CPCCBC4012B
READ AND INTERPRET PLANS AND SPECIFICATIONS
ASSESSMENT SUMMARY

The assessment activities for *CPCCBC4012B Read and interpret plans and specifications* cover all aspects of the unit of competency required. To demonstrate competence in this unit, a participant must undertake all tasks and complete them satisfactorily and consistently. For Apprentices and Trainees, this includes employer completion of the Employer Record Book (ERB).

Participants must read all the information given before starting any assessment task. The assessment tasks are intended to be equitable, fair and flexible. If a participant has any questions or requires alternative arrangements to be made such requests should be directed to their Trainer/Assessor, who should note such arrangements in the 'Assessor Comments' on the affected assessment. If a participant feels they are not yet ready to be assessed, they should discuss their options with their Trainer/Assessor.

To satisfactorily complete the assessment, the participant is required to answer all questions correctly and demonstrate their skills to industry standards. If a participant does not answer some questions or perform some tasks, they will be deemed 'Not Satisfactory' for the task and 'Not Yet Competent' for the unit of competency. The Trainer/Assessor is able to provide the participant with additional information on interpreting the assessment outcomes and provide guidance on the participant's options. Should a participant still be deemed 'Not Satisfactory' they will have the opportunity to undertake a supplementary assessment or appeal the result.

By signing the cover page for each assessment item, the participant acknowledges they understand the assessment instructions and requirements and consent to being assessed. The participant also verifies and assures the RTO that the work submitted is their own work.

Participant Name	Tess Veldink

Task	Assessment Results	
Theory Exam	☐ Satisfactory	☐ Not Yet Satisfactory
Practical Assessment	☐ Satisfactory	☐ Not Yet Satisfactory
Outcome for Unit of Competency	☐ **Competent**	☐ **Not Yet Competent**

Assessor Name	
Assessor Signature	
Unit Competence Determination Date	Click here to enter a date.

CPCCBC4012B
READ AND INTERPRET PLANS AND SPECIFICATIONS

THEORY EXAM INSTRUCTIONS

- This exam will occur under standard assessment conditions.
  - An oral examination may be allowed under certain circumstances, whereby the Participant's answers will be documented by a party other than the Participant. This must be acknowledged in writing (e.g. FT001 and Assessor Comments)
- Participants must provide enough detail in their responses to demonstrate their knowledge and skills.
- Please fill in the details below, providing your name, signature and date of assessment.
  - Your signature acknowledges that this is your own work.
- Assessors are to complete marking in pen of a different colour to the Participant.
- If a Participant initially answers a question incorrectly but modifies their response, they must follow the instructions below:
  - If a Participant changes their response in writing, they must put their initials next to the written change.
  - If a Participant changes their response verbally, this must be noted on the exam paper by the assessor.

Participant name: Tess Veldink

Participant signature: Tess Veldink

Date: 23/03/2020

Assessor name:

Assessor signature:

Date: Click here to enter a date.

Number of questions	Number of questions answered correctly	Task outcome (Tick)	
		Satisfactory	Not Yet Satisfactory
87		☐	☐

ASSESSOR COMMENTS

Q1. Plans and specifications are used to inform which of the following processes? Tick all that apply.

Answer

Choice	Possible Answers
☑	Building contracts
☑	Development applications
☑	Estimation
☑	Planning
☑	Supervisory tasks
☑	Tenders

Q2. Which compass direction is always shown on plans and drawings?

Answer North

Q3. What information is provided on a location plan?

Answer

A location plan details the:
- lot numbers
- Deposit plan numbers
- North point
- Scale (usually 1:5000)

Q4. What detail does a site or block plan contain?

Answer

A site or block plan gives the following information:
- Outline of site boundaries showing location of proposed building and existing dwellings
- Street frontage names
- Major geological and topographical features (trees and vegetation)
- Datum points, contours and slopes
- Driveways, stormwater drainage, easements and right of carriage
- Soil and surface water drains, pipe sizes
- Service runs from the house to mains - utility services location
- Details of paving and retaining walls

Q5. What do floor plans identify?

Answer

- Floor plans identify the proposed structure, such as rooms, positions of fixtures, floor coverings

Q6. What is a landscape plan and what information might it provide?

Answer Shows details of plants, paths, garden layouts and retaining walls

Q7. What are elevation views? What do they provide to the plan reader?

Answer View of the proposed structure from its sides (i.e. from north, south, east and west).

Each side is what is called an elevation view.

Q8. What is a section?

Answer

A section is a vertical view through the building. The direction of scrions lines or arrows is usually shown on the plan to help interpret the sectional view.

Key features on a section plans include:

- Height of building
- Position of piers, beams, openings
- Floor to ceiling heights
- Distance between finished floor and existing or proposed ground levels
- Construction details

Q9. What are detailed drawings?

Answer

Detailed drawings are to prepare drawings to scale

Q10. What are specifications?

Answer

Specifications are details that support drawings and plans, providing details of the materials and techniques to be used, details of fixtures and fittings, and standards to be observed.

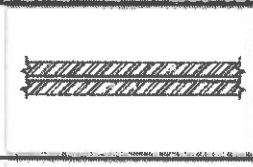
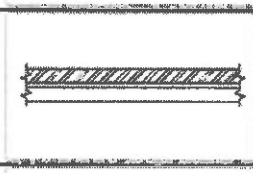
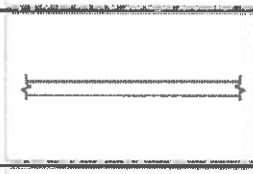
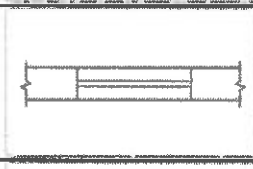
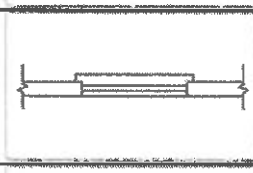
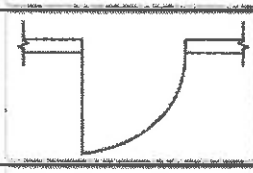
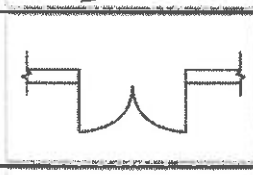
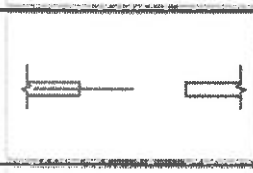
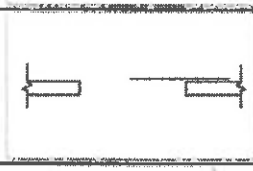
Q11. Explain the meaning of the abbreviations in the table below.

Answer

Abbreviation	Meaning
ACRYL	Acrylic
AS	Australian Standards
ASSD	Assumed Datum
B	Basin
BN	Bull Nose
BTH	Bath
BWK	Brickwork
CB	Concrete Block
CF	Concrete Floor
CG	Clear Glass
CJ	Ceiling Joist
CORR	Corrugated
CWT	Cold Water Tank
DG	Double Glazing
DH	Double Hung
DPC	Damp Proof Course
DSB	Distribution Switch Board
DW	Dishwasher
EJ	Expansion Joint
FPBD	Fibrous Plaster Board
FFL	Finished Floor Level
FHR	Fire Hose Reel
GPO	General Purpose Outlet
HBD	Hardboard
HTR	Heater
HWD	Hardwood

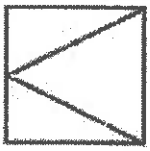
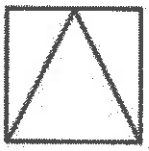
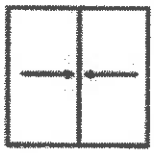
Q12. Name each of the drawing symbol images shown in the table below.

Answer

Name	Image
Wall – Cavity Brick	
Wall – Brick veneer	
Wall – Timber stud	
Window – in cavity wall	
Window – in signle wall	
Door – swing single	
Door – Swing double	
Door sliding into pocket	
Door – sliding exposed on wall	
Single GPO	

Q13. Identify what the following window symbols represent on elevations.

Answer

Item	Drawing
Hinged at side	
Hinged at top	
Sliding Horizontally	
Fixed	

Q14. What does a clouded area on a plan indicate?

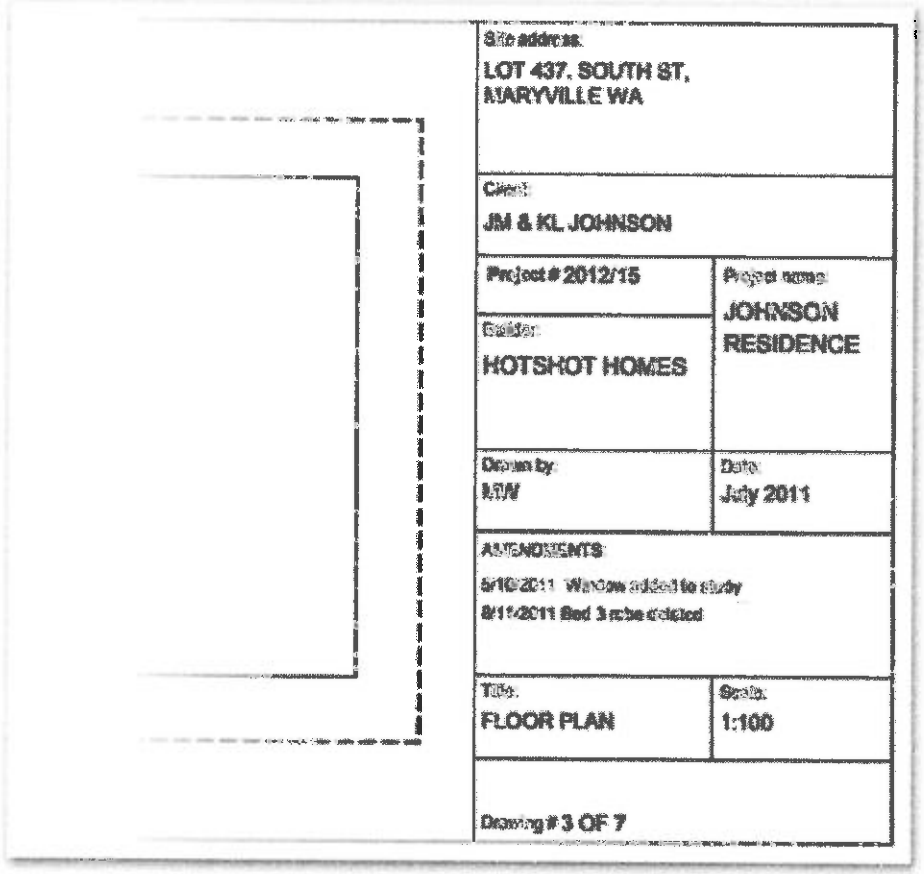
Answer On plans revisions or amendments are represented by a clouded area

Q15. An amendment to specifications could relate to which of the following? Tick all that apply.

Answer

Choice	Possible Answers
☑	Contact details of all construction crew members
☑	Materials or products used
☑	Methods of carrying out specified work

Refer to the title block below to respond to Q16. to Q18.



Source: http://www.dtwd.wa.gov.au/sites/default/files/teachingproducts/BC1934_CCBY.PDF

Q16. On what date was an amendment made to the window details?

Answer 05/10/2011 ☐

Q17. True or False (Tick your response): Details of the window in Q16. should also be reflected in the specifications and confirmed with the client.

Answer

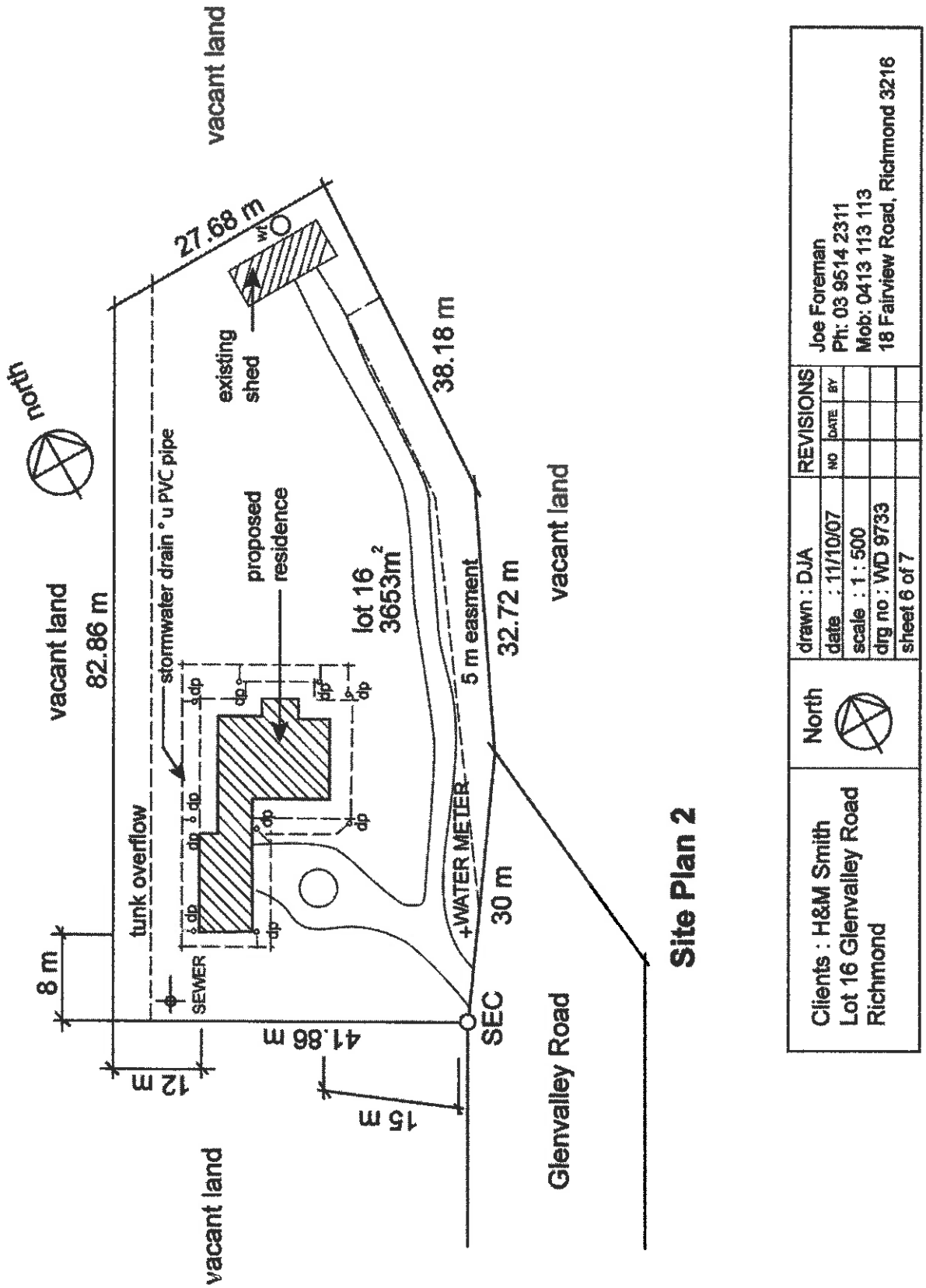
☑	True
☐	False

☐

Q18. What amendment occurred on 08/11/2011?

