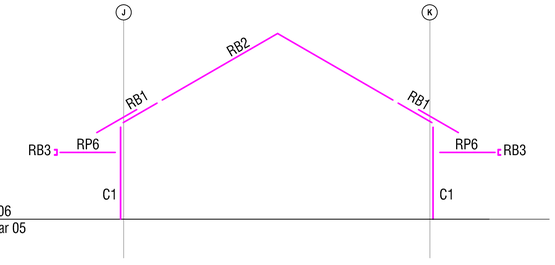


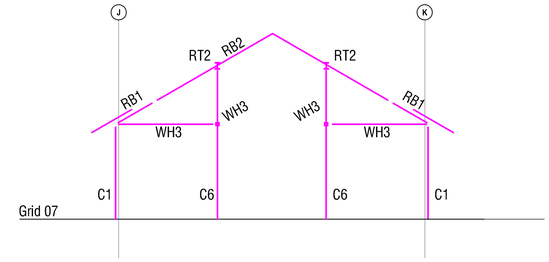


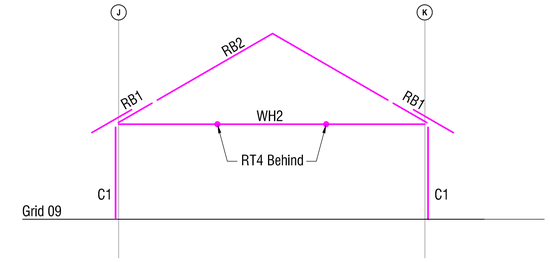
Section J S03

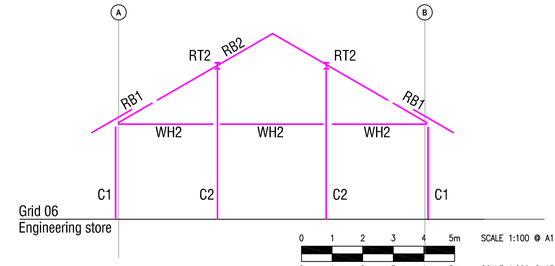












0 1 2 3 4 5m SCALE 1:100 @ A1

0 1 2 3 4 5m SCALE 1:200 @ A3

JM MJJ
VERIFIED MJJ
JDL MJJ
DRAWN MR

ISSUE	AMENDMENT	DATE
A	TENDER	17.03.06
B	AMENDED AS CLOUDED	31.03.06
C	AS NOTED	18.05.06

CLIENT

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE MAKING ANY SHOP DRAWINGS OR COMMENCING ANY WORK.

Australian Consulting Engineers
Success is our business

ARCHITECT

colin stewart architects
wetlands house dairy road hyllmkik act
po box 3460 manuka act 2603
ph 02 6228 1200 fax 02 6228 1499
e-mail csa@csarchitects.com.au
primary nominee:
colin sydmouth stewart
act 834, nsw 3119