Answer Bed 3 robe deleted ☐

Refer to the site plan below to respond to Q19. to Q26.



Q19. What structure is being built on this site? Tick your response.

Answer

Choice	Possible Answers
☑	Residence
☐	Road
☐	Shed
☐	Water meter

☐

Q20. What is the Lot number of this site?

Answer Lot 16 ☐

Q21. What is the size of this lot?

Answer 3635 metres squared ☐

Q22. Is the shed at the north-east of the proposed structure to be removed or retained? Tick your response.

Answer

Choice	Possible Answers
☐	Removed
☑	Retained

☐

Q23. True or False (Tick your response): The sewer is at the eastern boundary of the property.

Answer

☐	True
☑	False

☐

Q24. True or False (Tick your response): The driveway is located to the south of the proposed property.

Answer

☑	True
☐	False

☐

Q25. What size is the easement on the eastern boundary of the site?

Answer 5m easement ☐

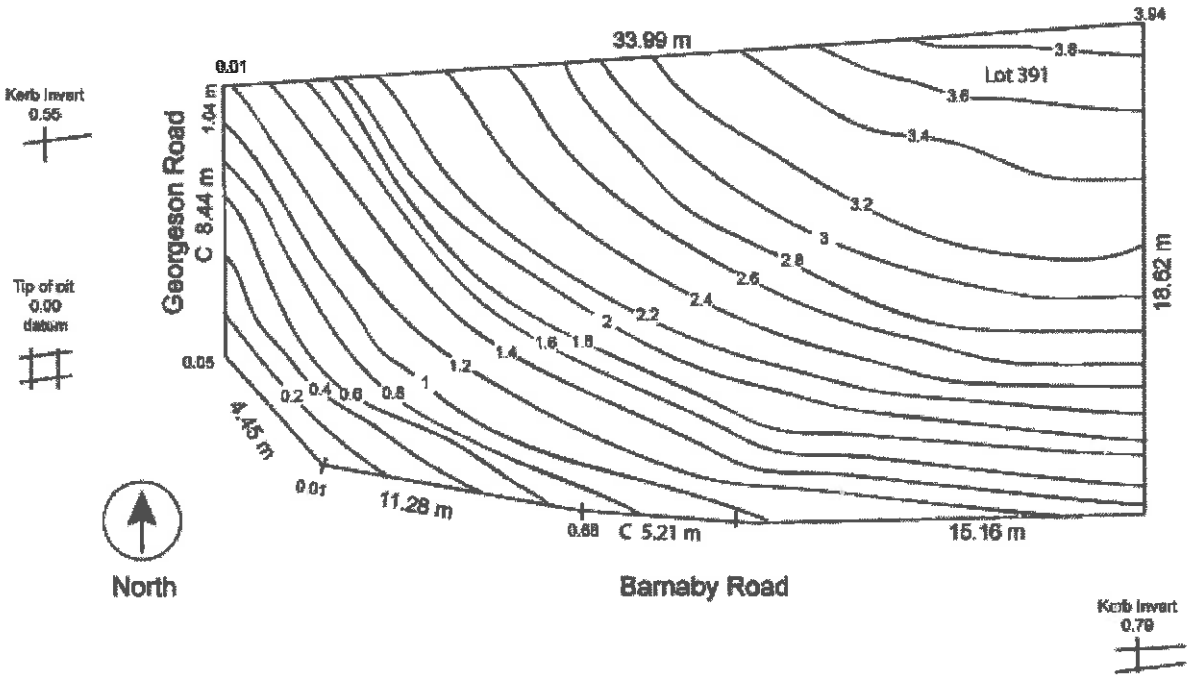
Q26. True or False (Tick your response): The stormwater drain is constructed from PVC pipe.

Answer

☑	True
☐	False

☐

Refer to the contour plan below to respond to Q27. to Q28.



Q27. What is the level at the northernmost point of the site?

Answer 1.2m ☐

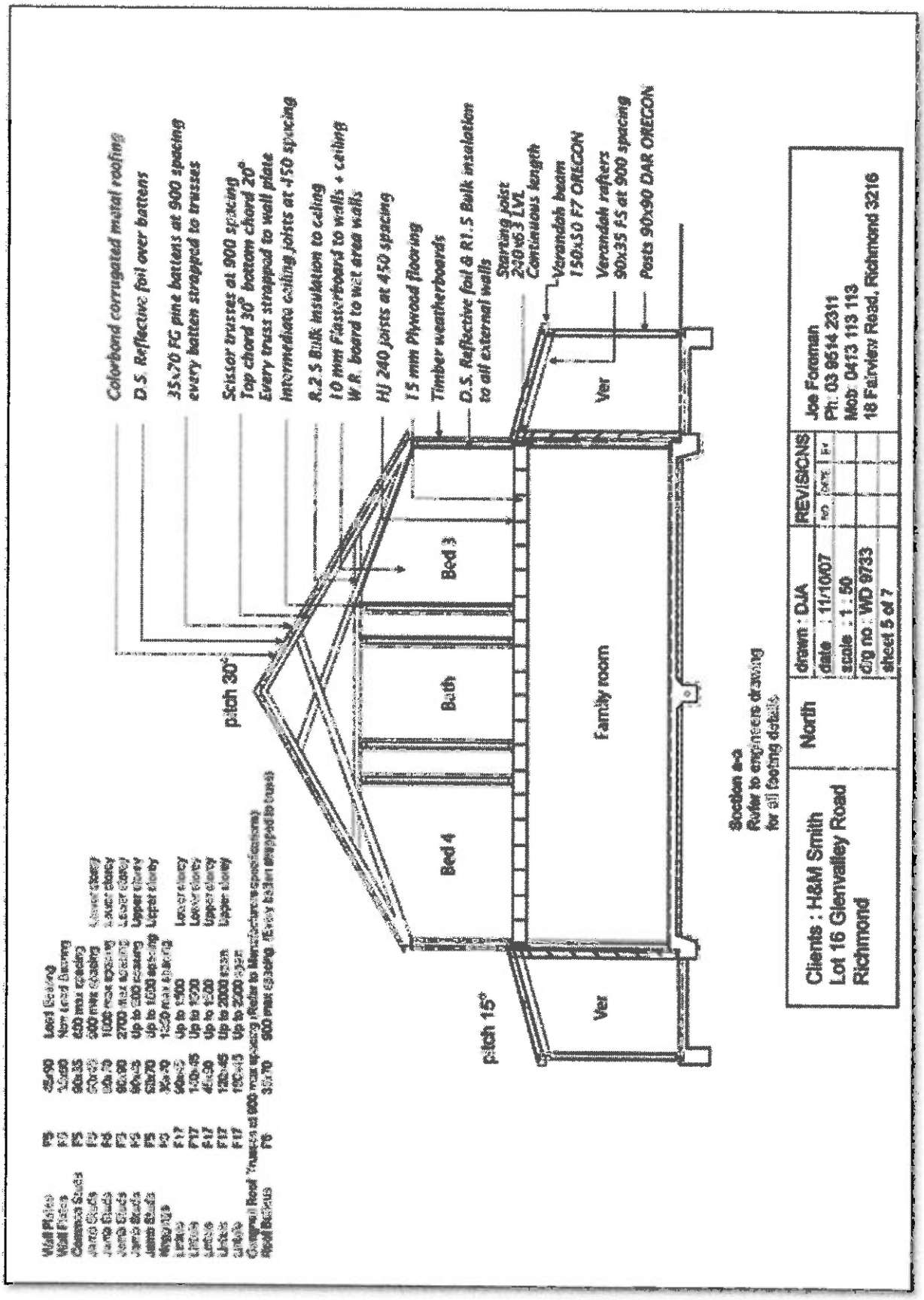
Q28. Which end of the site has the lowest level? Tick your response.

Answer

Choice	Possible Answers
☑	East
☐	West

☐

Refer to the sectional drawing below to respond to Q29. to Q49.



Q29. Give a brief description about the building from the detail available in the sectional drawing. Is it the same structure proposed in Q19. to Q26. ?

Answer This plan shows key features of the structure such as the location, heights and positioning. This allows trade to generate quotes and illustrate how the structure is going to be built and allows for the council to determine the applicable codes.

This drawing is the same as the structure in questions 19 to 26 because its has the same client, draftsman and drawing details.

Q30. Who is the client?

Answer H&M Smith

Q31. Where is this project to be built?

Answer Glenvalley Road Richmond

Q32. What are the contact details for the draftsman?

Answer Joe Foreman
Ph: 03 9514 2311
Mob: 0413 113 113

Q33. What sheet number is this drawing?

Answer Number 5 out of 7

Q34. What timber is required for loading and non-load bearing walls?

Answer Timber weatherboards

Q35. What spacing is recommended for common studs?

Answer 600 max spacing ☐

Q36. What type of roof truss is to be installed?

Answer Gangnail roof trusses at 900 max spacing ☐

Q37. What centres are the trusses positioned at?

Answer Top chord 30 degrees, bottom chord 20 degrees ☐

Q38. What size are the veranda posts?

Answer 90 x 90 ☐

Q39. What timber species are the veranda posts to come from?

Answer Dar Oregon timber ☐

Q40. What pitch is the roof?

Answer 30 degrees ☐

Q41. What size are the noggings and at what spacing?

Answer Size is 35 x 70 and 1350 max spacing ☐

Q42. What size are the ceiling joists?

Answer Intermediate ceiling joists at 450 spacing ☐

Q43. What timber is used for roof battens and what spacing?

Answer FG pine battens at 900 spacing ☐

Q44. What thickness is the plasterboard sheeting?

Answer 10mm ☐

Q45. What type of flooring is to be installed?

Answer 15mm plywood flooring ☐

Q46. What is the roof cladding material?

Answer Reflective foil ☐

Q47. Where will you find information about the footings?

Answer Engineers drawings will show all footing details ☐

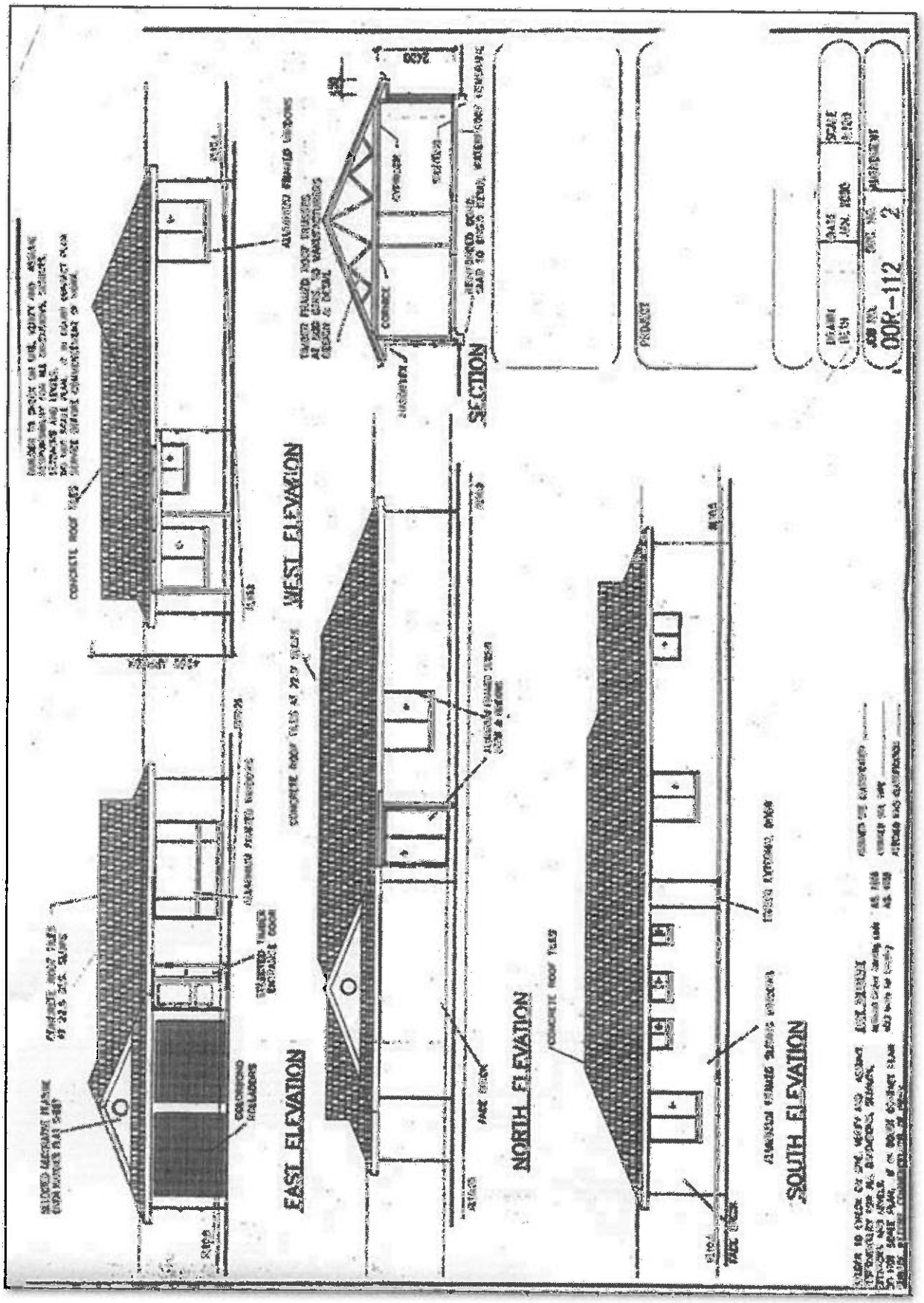
Q48. What do the letters 'DAR' refer when timber ordering?

Answer Dressed All Round ☐

Q49. Explain what '240 x 63 LVL' refers to on the sectional drawing. What do the letters 'LVL' refer to?

Answer Laminated veneer lumber (LVL) is an engineered wood product that uses multiple layers of thin wood assembled with adhesives. ☐

Refer to the drawing below to respond to Q50. to Q65.



Q50. What is the number of the drawing?

Answer 2

Q51. What is the Job Number?

Answer 00R-112

Q52. What is the scale of the drawing?

Answer 1:100

Q53. What does the drawing show?

Answer This drawing shows the different elevation from view of the house

Q54. Which view shows the front of the house?

Answer East view

Q55. How many motor vehicles can be parked in the garage?

Answer 2

Q56. What are the window and doors made from?

Answer Aliuminum

Q57. What is the size of the eaves?

Answer 450

Q58. What are the eaves lined with?

Answer The concrete roof ☐

Q59. What type of roof structure is the roof built from?

Answer Timber framed roof trusses ☐

Q60. Which Part of the NCC should be read for more detail about the requirements for the roof structure in Q59. ?

Answer Part 3.4.3 Timber framing ☐

Q61. Which Australian Standard should be read for more detail about the roof structure in Q59. ?

Answer AS: 1684 ☐

Q62. What is the roof cladding materials made from?

Answer Concrete roof tiles ☐

Q63. Which Part of the NCC should be read for more detail about the roof cladding materials in Q62. ?

Answer Part 3.5.1 Roof cladding ☐

Q64. Which Australian Standard should be read for more detail about the roof cladding materials in Q62. ?

Answer AS:1562.1:2018 ☐

Q65. What is the roof pitch?

Answer 22.5 degree slope ☐

Q66. Identify one (1) regulatory body you may need to submit plans to for approval?

Answer City Council for development approvals

Q67. Briefly describe the approval process and timeframes for an approval through the regulatory body in Q66.

Answer Development Approval process with the City Council:

Q68. What is a prime cost (PC) item? Give an example.

Answer An amount of money included in a contract sum to purchase a particular item such has tiles, taps, doors and bathroom fittings. It is an estimated amount that is agreed and the items selected at a later stage.

An example of this would be a bathroom taps. It might be estimated at $50 and when it comes to purchase the tap might have increased to $60. Therefore the final contract sum will vary.

Q69. What is a provisional sum (PS) item? Give an example.

Answer An amount of money included in a contract sum to cover work/materials, not detailed in the contract. Provisional sum items are usually builders site costs. Builders are legally required to ensure estimates are made but unforeseen events might add to the contract sum.

An example of this would be tree roots that were discovered on the lot once excavation started. Builders then quoted and the contract sum increased.

Refer to the Bill of Quantities below to respond to Q70. to Q76.

Organized Builders Estimating Solutions

Bill Summary

7 October 2011

Web2Estim [illegible] Template 2 storey

[illegible]
P.O. Box [illegible] Frankston South 3199
0413 779 [illegible]

	Cost Centre		Amount	
01	PRELIMINARIES		$21,239.00	5.9%
01A	Preliminary Stage		$0.00	.0%
02	SITE PREP & DEMOLITION		$6,010.02	1.7%
03	HIRE ITEMS		$9,909.70	2.8%
04	SET OUT		$1,350.00	.4%
05	POWER PROVISION		$2,670.00	.7%
06	WATER CONNECTION		$1,550.00	.4%
07	SEWERAGE & STORMWATER		$9,400.00	2.6%
		01 - Prelims	$51,128.70	14%
08A	Base Stage		$0.00	.0%
08	PUMP & CRANE HIRE		$2,070.00	.6%
09	TERMITE CONTROL		$760.00	.2%
13	FOUNDATION PACKAGE		$19,079.03	5.3%
17	STRUCTURAL STEEL		$12,000.00	3.3%
		02 - Base	$33,849.03	9%
20A	Frame Stage		$0.00	.0%
20	FRAME TIMBER		$5,127.16	1.4%
22	FLOOR TRUSSES		$2,249.00	.6%
23	ROOF TRUSSES		$3,360.00	.9%
24	WINDOWS ALUMINIUM		$25,541.00	7.1%
29	FRAME CARPENTER		$7,336.00	2.0%
		03 - Frame	$43,813.76	12%
30A	Lockup Stage		$0.00	.0%
31	METAL ROOF		$16,539.90	4.6%
32	RENDERING		$9,096.00	2.5%
34	BRICK SUPPLY		$3,276.00	.9%
35	BRICK SAND		$800.00	.2%
36	STEEL LINTELS		$828.52	.2%
38	BRICKLAYER		$8,450.00	2.4%
39	ELECTRICIAN		$152.01	.0%
40	INTERCOM & SECURITY		$1,200.00	.3%
41	PLUMBER		$6,775.00	1.9%
42	DUCTED HEATING & COOLING		$18,990.00	5.3%
43	INTERNAL LOCKUP MATERIALS		$921.85	.3%
45	INTERNAL LOCKUP CARPENTER		$2,400.00	.7%
46	WALL INSULATION		$3,265.50	.9%
47	EXTERNAL LOCKUP MATERIALS		$1,936.70	.5%
48	EXTERNAL LOCKUP CARPENTER		$11,770.00	3.3%
		04 - Lockup	$86,142.48	24%
50A	Fixing Stage		$0.00	.0%

[illegible]

Organized Builders Estimating Solutions

Bill Summary

7 October 2011

Website Item: Website Template 2 storey

Organized Builders
P.O. Box 8283 Frankston South 3199
0413 770 958

	Cost Centre		Amount	
50	PLASTERER		$12,000.00	3.6%
51	STAIRCASE & BALUSTRADE		$7,000.00	1.9%
52	CABINET MAKER		$22,000.00	6.1%
53	SINKS & BASINS		$2,036.03	.6%
54	FIX MATERIALS		$2,010.69	.6%
55	FIX CARPENTER		$3,631.80	1.0%
56	INTERNAL TILE SUPPLY		$6,100.00	1.7%
57	INTERNAL TILER		$7,368.80	2.1%
58	PAINTER		$16,075.80	4.5%
59	SHOWER SCREENS & MIRRORS		$1,448.00	.4%
61	TOILET SUITES		$1,500.00	.4%
		05 - Fixing	$82,161.02	23%
61A	Completion Stage		$0.00	.0%
62	KITCHEN APPLIANCES		$2,700.00	.8%
63	HOT WATER SUPPLY		$2,408.23	.7%
64	TAPWARE SUPPLY		$2,745.00	.8%
67	GARAGE DOOR SUPPLY		$1,437.84	.4%
68	HOUSE CLEANER		$1,089.00	.3%
71	CARPET, VYNIL & FLOATING FLOORS		$3,350.00	.9%
72	CLOTHES LINE & MAILBOX		$700.00	.2%
73	WINDOW FURNISHINGS		$5,000.00	1.4%
74	FENCING		$4,985.50	1.3%
76	LANDSCAPING		$12,000.00	3.3%
78	OFFICE FEES & COSTS		$26,000.00	7.2%
		08 - Completion	$62,903.14	17%
		Total	$338,980.18	
	Contingency Sum	1.0%	$3,389.80	
	Profit & Overheads	15.0%	$56,262.53	
	GST	10.0%	$46,763.26	
		Total	$470,815.73	

Prices do NOT include GST

Source: http://organizedbuilders.com.au/sites/default/files/BOQ-Summary.pdf

Q70. True or False (Tick your response): This Bill of Quantities represents a job for a two-storey house.

Answer

☑	True
☐	False

☐

Q71. Identify two (2) materials being used for the floors?

Answer 1. Timber
2. Bricks

☐

Q72. True or False (Tick your response): A landscaper has been contracted for this job.

Answer

☑	True
☐	False

☐

Q73. How much does the contracted plasterer cost?

Answer $12,900.00

☐

Q74. How much do the kitchen appliances cost?

Answer $2,700.00

☐

Q75. What percentage of the total cost does the fixing stage represent of the building contract?

Answer 23%

☐

Q76. What percentage of the total cost does the completion stage represent of the building contract?

Answer 17%

☐

Refer to the Purchase Order below to respond to Q77. to Q82.

Organized Builders Estimating Solutions

A.B.N. [illegible]

info@organizedbuilders.com.au

P.O. Box 5283 Frankston South 3163 0413 770 956

7 October 2011

Purchase Order No Web2Stem/20

Delivery Date

Order Date 7/10/2011:

To: TO BE ALLOCATED TO

Job: Organized Builders
P.O. Box 5283 Frankston South 3163
0413 770 956

Supervisor: Builder:
Job Type: Two Storey

Please Supply: FRAME TIMBER

Reference	Description	Quantity	Units	@	Amount
Frame Timber Ground floor walls and beams to ceiling / floor		1		$0.00*	$0.00
Pine 90 x 35 mgp10 (long lengths)		130	m	$1.07*	$139.10
Pine 90 x 45 mgp10 (Long Lengths)		120	m	$1.05*	$126.00
Pine F5 90 x 45 studs 2.4 m long Studs Cut to mm		100	each	$1.60*	$160.00
Pine F5 90 x 45 studs 2.7 m long Studs Cut to mm		45	each	$1.03*	$46.35
Pine 90 x 45 mgp10 (Long Lengths) studs over 2.7 3003.0 2553.3		322.5	m	$1.05*	$322.99
90 x 45 KDHW F17 1554.4 1727 2/9 9/3.0 2252.4 8/3.0		159.3	m	$1.60*	$163.30
140 X 45 KDHW F17 1313.6 7/2.4 4/1.8		79.8	m	$1.03*	$70.50
240 X 45 KDHW F17 alternate option / better to use E14 beams in lieu of F17 7/3.6 2/3.3 1/2.1 1/1.5 1/1.2 1/3.9		40.6	m	$1.60*	$40.50
290 X 45 KDHW F17 Must be H2 treated 2/3.6 4/3.9		22.8	m	$1.03*	$22.99
290 x 45 F17 KDHW 6/3.9 2/3.3 4/4.2 6/3.6 1/1.2 1/1.8		71.4	m	$1.05*	$71.40
Sheet brace 2400 x 1200 4mm Ply		3	sheet	$1.03*	$3.09
Sheet brace 2700 x 1200 4mm Ply		6	sheet	$1.03*	$6.00
Sheet brace 3600 x 1200 4mm Ply		4	sheet	$1.03*	$4.00

This Order is subject to our Standard Notes and Conditions. Authorised by:

.....
Organized Builders

[illegible]

Source: http://organizedbuilders.com.au/sites/default/files/Databuild-Bill-of-Quantities.pdf

Q77. How many Pine F5 90 x 45 studs (2.4m long) are required?

Answer 100

Q78. If the material in Q77. increased in cost to $2.75 each, what would be the total cost for this material?

Answer $275.00

Q79. How many sheet of ply are required in total (i.e. all sizes)?

Answer 13 sheets

Q80. What material has the highest total cost?

Answer Pine 90x45 (long lengths) $322.50

Q81. How many metres are required of the material in Q80. ?

Answer 322.50m

Q82. What beam is identified as being a better option than F17?

Answer Better to use E14 beams

Refer to the labour chart below to respond to Q83. to Q86.

	LABOUR BUILDING WORKS	Registere (for dea bac
		Skilled Worker
	Per hour	A $
17001	Asphalter (Road Construction)	107.40
17002	Bamboo Scaffolder	187.20
17003	Bar Bender and Fixer	214.30
17004	Bricklayer	136.70
17005	Builder's Lift Operator	-
17006	Carpenter (Formwork - Building Construction)	201.10
17007	Concrete Repairer (Spalling Concrete)	185.60
17008	Concreter	193.50
17009	Construction Plant Mechanic	150.60
17010	Demolition Worker	165.60
17011	Desinlayer	166.00
17012	Floor Layer	139.20
17013	General Welder	152.00
17014	Glazier	154.00
17015	Joiner	139.20
17016	Leveller	150.20
17017	Marble Worker	179.80
17018	Mason	146.10
17019	Metal Scaffolder	131.00
17020	Metal Worker	154.70
17021	Painter and Decorator	127.40
17022	Painter (Texture-Spray)	-
17023	Pipelayer	166.00
17024	Plant and Equipment Operator (other than cranes)	139.60
17025	Plant and Equipment Operator (cranes generally)	168.50
17026	Plasterer	154.70
17027	Plumber	140.20

Source: https://www.archsd.gov.hk/media/89170/sor2013_vol1_builders_works_2013_11_04.pdf

Q83. Based on the hourly rates given, which is the least expensive trade to contract?

Answer Asphalter (road construction)

Q84. If the trade in Q83. were to be contracted for two (2) hours' work, how much would this cost?

Answer $214.80

Q85. Based on the hourly rates given, which is the most expensive trade to contract?

Answer Bar bender and fixer

Q86. If the trade in Q85. were to be contracted for six (6) hours' work, how much would this cost?

Answer $428.60

Q87. Name the building legislation (Act and Regulations) that apply within your jurisdiction and should be referenced when reading plans and building contracts.

Answer Queensland Building and Constructuin Commission Act 1991

CPCCBC4012B
READ AND INTERPRET PLANS AND SPECIFICATIONS

PRACTICAL ASSESSMENT INSTRUCTIONS

- The following practical assessment will require the Participant to complete work related activities.
- The Assessor will conduct observations of the Participant's work to determine whether they display sufficient practical skills and knowledge.
- Please fill in the details below – providing your name, signature and date of assessment.
    - The Participant's signature acknowledges that the Assessor provided clear instructions and the Participant understood what was required to complete this assessment.
- The Assessor may substitute a Practical Task with an alternate task of equal value.
    - Alternate tasks must be fully documented by the assessor in the Assessor Comments area.

Participant name: Tess Veldink

Participant signature: Tess Veldink

Date: 30/03/2020

Assessor name:

Assessor signature:

Date: Click here to enter a date.

Task	Task outcome (Tick)	
	Satisfactory	Not Yet Satisfactory
Task 1 (Occasion 1)	☐	☐
Task 1 (Occasion 2)	☐	☐

ASSESSOR COMMENTS

CPCCBC4012B
READ AND INTERPRET PLANS AND SPECIFICATIONS

Practical Task 1 (2X)

Description of task:
On two (2) occasions, a suitable observer is to verify the participant's ability to read and interpret plans and specifications in order to inform estimation, planning and supervisory activities.

The participant is to gather evidence of how they have completed each component of the Practical Task, which is to be submitted with this Practical Assessment sheet. Evidence to be submitted may include:

- Any drawing with a cloud or mark-up you have inserted.
- Copy of the correspondence regarding mark up and any site management/authorising engineer response.

The observer is to provide detailed comments on the tasks completed by the participant. The assessor is to verify the observer's comments in the Assessor Comments section, and provide the Practical Assessment outcome on the front cover of this document.

Resources required:
Drawings (including site plan), Specifications, Tender documentation, Telephone, Facsimile machine, Computer.

Assessment of task

Name of participant:	Tess Veldink
Name of observer:	Carl Brooks – Donald
Role of observer (Confirm suitability to sign)	Estimator
Email address of observer	reception@bluestarcorporate.com.au
Signature of observer:	
Date:	15/04/2020

When completing the task, did the participant:	**Tick if satisfactorily completed. Provide comments if left unticked.**	
	1st Occasion	**2nd Occasion**
1 Interpret drawings		
1.1A. Identify purpose and advantage of different types of drawings.	☑	☑
1.1B. Identify different aspects of drawings.	☑	☑
1.1C. Identify, understand and apply: • Commonly used symbols and abbreviations • Common building and construction terms on drawings	☑	☑
1.1D. Identify building site from location drawings.	☑	☑
1.1E. Identify on the site plan: • True north • Building orientation	☑	☑

	• Key features in relation to building and other structures • Levels • Contours • Service entry points • Site features to be removed or retained		
1.1F.	Identify key features of plans, elevations and sections.	☑	☑
1.1G.	Identify client requested variations to standard plans on drawings.	☑	☑
	2 Interpret specifications		
1.2A.	Identify and correctly apply Provisional Sum (PS) and Prime Cost (PC) values.	☑	☑
1.2B.	Identify and confirm customer variations to standard specifications and communicate changes to organisational personnel.	☑	☑
1.2C.	Apply and communicate correct interpretations of essential elements to estimation, planning and supervisory tasks (including labour hours/costs and material quantities/costs).	☑	☑
1.2D.	Identify Building Codes or standards affecting the work to be undertaken (including references to Australian Standards and the National Construction Code).	☑	☑
1.2E.	Identify key features of products included in the specification, including the design, purpose, aesthetics and cost relationships.	☑	☑
	3 Communicate with others		
1.3A.	Consult with industry professionals, clients, organisational personnel and appropriate local authorities.	☑	☑
1.3B.	Effectively communicate using the following methods: • Verbally using language/concepts appropriate to cultural differences • Non-verbal communication • Using technology (including telephone, facsimile, email)	☑	☑
	The Participant's performance was: ☑ Satisfactory ☐ Not Satisfactory		

OBSERVER COMMENTS

Interpret drawings

This section was discussed through an email trail for both occasions – between the client and the contractor.