PROJECT

PALARANG COUNCIL OFFICES
MAJARA STREET BUNGENDORE

DRAWING TITLE

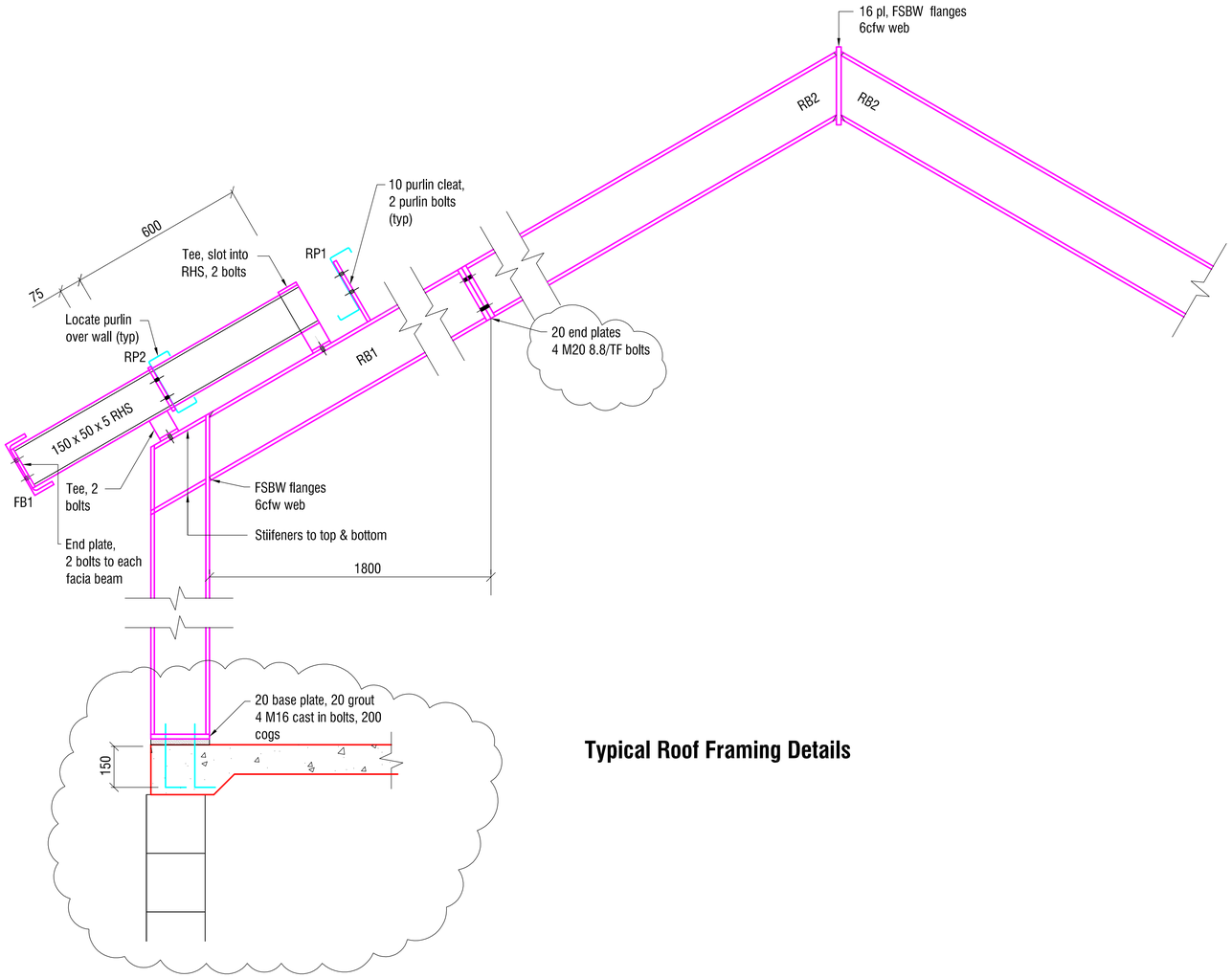
ROOF FRAMING DETAILS

NORTHROP
Consulting Engineers
Canberra Sydney Newcastle Wollongong
15 Altree Court PHN (02) 6285 1822
Phillip ACT 2606 FAX (02) 6285 1863
EMAIL canberra@northrop.com.au A.B.N. 82 064 775 088

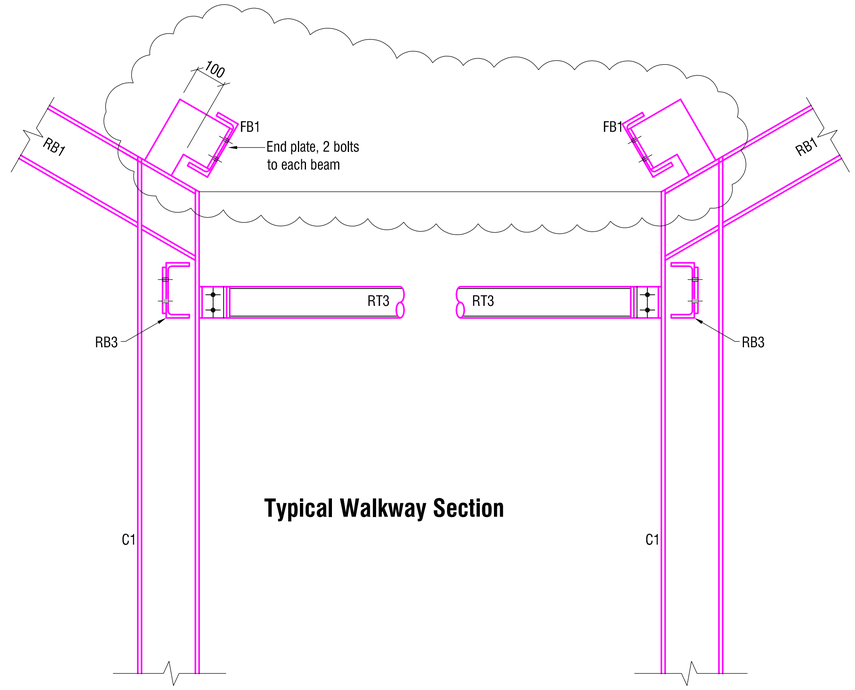
JOB NUMBER
CB050308

DRAWING NUMBER
S05 C

SIZE: A1



Typical Roof Framing Details



Typical Walkway Section

JM MJJ
VERIFIED MJJ
JDL MJJ
DRAWN MR

0 0.1 0.2 0.3 0.4 0.5m SCALE 1:10 @ A1
0 0.1 0.2 0.3 0.4 0.5m SCALE 1:20 @ A3

ISSUE	AMENDMENT	DATE
A	TENDER	17.03.06
B	AMENDED AS CLOUDED	31.03.06

CLIENT

Australian Consulting Engineers
Success is our business

ARCHITECT

colin stewart architects
wetlands house dalry road tyshwick act
po box 3469 manuka act 2603
ph 02 6229 1200 fax 02 6228 1499
e-mail csa@csarchitects.com.au
primary nominee:
colin sydmouth stewart
act 834, nsw 3119

PROJECT

PALARANG COUNCIL OFFICES
MAJARA STREET BUNGENDORE

DRAWING TITLE

STEEL DETAILS – SHEET 1

NORTHROP
Consulting Engineers
Canberra Sydney Newcastle Wollongong
15 Altree Court
Phillip ACT 2606
PHN (02) 6285 1822
FAX (02) 6285 1863
EMAIL canberra@northrop.com.au
A.B.N. 82 064 775 088

JOB NUMBER
CB050308

DRAWING NUMBER
S07 B

SIZE: A1