11A – The purpose and advantages of drawings was explained generally and how a specification document supports drawings. The different categories of drawings were listed and the drawings attached to the email trail were identified.

11B – There was a general overview written about the aspects of drawings. The drawings attached to the email trail were identified and discussed in detail.

11C – Commonly used symbols and abbreviation were identified in both occasions. In the second occasion multiple tables of symbols were included to help the client understand their house drawings and discussed in detail. In the first occasion only some symbols were listed due the project coming from an electrical view.

11D – In occasion one the building site and location site difference were touched on and the participant expressed that this was an electrical project tender and that these drawings didn't display a location or building site. In occasion two the differences between the two plans was discussed in further detail, giving details on both different plans.

11E – The participant identified and explained the key features found of the drawings for both occasions such as north points, service entry points, building orientation and electrical paths.

11F – Both occasions the participant discussed the key features of plans, elevations and sections. Plans were discussed in further detail as the participant related it back to the drawings submitted for each occasion. Elevation and sections were discussed thoroughly, however drawings examples weren't submitted as evidence.

11G – Both occasions submitted evidence to show client variations from the standard plans using the clouded area. The changes were then discussed and explain to the client, showing an understanding of the changes.

Interpret Specifications

This section was discussed through an internal meeting with meeting minutes sent to the company for both occasions – between the client and the contractor.

12A – Provisional sum and Prime costs were discussed and the differences explained. The participant then gave examples and explained the steps companies need to take to ensure these are upheld in the building process.

12B – The importance of customer variations to project managers and supervisors was highlighted, this was then related back to the standard specifications on the project. The processes of receiving and approving a customer variation was explained.

12C – For both occasions the essential elements of a project were explained including materials, labour and quantities - these elements make up a project budget. The creation of a project budget was then explained in detail with a budget example.

12D – Building Codes and Standards were listed which are highlighted in the specification document for occasion one and the new home tender for occasion two.

12E – Key features in the specifications were highlighted as important and each features was explained and related back to each occasion.

Communicate with others

13A & 13B – In both occasions the participant consulted with industry professionals and clients (Watpac, Blue Star Electrical, Coral Homes & new home owners). To consult the participant used multiple effective communication methods such as email, meetings, meeting minutes and used the correct professional tone throughout.

Occasion 1

Contractor: Watpac
Subcontractor: Blue Star Electrical

Interpret drawings

To: gabrielle@bluestarelectrical.com.au
Subject: Site Electrical Service Plan for Military Base
From: Tess Veldink – Watpac

Hi Gabrielle,

As discussed last week with your team Blue Star have confirmed that they are going to be quoting the Electrical Service Plan for the Military Base in Redbank. Attached are the specifications and revision 0 drawings.

Before submitting your quote one of Watpac's procedures is to give an insight into interpreting drawings.

Purpose & advantages of different types of drawings
A drawing is the means of showing the shape, size and position of a building site, together with the composition of the materials used and the overall construction of the project. Specifications are a detailed document that supports drawings and plans and provides details of the materials, techniques and standards.

There are multiple categories of drawings these include, initial sketches, CAD drawings, preliminary and final drawings and plans, detailed amendment drawings, presentation drawings and service details. Service details drawings are the ones attached in this email as it shows the electrical wiring of the project.

Aspects of drawings
Aspects of drawings include plans, elevations, sections and views in isometric projection and perspective, these aspects drawings are more complex and show views and different forecasts. A plan is often a top-down view, which shows the layout or arrangement of a structure and its surroundings. Types of plans include, location plans, site plans, floor plans, detailed plans and landscape plans. The plans given in this tender are detailed plans, that illustrates a particular method of construction. In this case it would be the electrical structure of the military base project.

Electrical symbols and abbreviations
The drawings provided show an overview of the of the underground conduit system and the main submains station. These drawings don't have many commonly used electrical symbols and lines. Most of the symbols will be on the more in-depth drawings, however some of them include – Lamp - general, power panel board and fluorescent lamps (street poles/lamps). For more electrical symbols you will need to look at the other drawings referenced on the plans.

The set of drawings do show orientation and provide a scale bar in the legend at the bottom of the page – all drawings show the positioning of north with the original scale at 1:100. Abbreviations are used to help keep drawings clear and easy to read and to simplify

notations on drawings. Some abbreviations include LV – low volt, FCU – feeder control unit, COMMS – communication and SEC – specific electrical conductivity.

Identifying different parts on a site drawing

As mentioned previously the drawings given in this electrical tender package are site plans/detailed plans. These plans are different to a builder's site/block plan and location plans because the drawings only show the electrical plans.

Key features on the electrical service plans show the conduit paths, where the pits are located, entries, gates, boundaries, true north and building orientation.

Identifying key features of plans, elevation and sections

Plans show people interested (in this case it would be the electricians and their subcontractors) the proposed structure of the electrical work - how it will be constructed and how it will look when it's completed. Plans also show the location of various features on the site and illustrate details such as the positioning of conduits, submains and pits, so that council can determine compliance to its codes and allows subcontractors and suppliers to quote the project.

Elevations and sections aren't present in the drawings currently provided however; this will now be explained due to other drawing that will be submitted if your tender is successful.

Elevation is a view you see when standing in from of that wall. Most council require an elevation from each side of the project and the view is indicated by north, south, east or west. Elevation indicates finishes to external walls and size of windows, doors and balconies.

A section is a vertical view (slice) through the building. The direction of section lines or arrows is usually shown on the plan to help interpret the sectional view. Key features include – height of building, position of piers, beams and openings, construction details and distance between finished floor and existing or proposed ground levels.

Please let us know if you have any questions regarding the above.

Many Thanks,

Tess Veldink
Contract Administrator

MDA CONSULTING ENGINEERS

Pricing Brief
Electrical Services

Revision	Date	Approved by
1- Pricing Issue		

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SECTION 001 GENERAL REQUIREMENTS

01 EXTENT OF WORK

The extent of work covered by these documents includes the supply, manufacture, installation, testing, commissioning and subsequent maintenance for the stipulated period of the work specified herein and shown on the accompanying drawings. Provide all manufactured items, materials, labour, cartage, tools, plant, appliances and fixings necessary for the proper execution of the works, together with all minor and incidental works.

Provide the following major items, but not limited to:

1. Liaison and finalisation of applications with Energex for suitable power supply to the site.
2. Provision of underground HV conduits and padmount transformer site in accordance with Energex Underground Distribution & Construction Manual by an accredited Energex contractor.
3. Main switchboard.
4. Consumers Mains
5. Sub-mains.
6. Distribution switchboards.
7. Earthing.
8. Light and power sub-circuit wiring.
9. Luminaires.
10. General purpose outlets, permanent connections.
11. Emergency lighting system.
12. Wiring to terminal points for other services including ventilation, air conditioning control panels and hydraulic control panels/equipment.
13. Trenching and backfill for electrical services.
14. Trenching and backfill for Telecommunication conduits.
15. Telecommunications system including pathways for NBN
16. Security Access Control System & CCTV System.
17. Free to Air and Satellite Pay Television Distribution System
18. Visitor Intercom System.
19. Category 6 cabling supply and install for the cold water meter automatic metering reading system.
20. Lightning protection.
21. Standalone smoke alarms within each unit to AS3786
22. Addressable Fire Detection and BOWS System to Fire Engineering Report, NCC 2016, AS1670.1 & AS 1670.4
23. Fire seal penetrations in fire rated walls & floors after installation of electrical services.
24. Commissioning and testing .
25. As Installed Documents.

02 INFORMATION TO OTHERS

The Electrical Contractor shall supply the following information or equipment to other Contractors to complete the electrical installation:

Building Work:

1. Provide information on location of pipe sleeves (supplied by Electrical Contractor), Blockouts and penetrations in walls and floors for passage of trays and conduits. The Electrical Contractor is responsible for packing and sealing about the pipework or ductwork to meet the acoustic and fire rating of the wall construction.

2. Provide reflected ceiling plan showing locations for trimmed openings in ceilings for recessed fluorescent lights and untrimmed openings in ceilings for other recessed lights and speakers.

3. Provide drawings showing locations of access panels in set plaster ceilings for access to cable trays and concealed smoke/thermal detectors.

4. Provide schedules of door signage requirements detailing label size and lettering for the following:

   - Communications services/equipment room.
   - Main switchboard cupboard/room.
   - NBN cupboard/room.
   - FDCIE.
   - Any other signage required.

5. Coordinate all location of electrical services with the structural services of the building.

Landscaping Work:

1. Coordinate with the Landscape Contractor the submain size to irrigation control panel and obtain confirmation of adequacy.
2. Submit electrical reticulation/lighting design for approval for electrical works in landscape areas in accordance with the Landscape Designs

Mechanical Work:

1. Liaise and determine the power and fire requirements for mechanical services equipment with the mechanical contractor
2. Advise and coordinate with the Mechanical Contractor the size of submain to mechanical switchboards, power supplies to all other mechanical equipment, fire controls and connections and obtain confirmation of adequacy.
3. Mechanical Services Switchboards, control panels and connection to all mechanical and air conditioning equipment unless nominated otherwise on drawings is by Mechanical Contractor. Where the electrical contractor is to provide submains, sub-circuits and fire controls to control panels and/or local isolators for mechanical services, they shall terminate and test these services to the control panel/local isolator.
4. Provision of circuit breakers and main switch within apartment & retail switchboards to service the apartment & retail tenancy air-conditioning systems is by electrical contractor. The mechanical contractor shall provide sub-circuits from apartment & retail switchboards to air conditioning equipment and terminate/test sub-circuits.

Hydraulic Work:

1. Coordinate and determine with the Hydraulic Contractor the power supply requirements and fire controls to all hydraulic equipment and obtain confirmation of adequacy. Provide power supplies terminated to local isolator switches where required.
2. Hydraulics Services switchboards, control panels and connection to all hydraulic equipment unless nominated otherwise on drawings is by Hydraulics Contractor. Where the electrical

contractor is to provide submains, sub-circuits and fire controls to control panels and/or local isolators for hydraulic services, they shall terminate and test these services to the control panel/local isolator.

NBN Work:

1. Provide pathways within the building in accordance with NBN pathways requirements & designs.
2. Provide power connections to all NBN equipment.

Lift services:

Lift Services Switchboards and connection to all electrical, telecommunications and security services for lift equipment unless nominated otherwise on drawings is by Lift Contractor. Where the electrical contractor is to provide submains, telephone infrastructure and security services to control panels for lift services, they shall terminate and test these services to the control panel. Obtain electrical requirements from lift contractor.

Pool SYSTEMS:

Pool Services Switchboard and connection to all electrical services for pool equipment (including lighting within pool) unless nominated otherwise on drawings is by Pool Contractor. Where the electrical contractor is to provide submains to control panels for pool services, they shall terminate and test these services to the control panel. Obtain electrical requirements from lift contractor.

Fire Sprinkler SYSTEMS:

Fire Sprinkler Pump panels and connection to all electrical services for fire sprinklers equipment unless nominated otherwise on drawings is by fire sprinkler contractor. Where the electrical contractor is to provide submains & fire controls to control panels/equipment for fire sprinklers, they shall terminate and test these services to the control panel/equipment. Obtain electrical requirements from fire sprinkler contractor.

03 REGULATIONS AND AUTHORITY REQUIREMENTS

The whole of the works shall comply with all the latest relevant regulations and all local authority requirements including but not limited to:

- Gold Coast City Council
- Queensland Fire & Emergency Service
- National Construction Code (NCC)
- Energex
- NBN
- Work Cover Authority
- Australian or relevant British Standards
- Work Place Health & Safety Act
- Fire Engineering Report

Include the cost of any materials or equipment required to meet such regulations and requirements whether specifically shown or described in the documents or not. The electrical contractor shall pay any fees to any authority pertaining to this project.

04 STANDARDS

The electrical services described in this document shall include all work obviously requisite to design

and complete the installation in accordance with all relevant codes and authorities including:

1. AS 3000 - SAA Wiring Rules;
2. AS 3008 - Part 1 Electrical Installations - Selection of Cables;
3. AS 3439 - Part 1 Low Voltage Switchgear and Control Assemblies;
4. AS 1680 - Part 1 Interior Lighting General Principles and Recommendations;
5. AS 1680 - Part 2 Recommendations for Specific Tasks and Interiors;
6. AS 1680 - Part 2.1 Circulation Spaces and Other General Areas;
7. AS 1680 - Part 2.2 Offices and Screen Based Tasks;
8. AS 1680 - Part 2.4 Industrial Buildings and Process Tasks;
9. AS 2293 - Parts 1 & 2 Emergency Evacuation Lighting in Buildings;
10. AS 1670.1- Part 1 Fire Detection, Warning, Control and Intercom System
11. AS 1670.4- Fire Detection, Warning, Control and Intercom Systems
    Part 4 Sound System and Intercom System for Emergency Purposes
12. AS 1768 - Lightning Protection
13. AS 1754 - Electrical Safety
14. AS 1049 - Cable Insulation Requirements
15. AS 1417 - Parts 1 and 2 receiving antennas for radio and television in the frequency range 30 MHz to 1 GHz
16. AS/NZS 3080 - Integrated Communications Cabling for Commercial Premises
17. AS 3084 - Telecommunications Pathways and Spaces for Commercial Buildings.
18. AS 1170.4 – Structural Design Actions Earthquake Actions in Australia
19. NBNCo Building Design Guide – New Developments
20. Queensland Electricity Connection and Metering Manual
21. AS/ACIF S009: 2006- Installation Requirements for Customer Cabling (Wiring Rules)
22. Energex Underground Construction Manual
23. National Construction Code 2016
24. Fire Engineering Report

05 CERTIFICATION

All electrical services must be supplied, installed and certified in accordance with the design documentation, local and/or state government regulations, and above mentioned standards by a registered and licenced electrical contractor.

Certify installation of all fire safety services in accordance with the Local Government Regulations. Include certificate in the maintenance manual.

06 SITE INSPECTIONS

The Electrical Contractor acknowledges that he has visited and inspected the site and taken into account the existing and/or adjacent structures to fully acquaint himself with its nature, means of access, working space, note levels and local conditions and included all allowances within the contract sum for all necessary works implied but not necessarily be documented in either the specification and/or shown on the drawings.

The Electrical Contractor acknowledges that he has inspected the site and that he has become conversant with all (visible and latent) existing conditions of access to the site for building purposes and with services shown on the contract documents and has allowed for all such factors in the contract sum.

No claims arising from the failure of the Electrical Contractor to take all existing conditions on the grounds of ignorance of the amount and kind of work involved and the conditions under which the works shall be executed shall be allowed.

07 DESCRIPTION OF THE BUILDING

All details of building construction must be ascertained from the appropriate building documents (architectural, structural, etc.) and by a site inspection.

The builder shall provide a set of all building documents to the Electrical Contractor for their examination.

08 SAMPLES

Samples shall be

- submitted to the Project Manager in the format as specified in the General Conditions.
- submitted switchboards, luminaires, wiring ducts, brackets, fixings, equipment, switches and outlets and all other equipment and accessories whose appearance shall be visible.
- approved before installation commences.
- be held on site after approval and used as a standard for acceptance or rejection of subsequent production units. Samples shall be returned on completion of the project.
- be labelled to identify their intended use and relation to these documents, e.g. Type B Luminaire, GPO for Plantroom etc.

Subject to approval of the Project Manager, where an item of equipment is a standard item copies of the manufacturer's catalogue or brochure may be accepted provided that all dimensions and relevant information are shown in the catalogue or brochure.

09 TENDER DRAWINGS

The tender drawings show general arrangement only, are not fully dimensioned or sized and are in places drawn for clarity of intent rather than dimensional accuracy. Information will not necessarily be shown in both the Specification and Drawings. Any items shown in one or the other forms part of this contract.

Do not scale the tender drawings. Verify all dimensions by site measurement. Obtain formal approval from the Project Manager before making any fundamental changes from the conceptual layout.

Co-ordinate the layout with the Project Manager and all other trades. Set out all equipment and services to suit actual space conditions.

Locate all equipment in accordance with the manufacturers operating & maintenance requirements.

10 AS-INSTALLED DRAWINGS & MANUALS

.01 General

Provide as-installed drawings and Operation & Maintenance manuals on completion of the works and prior to the issue of the Certificate of Practical Completion.

Submit preliminary copies of the documents for checking in DWG format plus one set of prints.

.02 Drawings

The drawings shall be in AutoCAD 2018 or later.

Pencil or freehand drawings shall NOT be acceptable.

Working drawings prepared and submitted prior to installation shall be amended to show all variations and may be accepted as the as-installed drawings for the portion of the works.

Contract drawings may be supplied in electronic form emailed at **current commercial rates**, so that they may be amended to form the as installed drawings. It may be necessary to reword the notes and title blocks on the drawings so that the drawings depict the details of the works.

The drawings shall show the following information:

- The as-installed location of all outlets.
- Circuit grouping.
- switch grouping and position of switches.
- The route of conduit runs concealed from view.
- The route of cable trays.
- The route of sub-mains.
- The route of spare conduits suitably identified for the purpose.
- The location of switchboards.
- The route of cabling for, emergency lighting, security, PABX, voice/data cabling systems and the like.
- The arrangement of switchboards.
- The arrangement and connection of sub-main reticulation, including the size and type of cables (single line diagram).
- All relevant information which would assist in carrying out the maintenance, additions and/or alterations to the installation.

.03 O&M Manuals and 'As Constructed Drawings'

Prior to practical completion provide three copies of drawings bound which depict the following:

- Index.
- Manufacturers' brochures on all equipment and accessories used in the installation e.g. GPO's, switches, circuit breakers, relays etc.
- A schedule of all luminaires with manufacturers' brochures, drawings and lamp sizes and types to be used with each luminaire.
- Operating and Instructions manuals for, emergency lighting, security systems, property management system, PABX system and the like incorporating a comprehensive list of components and type or catalogue number(s).
- Maintenance and testing instructions for, emergency lighting, security systems, and all components in the installation which require regular preventative maintenance and checking.
- A written text on the method of operation of for, emergency lighting, security systems, and components in the installation.

- CAD disks and transparencies of 'As Constructed' drawings.
- A list of service companies and agencies for maintenance of components, equipment and systems in the installation.

A draft hard copy of the manual shall be submitted for checking, before submission of the final copies of the manual. Where manufacturers' drawings are included in the manual, they shall be folded and included within the manual, or alternatively bound separately and cross-referenced in the manual.

11 AUTHORITIES INSPECTIONS AND FEES

Lodge all notices and pay all fees required by the controlling Authorities.

Carry out demonstrations of all systems as required by the authorities. Also allow for all pre-inspection testing to ensure that all systems are ready for the authority's inspection.

The Project Manager shall have the right to inspect the work in progress and all materials the Contractor proposes to use and in the event of any dispute in this connection, the Project Manger's decision shall be binding and final.

12 COMMISSIONING AND TESTING

.01 General

Subject all systems to a commissioning and testing procedure before they are put into service.

Provide all test instruments, other testing facilities and skilled and unskilled labour required to verify all systems and equipment performance and to complete all check list records. Include cost in tender price.

Any work, which does not comply with the brief, shall be made good.

Give at least 14 days' notice prior to the start of the commissioning of any particular system, and submit a programme of testing and commissioning procedures for that system. Modify the programme as required.

.02 Check List

Prepare a detailed and comprehensive checklist prior to commissioning and testing. Three months prior to the start of commissioning submit the proposed checklist for approval.

The purpose of the checklist is to:

- Ensure that all items that should be checked are checked.
- Produce a permanent record of the commissioning checks carried out.

Accordingly the checklist must be built up from information contained in this brief, from suppliers, manufacturer's installation and commissioning data and from experience in commissioning similar equipment and systems.

The detail of the checklist must be such that it can be completed with a reading or a tick, which means that every device must be listed.

eg. circuit - 3 - L6 Megger reading - 50 M Ohm

The checklist shall cover at least the following:

- Electrical reticulation and general power.
- Lighting installation.
- Emergency and exit lighting.
- Telephone block cabling system.

- Data cabling system (if part of the project).

13 PROTECTION OF ELECTRICAL EQUIPMENT, SWITCHBOARDS AND MATERIALS

Take special care to protect all apparatus and equipment provided in connection with this work. The protection shall include covers to prevent grit, plaster or other foreign substances from entering the working parts of equipment. Take special care to keep all open ends of pipes and conduits, etc., closed while in storage or during the course of installation.

All materials, goods and equipment etc forming part of the works must be complete, intact and in good order at Practical Completion. Safeguard such materials, goods and equipment until then.

14 MAINTENANCE AND WARRANTY

.01 Operational Maintenance (12 months after Practical Completion of Head Contract)

During the maintenance period provide qualified and experienced personnel to perform the maintenance required for safe and reliable operation, including the following:

- Make regular service visits at the required intervals and at times agreed with the building staff, and carry out regular maintenance procedures, including running adjustments, and the like.
- Promptly attend unsatisfactory operation of any equipment at any time of the day or night, and restore the installation to proper working order. Before the start of the maintenance period, supply the contact telephone numbers of the persons to be called.
- Make good faults or damage caused by defects in the installation, and replace defective parts or parts showing signs of undue wear.
- Supply the necessary maintenance manuals.
- Leave the areas and equipment in and on which maintenance work was performed clean and tidy after each visit.
- Provide a record of each visit including the date and time, work carried out, name of the service operator and any relevant information in one of the following forms:
  - A computer record;
  - a log book with pages set up for operational maintenance records, neatly bound in durable vinyl or similar hard covers, permanently labelled with the project name and data of issue.
- At the end of the maintenance period, make a service visit, test the safety and protective devices, demonstrate the satisfactory operation and certify in writing that all systems are in satisfactory working order, and is operating correctly.
- Refer to Appendix A for further details on warranties required and warranty lengths.

15 LABELS

Label the following:

1. Switchboards, switchgear and controls.
2. Power outlets, isolating switches and light switches.
3. All major submains at each distribution board or access panel.
4. Labels for power outlets and switches shall indicate circuit numbers at the switchboard. Plastic flush plates shall either be engraved and filled with colour or be fitted with proprietary engraved circuit identification discs equal to IPA studs.
5. Label cables with slip on ferrules.
6. Other labels shall be engraved type, mechanically fixed in position. Adhesive fixing is not acceptable. Interior labels shall be laminated plastic, exterior labels anodised aluminium.
7. Label the circuit breakers which supply emergency lighting circuits as per AS2293.

16 WARNING NOTICES

All switches, pushbuttons and devices that may activate visible or audible alarms, equipment shutdowns or start ups shall be labelled to indicate the purpose of the switch, together with the appropriate wording "DO NOT SWITCH ON/OFF".

17 TRAINING

A minimum of three days prior to PC date, the Contractor is to undertake training of the client's representatives to allow understanding of all services and equipment installed.

Training is to be provided by a representative from the subcontractor who installed the equipment/service and includes a minimum: electrical, dry fire, security/access control, CCTV systems Operational manuals are to be provided prior to training. If the full manuals are not available at the time of training, the client may accept a basic handover pack for the interim.

Training shall only be provided on completed systems and equipment.

SECTION 002 ELECTRICAL SYSTEM DESCRIPTION

01 ELECTRICITY SUPPLY

Energex are providing a low voltage supply at the terminals of the proposed padmount transformer located on the site.

The Contractor shall:

- Provide Developer works & activities in accordance with the project connection contract including but not limited to conduits, earthing provisions and padmount transformer site preparation.
- Have supply made available for the LV switchboard from this low voltage Energex supply.
- Liaise with the Energex to ensure supply is available when required.
- Pay all costs associated with the provision of supply.

02 CONSUMER MAINS

Consumer mains shall be copper fire rated run on cable tray from LV terminals of the padmount transformer to main switchboard. The consumer mains shall be sized in accordance with AS 3000 maximum demand and AS3008.

03 MAIN SWITCHBOARD

Provide main switchboard for the building to comply with AS 3439.1 for minimum form 3 IP53.

The main switchboard is to be divided into the following separate sections:

- Fire Services Section.
- Community section complete with either direct connect or C.T metering.
- Tenancy Metering section.

04 METERING

Provide all facilities and components necessary for the installation of the meters by the Supply Authority. Meters shall be designed to be located in the main switchroom for the community section of the main switchboard. The individual supply authority metering for each unit shall be designed to be located in metering panels located within the electrical riser and to the Queensland Electricity Connection and Metering Manual (QECMM) and the Embedded Energy Providers requirements. The meters shall meet the National Electricity Code requirement for the contestability market.

05 EARTHING

Design Supply and install complete earthing system in accordance with the requirements of Australian Standards and the Supply Authority.

Provide earthing for the NBNCo network in accordance with NBNCo Design Guide lines and AS/ACIF S009:2006.

06 SUBMAINS

Power reticulation to the various parts of the building shall be distributed via copper fire rated cables for essential services and copper XLPE type cables (three phase) for other services.

All submains shall be sized as per AS 3000 and AS 3008.

Complete maximum demand calculation in accordance with AS3000 appendix C for all consumer mains and sub mains for sizing of mains. Check capacity of equipment to be supplied by others for the project prior to confirmation or orders for sub mains.

07 COMMUNITY DISTRIBUTION BOARDS, METER PANELS AND UNIT DISTRIBUTION BOARDS

Design, Supply and install new community distribution boards, meter panels and unit distribution boards as described below.

All community & retail tenancy distribution boards shall be rated at 10kA with Form 1 segregation, degree of protection IP42, complete with 3 phase chassis and shall be sized with at least 30% spare capacity. Distribution boards shall be provided with fault current limiters (FCL) where required. Distribution boards shall comply with AS 3439.1.

All meter panels shall be 3 phase custom designed, rated at 10kA with form 1 segregation, degree of protection IP42, supply authority metering isolation links/fuses, direct connect meters and unit distribution isolation circuit breaker (one for each unit). The meter panels shall be designed to comply with AS 3439.1, the QEMM & QECM and the Emdedded Energy Provider's requirements.

The unit distribution boards shall be rated at 6 kA with form 1 segregation with a degree of protection IP4X. The unit distribution shall be a flush mounted moulded polycarbonate type c/w with doors and DIN rail chassis and sized to have 4 spare spaces for future DIN mounted MCB.

08 ELECTRICAL RETICULATION

Cable sizing shall be based on the following:

- Consumer main shall be sized on maximum demand calculation in accordance with AS 3000 appendix C and include spare capacity of 20%. Consumer mains shall be selected as to AS 3008 requirements and be fire rated.
- Submains shall be rated in accordance with AS 3000 appendix C and selected as per AS 3008 requirements and have a 20% spare capacity.
- All submains are to be sized including equipment loads specified by the appropriate contractor.
- Voltage Drop: Limited to 7% of the supply voltage on any point on the system. Apportionment as follows:
  - Point of supply to main switchboard 1%
  - Main Switchboard to Community Distribution Board or Meter Panels – 1.5%
  - Meter Panels to Unit Distribution Boards – 2.5%
  - Subcircuits – 1%
- Cable trays and riser ducts to be sized to allow for 30% space capacity for future additional cabling.
- Minimum cable sizes are as follows: Compliance with AS 3000 and AS 3008.
- Lighting Circuits 2.5mm² Cu in community areas
  1.5mm2 Cu in apartments.
- General Purpose Power Circuits 2.5mm² Cu.
- Control Circuits including
  Bells, Alarms, etc. 1.5mm² Cu.
- Flexible Cords 30/0.25mm² Cu.

09 LOW VOLTAGE POWER SYSTEMS

- Supply and install low voltage power system as documented.

- Design all protective equipment supplied by the contractor, which forms part of the installation, shall grade with and discriminate with the Electricity Distributor's protection. It shall be this contractor's responsibility to obtain all relevant time current characteristic curves and the like from the Electricity Distributor to co-ordinate the discrimination of the protective devices.
- Maintain the same phase sequence as provided by the Electricity Distributor to all sub-mains, switchboards and multi-phase outlets throughout the installation. The following terminology shall apply:
    - A phase - Red
    - B phase - White
    - C phase – Blue
- Arrange all circuits to lighting and power outlets in accordance with the following requirements:
    - Light Circuits - 16A connected load maximum calculated at 240V.
    - Power Circuits
        - One circuit per 5 off 10A double socket outlets in non-air conditioned community areas, eg. Car park, plantroom.
        - One circuit per 6 off 10A double socket outlets in air conditioned community areas.
        - One circuit per each item of permanently connected equipment.
        - One circuit per 15A or 20A G.P.O.

10 LIGHTING

.01 General

- Appropriate emergency and exit lighting is required throughout the building to comply with NCC and AS 2293.
- Provide lighting to any space requiring artificial lighting for access, maintenance or operation.
- Fire stair lighting is to be unswitched and controlled from reed switch at each level of the fire stairwell and supplied from DB-MSB. On activation of one reed switch within the fire stairwell all the lights within that stairwell shall turn on.
- Lighting levels quoted are "Maintenance Illuminance" values.
- Values of coefficients of utilisation from recognised laboratories shall be used.
- Exterior lighting shall be designed and installed in accordance with AS 1158.3.1 unless noted otherwise.
- Maintenance factors for internal fixtures shall be those shown in table C2 of AS 1680 and table F1 of AS 1158.3.1 for external fixture, for 2 year cleaning periods.
- All lighting controlled from PE Cell and/or time clock shall be designed with an Auto/Off/Manual selector switch located on the escutcheon of the switchboard the lighting circuit is being supplied from.
- Time clock controlled lighting circuits are to be design to be grouped so that 50% of lighting within that area that is being controlled by time clocks are to be on a separate time clock setting.

11 TELECOMMUNICATION SERVICES

The developer has entered into an agreement with NBNCo as the telecommunications provider for the project. The Contractor shall design the telecommunication infrastructure to the NBNCo Building Design Guide for New Developments. The contractor is to manage and coordinate the works of the NBNCo to ensure the service connections to the site are completed in time to allow for the testing and commissioning of all works prior to Practical Completion.

The Contractor shall provide all spatial requirements, trenching, cable trays, conduits and pits for NBNCo cables and equipment.

All works are to be in accordance with the NBNCo Design Guide for New Developments.

12 DATA CABLING NETWORK SYSTEM

The Contractor shall design and provide a data cabling network system as documented.

Refer to Section 3 for specification details.

13 TELEVISION DISTRIBUTION SYSTEM

Design and provide a digital free to air and a Foxtel satellite Pay-TV systems for the reception and distribution throughout both towers.

The satellite Foxtel Pay-TV system is to be design to the latest Foxtel MDU standards.

14 LIGHTNING PROTECTION

Design and provide a lighting protection system in accordance with AS1768

15 SECURITY ACCESS SYSTEM & CCTV SYSTEM

Design and provide a central security access system for the building. The security access system shall control all vehicle entry points, pedestrian entry points, lifts and doors as documented. Design and provide interface with the visitor audio intercom system so the intercom system can control the visitor pedestrian entry points and vehicle entry points.

The security access system shall be as Inner Range Concept 4000 or equivalent

Design and provide an IP based CCTV system complete with NVR, cameras and associated equipment and wiring. The system shall accommodate cameras in areas documented on drawings plus 20% spare.

16 VISITOR INTERCOM SYSTEM

Design and provide a central visitor colour video intercom system for the building. The visitor intercom system shall control all vehicle entry points, pedestrian entry points, lifts and doors as documented. Design and provide interface with the security access system so the intercom system can control the visitor pedestrian entry point, vehicle entry points and lifts.

The visitor system shall be a Fermax, Aiphone, Urmet or equivalent

17 EMERGENCY LIGHTING SYSTEM

Provide a emergency and exit lighting system in accordance with the National Construction Code and AS2293.1

18 SMOKE DETECTION AND ALARM SYSTEM

.01 Smoke detection system

The Contractor shall supply install and commission the fire detection and alarm system including a Fire Detection Control & Indication Equipment (FDCIE) in accordance with the NCC 2016, Fire Engineering Report and AS 1670.1. The system should also include an integrated Fire Fan Control Fan for smoke hazard management controls and Building Occupant Warning System (BOWS)

The facility for the FDCIE shall alarm to the Fire Brigade via a monitoring company. If stated in the NCC the Contractor shall arrange for the FDCIE to be monitored.

The Contractor is responsible for organising the connection of the monitoring system and paying for the first 12 months of the monitoring cost

The Contractor shall design the fire systems to ensure that mains power are not removed from any systems during fire system testing

Building Occupant Warning System (BOWS)

The Contractor shall provide a BOWS in accordance with NCC 2016, Fire Engineering Report, AS1670.1 and AS1670.4.

Consideration should be given to the location of the speakers. Volumes for each speaker should be adjustable to ensure the volume levels are suitably fine-tuned to the requirements of the NCC, AS1670.1.and AS1670.4. The speaker locations and types shown on the drawings are indicative only. The contractor is to ensure that speaker designs & selections, specifications, locations and quantities deliver the sound levels and speech intelligibility requirements of NCC 2016 & AS 1670.4

19 AUTOMATIC METERING READING CABLING

The contractor shall design, supply and install 4 pair Category 6 for each apartment and community AMR cold water meter. The Category 6 cable shall be installed from each cold water meter to the AMR data gathering point including terminations, testing and commissioning. The contractor is to determine and coordinate this work with the hydraulic contractor.

SECTION 003 TECHNICAL REQUIREMENTS

The electrical design and installation shall meet the technical requirements as specified in this section.

01 ELECTRICAL SUPPLY

.01 Electrical Characteristics

The electrical supply to the installation is a low voltage supply 415/240V, 3 phase and neutral 4-wire 50 Hz direct from Energex substation.

.02 Consumers Mains

Fire rated consumer main shall run from the L.V. terminals of the padmount substation to the main switchboard.

.03 Prospective Fault Level

The prospective fault level current at each consumer's point of connection shall be as advised by Energex. Recommended 28KA min.

All parts of the installation, main switchboards and equipment, up to and including the main protective devices shall be sized and selected to withstand the stresses caused by the prospective fault level for a period of one (1) second.

.04 Phase Sequence

Maintain the same phase sequence as provided by the Supply Authority to all sub-mains, switchboards and multi-phase outlets throughout the installation.

The following terminology shall apply:

A phase - Red
B phase - White
C phase - Blue

.05 Earthing

The electrical system earthing shall

- comply with AS 3000.
- be in accordance with the Supply Authority's requirements.
- comprise a network of bonding between equipment, electrodes and services mains.
- include a separate earthing system to telephone distribution frames, electrodes etc.
- remove all existing redundant earthing equipment and wiring.

Earthing conductors:

- shall be copper, of adequate cross-section, and continuous throughout their entire length.
- shall be 2.5sq.mm minimum cross-sectional area, except for earthing conductors used for bonding other services to the earthing medium which shall be 6sq.mm minimum or the minimum defined by AS 3000 whichever is the greater.
- may be the form of copper sheathing to MIMS conductors where permitted by the Wiring Rules.
- shall be enclosed within the sheathing of T.P.S. cables for final sub-circuits.

- follow the basic routes as indicated on the drawings or as described herein.
- unless otherwise stated be installed in a manner to achieve the current ratings stated in Tables 8 and/or 14 of AS 3008.1 for XLPE/PVC cables as applicable.
- be identified at take-off boxes/switchboards by approved labels fixed to the front coverplates identifying the cable size, type and purpose.

Where sub-mains are provided to equipment supplied by others, provide the details of all busbars, fixings, studs and clearances which shall be required to be incorporated within the equipment for the satisfactory termination of the cables.

Terminate and connect cables to equipment supplied by others unless otherwise specified herein.

04 POWER FOR TESTING

Make all necessary arrangements and applications, etc., for the full permanent power to be connected before the date of practical completion.

The time of connection shall be arranged to suit the building programme.

Sub-mains, controls and associated items for equipment and systems installed by others shall be connected so that these services may be tested.

Lighting and power outlets shall NOT be connected to the supply for general usage before practical completion without prior approval from the Engineer.

05 SWITCHBOARDS

.01 General

Provide a main switchboard to correspond to the Energex Electricity supply and all distribution switchboards as required to serve all equipment in accordance with this specification.

Switchboards shall be:

- of approved manufacture.
- comply with the requirements of AS 3439.
- segregated in accordance with AS 3439 Form 3a back connected with incomers segregated from each other and the busbars for main switchboards, and Form 1 or 2 for distribution switchboards.
- Complete in every respect, fully wired and factory tested.
- Of overall dimensions suitable for the space allocated.
- designed to facilitate easy access to and removal of component parts.
- constructed and contain equipment to the approval of the local Supply Authority.

.02 Drawings

Drawings of main switchboards, switchboards which incorporate unmetered conductors and/or Supply Authority equipment shall firstly be submitted to the Supply Authority for their acceptance.

After acceptance by the Supply Authority, the drawings shall then be submitted to the Project Manager/Consulting Engineer for approval.

Drawings shall be in the format specified herein and show the following information:

- Manufacturer's name and catalogue number of any standard equipment.
- The general arrangement of equipment.

The main earthing conductor for the main switchboard installation shall:

- be run to and connected to a bolted, labelled connection on the earth electrodes.
- be bonded to the incoming water supply for domestic and fire services.
- if applicable, be run into the Supply Authority's substation for connection to the Authority's earth bus system.
- be provided with an engraved label with red filled letters inscribed - "MAIN EARTH - DO NOT DETACH".
- be green/yellow PVC covered.

Earth electrodes shall be:

- 19 mm diameter extensible phosphor bronze (or copper clad steel) 2m in length per section driven to a maximum depth of 8 m.
- sufficient in number to achieve the necessary resistance to earth.
- installed within a "Fibrolite" pit fitted with a lid inscribed in red filled letters - "MAIN EARTH - DO NOT DISCONNECT".
- driven into the ground by mechanical hammering.

Provide earthing to:

- all exposed metal parts forming part of this installation.
- metal conduits, frames, cable trays, trunking and ducts.
- cable sheaths and armouring.
- luminaires, equipment enclosures and switchboards.

Provide earth bonding to:

- all metal pipes entering or leaving the building.
- major internal piping systems, such as compressed air, reticulated gas systems, steam piping, and the like.

Earth connections for lift submains shall be a brass bolt, stud or screw, not less than 6mm nominal diameter.

02 METERING

Provide all fixings, panels, plug sockets, wiring, links and hardware to the requirements of the Embedded Energy Provider

Arrange for the provision of metering equipment to be provided and installed within switchboards to their satisfaction. Obtain Embedded Energy Provider's details and requirements from the builder

Maintain sufficient clearance between heavy current carrying conductors and metering instruments as may be required by the Supply Authority/Embedded Energy.

Make all necessary applications for the provision of metering equipment.

03 SUB-MAINS

Provide sub-main to all services, sub-mains shall:

- be of the size for full connected load with 20% spare capacity and maximum voltage drop of as documented
- be installed over routes which have been fully co-ordinated with other services.

- Full details of cabinet construction and dimensions.
- The method of supporting busbars and equipment.
- A description of all materials to be used.
- Clearances between live parts, and live parts and earth.
- Busbar dimensions and ratings.
- Internal wiring sizes and ratings.
- The size and wording of labels.
- wiring diagrams and schematics of instrument protection and control circuits.
- Front elevation of switchboard.
- Vertical section through each compartment.
- Sheet metal details.
- Weights of switchboards heavier than 500kg.

.03 Manufacture

Switchboards shall be manufactured be nominated by the electrical contractor for approval by the superintendent.

.04 Cabinet Construction

All switchboards shall:

- have coverplates folded so that all edges of the sheet are concealed.
- have all joints welded with continuous seam welds which have been ground flush after fabrication. Spot welds are UNACCEPTABLE.
- be provided with suitable means of securing the complete assembly to floor and/or walls.
- be fitted with approved means of supporting all cabling with bushed holes between compartments.
- have removable coverplates at the top.
- be provided with removable panels, escutcheon plates and covers at the front.
- contain a separate compartment for Supply Authority equipment which is provided with a means of fitting the Supply Authority's seals.
- be of the flush fronted type with only toggles, handles, indicators, dials and like equipment for operational use protruding through the front panel.
- be arranged so that the maximum distance between floor level and top of switchboard does not exceed 2250 mm or to suit access constraints.
- have 100 mm (minimum) wiring space on each side, and 150 mm (minimum) wiring space at top and bottom for each compartment, the wiring space being increased to suit the quantities and types of cables entering and leaving the switchboards.
- contain cable entries and/or gland plates, sized to suit the cables specified and positioned to suit the site conditions. Gland plates shall be of non ferrous metal.
- contain louvered vents at the top and bottom with fine bronze wire mesh welded inside for switchboards larger than 0.3 cub.m in volume.
- be fitted with seals for a degree of protection as documented to AS 1939.
- be provided with removable lifting eyebolts for switchboards heavier than 250 kg.
- incorporate thermostatically controlled anti-condensation heaters for switchboards exposed to the weather.
- incorporate a ventilated cavity space at the top of externally mounted switchboards to prevent condensation accumulating on the inside of the top of the switchboard.

.05 Free Standing Cubicle Type Switchboards

Free standing cubicle type switchboards shall:

- comprise cubicles consisting of mild steel angle iron framework with 2mm (minimum) bright mild steel coverplates or alternatively 2mm (minimum) folded bright mild steel.
- have adjacent cubicles bolted together in an approved manner providing a rigid structure.
- be mounted on a supporting base frame formed from galvanised channel sections.
- be provided with removable lifting eyebolts.
- have access to each section by means of lift-off pintle hinged doors which are fixed in the closed position by two (2) (minimum) large diameter, captive, knurled cylindrical head screws.
- contain sheet metal segregation barriers between adjacent compartments or cubicles.
- incorporate sufficient cabling space at the side for cables entering from above or below with vertical cable fixing inserts for cable anchorage.
- be completely accessible from the front.
- contain explosion vents at the top of each segregated compartment.

.06 Proprietary Type Panelboards

Proprietary type panelboards are acceptable for distribution boards, providing they comply with the following:

- Escutcheons and coverplates are secured with chromium plated nuts and washers.
- Panelboards are painted in accordance with this specification.
- Bus-bar chassis rated at 250 amp minimum.
- Provide as a minimum form 1 segregation with IP42 protection.

.07 Doors

Doors shall be provided on switchboards which are not mounted in enclosed cupboards. Doors shall:

- be fabricated from 1.6mm (minimum) folded bright mild steel.
- be fitted with a heavy duty latch complete with two (2) keys which are common to all switchboard locks in this project.
- be provided with folded metal stiffeners and bracing to achieve rigidity and prevent warping or sagging.
- be flush mounted within coverplates or switchboard enclosures.
- be hung on chromium plated lift-off pintle type hinges.
- be provided with latching bars on doors larger than one metre high.
- be fitted with chromium plated lifting handles on doors larger than one metre high.
- be arranged such that access to internal wiring and equipment by the dismantling of escutcheons and coverplates is possible without the need to remove the door.
- where in approved locations not requiring locking handles, be secured in the closed position by means of two (2) (minimum) large diameter, captive knurled, cylindrical head screws as specified for panels.
- be fitted with compressible neoprene gaskets within a metal channel.
- be sized so that the weight of any door does not exceed 20kg.

.08 Panels, Escutcheons and Coverplates

Panels, escutcheons and coverplates shall:

- be fabricated from 1.6 mm (minimum) folded bright mild steel.
- be not larger than one metre in height or width, and in no case exceed 0.6sq.m in area.
- be provided with two (2) lifting handles on panels larger than 0.4sq.m.

- be secured by means of four (4) (minimum) large diameter, plated, captive, knurled, cylindrical head nuts with larger diameter nylon washers on to replaceable threaded studs.
- be secured with large head chromium plated screws with larger diameter nylon washers for panels smaller than 0.2sq.m.
- incorporate cut-outs which
  - expose only toggles, handles, indicators, dials and the like.
  - are adequately stiffened where long cutouts are provided for equipment groups.
  - provide cut-outs for single pole breakers when multi-pole circuit breakers can be replaced with single pole breakers.
  - contain plastic inserts or painted metal covers over unused openings.

.09 Finishes

Ferrous metal shall:

- be cleaned free from rust, corrosion, grease and scale.
- have rough surfaces filled and rubbed smooth.
- be painted using a coat of rust inhibiting self-etching primer, an undercoat of zinc enriched paint and a coat of gloss enamel.
- have internal surfaces finished in gloss white colour.
- have external surfaces finished in Orange No. X15 to AS 2700.

Approved powder coatings may be submitted for approval. A painted colour sample approximately 300 mm x 300 mm shall be submitted for approval before painting. Non-ferrous parts shall be cadmium plated or tinned. External handles, bolt heads, catches, locks, nuts and screws shall be stainless steel or chromium plated.

.10 Busbars

Busbars within the switchboard shall:

- comply with AS 3439, and AS 3000.
- be manufactured from high conductivity hard drawn copper bar with radiused edges.
- be of sufficient cross sectional area to supply the capacity of the switchboard when all space on the switchboard is filled.
- be sized to limit temperature rise to 40 C for the main switchboard and to 65 C for distribution boards above an ambient of 40 C when carrying rated currents in enclosures of magnetic material
- be of minimum size 12 mm x 3 mm except for tee offs to miniature circuit breakers.
- be suitably tinned for aluminium cable lug terminations.
- be arranged for miniature overcurrent circuit breakers so that a multi-pole circuit breaker can be replaced with single pole breakers without disturbing the 3-phase busbar assembly.
- have neutral busbars of the same current rating and size as the phases.
- be used for all connections carrying 100A or above.
- be arranged so that all joints, terminations and fixings are fully accessible.
- be disposed and supported so that under short circuit conditions no busbar material is stressed to more than 25% of its breaking load or 33% of its elastic limit (whichever is the lesser).
- be arranged so that they can safely withstand the stresses caused by the prospective maximum fault current. The busbar system up to the line side terminals of the main protective devices shall be capable of withstanding the thermal magnetic and physical stress set up by a fault of the magnitude as shown on the drawing at 415 volts for 1 second. A copy of a "type test" certificate shall be submitted for the busbar systems before manufacture of the switchboards shall be permitted to commence. All fabrication carried out thereafter must be in strict accordance with all dimensions and requirements of the "type test".

- have fully lapped joints finished, coated with acid free petroleum jelly and bolted together with cadmium plated steel bolts, large diameter washers and nuts.
- be arranged for future extensions to adjacent switchboards where required.
- be provided with a removable section for the mounting of current transformers so that they may be removed or replaced without disturbing the remainder of the switchboard.
- be supported on synthetic resin moulded type insulators, panels and cleats. The use of bobbin type insulators secured through the busbar is not acceptable.
- pass through 12 mm (minimum) thick close fitting insulated panels through a single hole in metalwork where installed from one compartment to another.
- be phase coloured as follows:
  - A phase - Red
  - B phase - White
  - C phase - Blue
  - Neutral - Black
  - Earth - Green and Yellow
- be fully insulated by:
  - PVC dipping with a minimum of two (2) coats, or
  - PVC encapsulation, or
  - Shrink-on PVC sleeving with taped joints.

Except for fully encapsulated or fully P.V.C. dipped proprietary busbar assemblies, busbars shall be coated with an acrylic copolymer material approved by the Supply Authority. Provide warning labels on the boards with coated bars, advising that the bars should be treated as bare.

.11 Wiring

All instrument, indicator and control wiring shall:

- comply with AS 1042
- be of stranded copper conductors, minimum size 2.5sq mm V90 grade 0.6/1 kV PVC insulated.
- be supported on the square grid form using approved ducting and channels for groups of cables and approved plastic clips for single circuits.
- be identified using an engraved or moulded thimble suitably and securely fixed to the wire adjacent each terminal connection of the wire.
- be connected to approved 30A (minimum) rating terminal blocks of moulded insulating material which are labelled and numbered for the termination of all wiring which is external to the switchboard.
- be terminated using approved crimping lugs.
- comprise flexible conductors where connected to equipment mounted on doors or in positions subject to movement.

.12 Cable Terminations

All terminals shall be of adequate size to accommodate the cable sizes specified irrespective of the rating of the switchgear.

Busbar stub connections shall be provided on terminals for cables rated at 100A and above, and shall be suitable for the connection of bolted cable lugs.

All terminations to circuit breakers and control equipment shall be by approved crimping lug.

All termination connections shall be fully accessible for inspection and servicing.

.13 Links

Links for terminating neutral and earthing connections shall be:

- of brass or copper and square or rectangular section.
- provided with the same number of terminals as there are active poles and numbered to correspond.
- be fitted with tunnel type terminals for cables up to 6 sq.mm and stud type terminals to accept cable lugs for other cables.
- installed over the full length of multi compartmented switchboards.
- fully accessible.

.14 Hardware

All bolts, screws and nuts shall:

- have metric threads conforming to AS 1275.
- have hexagonal shaped heads.
- be of non-ferrous metal, or alternatively cadmium plated.
- be fitted with flat and spring washers.
- be chromium plated where exposed to view.

Self tapping screws and nylon or similar bolts/nuts shall NOT be accepted.

.15 Labelling

Labels shall:

- comprise machine engraved traffolyte plastic laminate with bevelled edges.
- contain 4 mm (Minimum) high black characters on white background except for "Danger" and "Fire Services" labels which shall be white characters on red background.
- be provided to indicate the function of main controls, sub-main controls, relays, fault current limiters, links, contactors, relays, starters and switches.
- be provided for lift submains to indicate the designation numbers of the lifts and whether the lifts are fire lifts.
- indicate the current rating of fuses for fault current limiters and the equipment protected by the fault current limiter.
- be provided on the rear of main controls and sub-main controls of back-connected switchboards so that the control can be identified from the rear of the switchboard.
- be in the form of a numeral for each single pole of sub-circuit controls, including each pole of multi-pole controls.
- be fixed by chromium plated screws, spring washers and nuts. Self tapping screws or adhesive are NOT acceptable.
- be provided on each switchboard to indicate:
  - details as required in Section 5 of AS 3439.
  - the switchboard number as designated in these documents.
  - supply mains, number, size and type.
  - origin of supply mains.
- be provided on the coverplate in front of fault current limiters which are mounted behind the coverplate and displaying the wording "FAULT CURRENT LIMITERS BEHIND PANEL".
- be provided to indicate "ON", "OFF" and other positions of all controls, switches, isolators and circuit breakers unless clearly indicated on the equipment.
- be provided where provision is made for the mounting of future equipment. These labels shall be blank and fixed in position.

- be provided for circuit breakers to which frequent access is required for switching and testing purposes, eg. light circuits, security lights, emergency lights, etc., and shall indicate the purpose of the circuit breaker.
- be provided for circuit breakers which are locked in the "ON" position to prevent unauthorised operation, eg. security circuits, clocks, fire alarms, etc., and shall indicate the purpose of the circuit breaker together with the additional wording "DO NOT SWITCH OFF".

A typewritten circuit schedule card in a clear acrylic windowed holder shall be located adjacent each distribution section of switchboards.

A line diagram of all switchboard connections and controls shall be mounted in a clear acrylic windowed frame located adjacent to the switchboard.

.16 Circuit Breakers

Miniature circuit breakers shall:

- be designed to withstand 25,000 switchings at rated current and voltage with a power factor of 0.95.
- be designed to withstand 50,000 switchings at no load.
- incorporate the following:-
  - arc interrupting device.
  - inverse time current characteristic.
  - thermal/magnetic trip
  - trip to operate when breaker is locked on.
- comply with AS 3858, AS 3111 and AS 2184 as applicable.
- have an interrupting capacity adequate for the maximum prospective fault current to which they may be subjected, and not less than 6 kA.

Moulded case circuit breakers shall:

- incorporate similar features as listed for miniature circuit breakers.
- comply with AS 3858 and AS 2184.
- have ambient temperature compensation for breakers over 160 amps.

Air circuit breakers shall:

- comply with the requirements of AS 1930.
- be arranged for cubicle mounting, horizontal isolation and withdrawal;
- have an operating mechanism designed to close manually and electrically via charged springs such that the contact speed is independent of the operator, and be free to open immediately the trip coil is energised;
- be provided with mechanically operated, visual indication of the switch position by means of a direct linkage from the main contact movement, indicator shall show Green for "Off" and Red for "On".
- have electrically driven spring charging mechanisms fitted with manual charging over-rides;
- have spring charge status indicator;
- have manual trip facilities fitted with means for locking in the 'trip' position;
- have provision for remote electrical open and close;
- be capable of being fully isolated without opening the cubicle door;
- incorporate over-current device providing the required discrimination.
- have the facility for being tested in the withdrawn position;
- be arranged such that secondary connections may be completed when in the isolated position;

- be equipped with an operation counter;
- be designed such that contacts may be rapidly replaced;
- be provided with automatic busbar shutters.
- have auxiliary switches to perform specified functions plus 2 normally open and 2 normally closed spares.

.17 Contactors

Contactors shall:

- comply with IEC 947 - Part 1.
- be suitable for AC 3 utilisation category.
- have a minimum current rating not less than that specified or the protective device immediately proceeding where no rating is specified.
- be suitable for uninterrupted duty.
- have type 2 short circuit co-ordination with the protection device preceding it.
- be suitable for 50,000 switching operations.
- be four (4) pole for change-over contactors.
- be Sprecher & Schuh, Klockner-Moeller, Telemecanique or approved equal.
- have 2 sets of normally open and normally closed auxiliary contact with 10 amps minimum rating.
- have renewable contacts and operating coils.

.18 Switches and Isolators

All switches and isolators rated at 50A and above:

- shall comply with AS 1775 and/or AS 3133.
- shall be fault making and load breaking.
- be rated for uninterrupted duty.
- shall be spring assisted manual closing.
- shall be suitable for the prospective fault current specified herein.
- shall include a mechanical "ON" and "OFF" visual indicator linked directly to the main contact movement.

.19 Fuses and Links

All fuses shall be H.R.C. type. Fault current limiting fuses in distribution boards may be DIN type. Other fuse carriers and links shall comply with the following.

H.R.C. fuse carriers and bases shall:

- comply with AS 2005.
- have a moulded plastic insulated fuse carrier.
- have a fuse indicator which is visible without the need to remove the fuse.
- have fully shrouded base contacts.
- be of G.E.C. or approved equal.

H.R.C. fuse cartridges shall:

- be certified for a fusing factor of Class Q1.
- be GEC/English Electric Type T.

Three (3) spare H.R.C. fuse cartridges of each rating and type used (including fault current limiting fuses) shall be provided on a labelled panel adjacent EACH switchboard.

.20 Programmable Time Controller

A 365 day 6 channel programmable time controller shall be provided in switchboards as required.

It shall be possible for a non technical person to programme the controller:

- using a key pad incorporated in the controller.
- for three separate day programmes plus a holiday programme.
- to switch each channel on and off at least three times per day accurate to one minute.

The controller shall incorporate:

- a digital display which normally shows the time. The display shall show each programme step as it is entered.
- it shall also be possible to review programmes after they have been entered.
- indicator lights to show the status of each channel.
- an output relay (with single pole changeover voltage free contacts) for each channel.
- a rechargeable battery to retain time and programme for at least ten hours. The battery shall have a service life of at least five years.

Provide a manual override switch for each channel and each standard daylight switch.

.21 Current Transformers

Current transformers for Supply Authority equipment shall be provided in accordance with their requirements.

Current transformers for other usages shall:

- comply with AS 1675.
- be class 1M for metering, class 2M for maximum demand metering and class 2.5P for protection.
- be of the resin encapsulated type.
- have 5A secondary windings.
- be separate units for metering and protection.
- be suitable to withstand the maximum fault current as specified herein.
- be clearly labelled to identify their rating and use.
- be capable of operating the load of the related device with an additional capacity of 5%.

.22 Meters

All meters shall:

- comply with AS 1024 for accuracies class 0.5.
- be industrial grade with shock resistant jewel bearings.
- be of the flush mounted type, square fronted of dimensions 96mm x 96mm with a quadrant scale.
- have suppressed zero, compressed overshoot and/or non linear scales as required by the range of measurement.
- be provided with a means of zero adjustment without the need for any dismantling.
- have a deflection of approximately 80% full scale range with a 5A load.
- be suitable for continuous duty.
- have direct reading scales graduated to suit each application.

- have dials with black characters on a white background.

Ammeters shall be provided for each phase of each section of the main switchboard.

Voltmeters shall be connected to a transfer switch so that phase-to-phase and phase-to-neutral readings can be obtained.

.23 Maximum Demand Indicators

Maximum demand indicators shall be:

- provided on each phase.
- have a 15 minute time constant thermal element.
- have both a demand pointer and manually resettable maximum indicator.

.24 Controls Relays

Control relays shall:

- have 5A minimum contact rating.
- be continuously rated.
- have silver contacts.
- have one (1) spare set of normally open and normally closed contacts.
- have surge suppression on coils.

Time delay relays shall be solid state electronic type. Pneumatic or dashpot operated devices are UNACCEPTABLE. Phase failure relays shall monitor 3-phase supplies for correct phase rotation, voltage balance with a 5-15% adjustable setting and 80% undervoltage setting.

.25 Mounting of Equipment

All equipment:

- Shall be mounted within the switchboard cabinet with only toggles, indicators, handles and dials protruding.
- Shall be mounted on fixing rails or insulating panels.
- Shall not rely on busbars for support.
- Shall be mounted to enable easy access for adjustment, replacement or maintenance.
- Which is intended for future installation shall have mountings, studs, busbar connections and escutcheon openings provided with painted blanking covers.
- Shall be installed so that a unit can be installed or replaced without disturbing adjacent units.

Circuit Breakers rated above 100A:

- Shall be arranged for front connection where installed within wall mounted switchboards.
- Shall be mounted so that the operating toggles of adjacent circuit breakers are in straight alignment.

Miniature circuit breakers:

- Shall be secured by separate clip-in type fixings as provided by the circuit breaker manufacturer.
- Shall be mounted on a lift-out chassis assembly.

Pulsed kilowatt hour meters:

- Shall be mounted within a sealed metal enclosure with only the reading dial visible.

Current transformers shall be mounted within a removable section of busbar so that they can be removed or replaced without disturbing other sections of the switchboard.

H.R.C. fuses for fault current limiters shall NOT project through the front coverplates.

Time switches shall be mounted so that they are accessible for adjustment without the need to remove switchboard covers.

06 INSTALLATION OF SWITCHBOARDS

All switchboards shall be secured in position with masonry anchors and screws or bolts.

Explosive powered fixings are NOT acceptable.

Entry holes into switchboard enclosures shall be cut only by means of hole saw or machine punching.

Flame equipment for making entry holes is NOT acceptable.

07 WIRING METHODS

All wiring shall be installed so that it can be readily renewed, repaired or relocated without affecting building finishes and construction.

Wiring for other systems, eg. MATV, Public Address, telephone, etc., shall be installed in a similar manner to light and power wiring in the same area.

All sub-main and general reticulation shall be installed within the corridor false ceilings on cable trays.

The following wiring methods shall be used in the installation:

Carpark, Plantrooms	-	TPI cables enclosed in PVC conduit.
Areas with false ceilings	-	TPS cables run in false ceiling, dry stud walls or in conduit chased in masonry walls.
Stairs	-	TPI cables in conduits cast into concrete.
Essential Services	-	In accordance with AS 3013 and above any other services.

08 INSTALLATION OF WIRING

.01 General

All cables shall:

- be run concealed unless specified otherwise. Exposed cables shall be run parallel to walls, floors and ceilings.
- be adequately fixed and supported with purpose made clips, cleats or saddles.
- be installed to permit adequate air circulation around each cable.
- be installed without any joints between items of equipment.
- be installed on the loop-in, loop-out principle without the use of connectors for sub-circuit wiring.
- be installed so that they can readily be withdrawn for the purposes of relocation and/or rewiring.
- be loomed on the square grid form, using approved plastic straps within switchboards.
- be installed such that they are not bent through radii less than the minimum bending radii specified by the manufacturer.
- be spaced apart to provide a gap of one cable diameter (minimum) between adjacent circuit or sub-main groups, where installed together over parallel routes.

- when grouped together comprise no more than four (4) cables per group with an equal spacing between each group.
- be fixed to permanent structural components of the building where the cables supply essential circuits, such as fire services, lifts, emergency lighting, etc. Additionally, these cables shall be positioned above ducts, pipes and other building components which may become dislodged and cause interference to the cables.

All main and sub-main cabling shall:

- be arranged in trefoil formation.
- be run parallel to building lines. Cables of 100 metres or more in route length, shall have individual phase conductors transposed, at approximately one third positions along the route length, to completely rotate the phase configurations.
- be supported on a system complying with clause "Cable Support System" except where specified otherwise.

.02 PVC Insulated Conductors Installation

PVC Insulated Conductors shall:

- be enclosed within conduits or wiring ducts.
- NOT be drawn into conduit systems until the conduit run is complete, swabbed out and inspected by the Project Manager.
- be installed on the loop-in system without the use of connectors.
- be jointed only at outlet or switch positions.

.03 XLPE Insulated and Sheathed Conductors Installation

PVC insulated and sheathed conductors shall:

- NOT be installed in locations where they cannot easily be withdrawn for rewiring purposes.
- be enclosed within concealed conduit where run in rendered walls or concrete.
- be installed through suitably sized and bushed access holes positioned vertically or horizontally in line where run within stud partitions.
- be secured in position by approved methods where installed in accessible locations.
- where run in accessible false ceilings, be clipped at maximum 1200mm centres to a permanent building structure. Cables shall be supported clear of ceiling tiles. Cables shall not be tied to ductwork, sprinkler pipes etc.
- NOT be secured or clipped where installed in inaccessible locations such as cavities and stud partitions.
- be protected by steel conduits where installed in locations which are liable to mechanical damage and where specified herein.
- be installed using the loop-in system without the use of junction boxes.
- be installed on cable trays (or other supports complying with clause CABLE SUPPORT SYSTEM) or in wiring ducts where 3 or more cables are installed over common routes.
- be grouped together and fixed to cable trays (or other supports complying with clause CABLE SUPPORT SYSTEM) for single core conductors which form a circuit or sub-main group.
- be installed in trefoil formation for single core conductors sized 90mm² or larger using purpose made clamps such that proximity effects in adjacent ferrous metals are minimized and equal reactance values between phases are achieved.
- be fitted with a cable gland on all circular cables where they penetrate equipment enclosures.

.04 MIMS Conductors Installation

MIMS conductors shall:

- be installed by qualified tradesmen suitably skilled in this class of work.
- be installed in accordance with the manufacturer's recommendations.
- have all ends properly sealed immediately after cutting.
- have the tails sleeved with phase colour coded sleeving over each conductor.
- be terminated with suitable glands secured to electro-tinned copper or brass earthing plates where entering metal enclosures.
- pass through one hole in ferrous metal in circuit or multi-phase groups via a brass plate with suitably sized holes.
- be installed using standard tools such as crimping and compression tools, stripping tool, potting tool, bending levers, roller straighteners as supplied by the manufacturer.
- be fitted with standard accessories such as pot seals, glands, sleeving, lugs, saddles as supplied by the cable manufacturer.
- be thoroughly straightened during erection and run in trefoil formation on parallel paths with properly radiused curves of not less than six (6) times the cable diameter.
- be securely fixed with metal saddles spaced at maximum 600mm centres and with multi-way saddles for cable groups.
- have the sheathing of groups of single core conductors electrically bonded at 20m (maximum) centres, by a copper conductor of conductivity not less than the cable sheath. Where the sheathing of cables is provided with an overall continuous covering of insulating material, the bonding need only be carried out at both ends.
- be free of joints except where the unbroken cable run exceeds the maximum coil length of cable and in this instance joints shall be factory made).
- be fitted with cable lugs in accordance with the cable manufacturer's recommendations.
- be PVC served unless otherwise specified.
- be fitted with PVC shrouds on all cable gland terminations on PVC served MIMS conductors.
- be tested immediately after termination and additionally after a 24 hour period in the Project Manager's presence with a 1000V insulation tester. If either reading is less than 100 megohms, the seals shall be removed and remade and the cable retested.
- be fitted with surge diverters at their origin.
- looped through a minimum of 360 deg. to form a helix in each cable immediately adjacent to terminations to equipment which vibrates.

09 DERATING

The sizes of conductors as specified are the **minimum** size which shall be provided.

Cables shall be installed in a manner corresponding to the appropriate tables and clauses of AS 3008-1 to obtain a current rating of the cable greater than the protective device. Where the cables are installed in a different manner such that their derated current rating is less than the rating of the protective device, the size of the cable shall be increased to provide a current rating greater than the protective device.

10 CABLES

.01 General

Unless otherwise specified all cables shall:

- have copper conductors.
- have stranded conductors.
- be of minimum size 2.5mm² (subject to volt drop) for light and power and 1.5mm² for control circuits.
- have insulation coloured as follows:

- Actives of single phase circuits : Red
- Actives of multiphase circuits
  - A phase : Red
  - B phase : White
  - C phase : Blue
  - All neutrals : Black
  - Switchwires, control wires, etc : as required functions.

.02 PVC Insulated Cables

PVC insulated cables shall:

- be insulated with 0.6/1 kV grade PVC compound type V75 or higher.
- comply with AS 3147.

.03 PVC Insulated & Sheathed Cables

PVC insulated & sheathed cables shall:

- be insulated with 0.6/1 kV grade PVC compound type V75 or higher.
- comply with AS 3147.
- have different colour sheathing for low voltage and extra low voltage (32 Vac or 115 Vdc maximum) circuits and/or fire services.

.04 XLPE Insulated PVC Sheathed Cables

XLPE insulated and PVC sheathed cables shall:

- be insulated with 0.6/1 kV grade XLPE compound type V90 or higher.
- comply with 3198.
- have black covered PVC sheath.

.05 MIMS Cables

MIMS cables shall:

- be 1000V grade (except 600V grade may be used for emergency direct current reticulation and control wiring).
- have copper sheathing.
- be P.V.C. served.
- have magnesium oxide insulation.
- be manufactured in accordance with AS 3187 with glands and accessories in accordance with AS 3188.

.06 Flame Retardant Cables

Flame retardant cables used as an alternative to MIMS cables complying with wiring systems clause of AS 3000 for use with essential services shall:

- Comply with AS3147.
- Comply with AS 3013 and have the WS rating as specified by the Standard relevant to the installation or WS52W (minimum) where Standard does not specify a rating.
- be approved by the Statutory Authorities having jurisdiction over the particular service.

.07 Flexible Cords

- be PVC insulated and PVC sheathed.
- comply with AS 3191.

11 CABLE TERMINATION LUGS

Cable termination lugs shall:

- be installed on ALL conductors except where tunnel or similar terminals, ensure that all cable strands are retained under the clamping screw are provided.

Copper to copper joints shall:

- comprise an approved clamp type cable lug with bolted connection to the conductor or crimp type installed with a ratchet type crimping tool.
- be copper.
- be in accordance with the cable manufacturer's recommendations.

Aluminium to aluminium joints shall be by one of the following methods:

- Compression method:
- select aluminium crimp lugs or tinned copper ferrules to suit the size and shape of the conductor:
  - select compression dies to suit the particular lug or ferrule;
  - fill aluminium lug or ferrule with oxide-inhibiting grease;
  - use a hexagonal die for stranded conductors;
  - use an indent die for solid conductors and indent the lug or ferrule twice.-
- Fusion weld method: Make joints by the fusion welding method with aluminium lugs, using jointers experienced in this method. Protect the cable insulation from heat by fixing substantial heat sinks to the cable near the joint. After completion of the weld wire brush the joint and file sharp projections smooth.

Provide a sample crimped lug cut in half for inspection, if requested.

Aluminium to copper connections shall be by the compression method specified in ALUMINIUM TO ALUMINIUM JOINTING using one of the following connector types:

- Bi-metal: Of the lug or pin type having a cast copper palm or pin, friction welded to an aluminium barrel section which is subsequently factory-filled with an oxide inhibiting grease.
- Tinned copper ferrule.
- Cast electro-tinned aluminium lug: Bolt the palm of the lug to copper busbar or terminal using a stainless steel bolt and nut with one large diameter stainless steel flat washer and one spring cup washer.

Straight through joints (tee offs) shall:

- have the minimum amount of insulation removed.
- have the complete joint wrapped with two layers of insulation, the first being a non hydroscopic film, the second being P.V.C. extending 100mm each side of joint.

12 CIRCUITING

Separate circuits shall be provided for lighting and power.
Circuiting shall be in accordance with the designations and notes within this specification.

Arrange all circuits to lighting and power outlets in accordance with the following requirements:

Light Circuits

16A connected load maximum for all areas.

Power Circuits (2.5sq.mm)

- 5 off 10A double G.P.O.'s in non air conditioned areas, eg. car park, plantroom.
- 6 off 10A G.P.O's in air conditioned areas.
- individual circuit for each item of permanently connected equipment.
- individual circuit for each 15A S.P.O. and air conditioning unit.

13 CONDUIT INSTALLATION

All conduit shall:

- be installed using the loop-in system (there shall be no tee-offs between outlets)
- be free from conduit fittings other than junction boxes, wall boxes, bends or couplings.
- be 20mm minimum diameter.
- be circular in section. Oval conduits are unacceptable.
- be installed so that conductors are only drawn into conduit at outlet positions, switch positions, draw-in boxes and switchboards.
- be installed complete with fittings and draw wires before wiring of a particular section is commenced.
- be concealed from view by running in ceiling spaces, concrete slabs, wall cavities or chasing into rendered masonry walls unless otherwise specified.
- contain a maximum of two (2) circuits.
- be arranged so that individual conduits are provided for light circuits, power circuits, Telstra wiring, fire alarm system wiring, low voltage wiring, emergency lighting wiring and communication system wiring.
- be placed above the bottom reinforcing bars where run in concrete slabs.
- be set at all changes of direction where concealed within the structure.
- be set using approved type conduit benders which prevent flattening of the conduit. (Application of heat in bending conduit shall NOT be permitted).
- be enclosed within the concrete and not in contact with the fill where installed in slabs poured on filling.
- be installed in a manner which shall not necessitate penetration of damp courses or influence the entry of moisture into the building.
- be located below the thermal insulation where installed in ceiling spaces.
- be provided with draw-in boxes at 24m (maximum) intervals.
- terminate at:
  - deep pattern junction boxes for ceiling outlets embedded in concrete.
  - standard depth junction boxes for outlets above false ceilings.
  - wall boxes for all flush wall outlets and switches.
- be provided with a polypropylene draw cords where installed for future wiring or wiring by others.
- be fitted with a stamped metal label indicating their purposes and the area which they are intended to supply where installed for future wiring or wiring by others.
- be swabbed out to remove all moisture before installation of wiring.
- be fitted with a sealed cap to prevent moisture or obstructions entering the conduit before cables are installed.
- be fitted with draw-in boxes and openings wherever necessary, but not less than every second direction change.

- be equipped with flexible couplings for 600 mm on either side where runs cross constructional joints.
- be positioned within the centre of concrete slabs.
- be positioned within masonry walls or columns with a minimum of 25mm of cover.
- be accurately positioned and aligned where they emerge from the concrete structure and fixed by fastening the upstands to approved rigid supports.

Conduit exposed to view shall:

- be installed in straight runs which are parallel or normal to the building structure.
- be installed over routes as agreed by the Project Manager.
- be erected to avoid the formation of moisture traps, but where this cannot be avoided the lowest point in the run shall be drilled (3mm diameter) to form a drain.
- be secured by spacer bar type saddles grouped in symmetrical positions providing 3mm clearance of the fixing surface.
- be painted a selected colour.

Flexible conduit shall:

- be provided between fixed conduit and equipment which is likely to be moved or subject to vibration.
- comply with AS 2052 for metallic type, and AS 2053 for non-metallic type.
- be fitted with brass or nylon terminators.
- be galvanised steel (PVC sleeved) where subject to mechanical damage or required for earth continuity (e.g. across construction joints); elsewhere PVC.
- be connected to concealed fixed conduit via a flush mounted junction box with a terminator secured by locknuts to the coverplate.

Steel Conduit shall:

- be galvanized, Class B complying with AS 2052.
- have screwed joints and terminations.
- be cut square, threaded with the minimum number of threads being cut consistent with the union, painted over the threads with conductive paint, reamed to remove burrs, and adequately terminated into threaded connections or lock nuts with no threads showing after assembly.
- be fixed at 1200mm (maximum) centres where surface run.

Conduit for underground wiring shall:

- comprise heavy duty rigid orange PVC conduit complying with AS 2053.
- be fitted with corrosion proof fittings.
- be installed over routes as approved by the Project Manager.

Rigid PVC conduit shall:

- be of high impact, cold setting, heavy duty complying with AS 2053.
- be jointed together and to fittings with an approved solvent cement.
- NOT be used in the following locations:
  - where exposed to mechanical damage.
  - where subject to ambient or contact temperature in excess of 50 deg.C.
  - for surface runs exposed to view.
  - in hazardous locations.
- be coloured orange.

- be provided with one (1) approved expansion joint for each straight section of surface run conduit exceeding 4m in length.
- be secured in position by approved saddles spaced at 600mm (max.) apart.
- be secured with galvanized or PVC saddles.
- be fastened to the side of a timber batten where installed across rafters or joists in accessible ceilings.

Where conduit is installed within poured concrete, provide adequate supervision during the pouring of concrete to ensure that conduits are not damaged or dislodged. Rectify any damaged or dislodged conduits.

14 CABLE SUPPORT SYSTEM

A cable support system shall:

- be provided to support all runs where required. It shall comprise:
  Cable Tray; and/or
  Cable Laddertray; and/or
  Cable Ladder
- be fitted with the manufacturer's standard bends, risers, curves, reducers and fishplates.
- be fixed to approved galvanised steel brackets and hangers except where installed vertically on a continuous wall.
- fixed such that there is an air space of 50mm minimum to the structure to which it is secured.
- be supported such that the maximum deflection between adjacent supports does not exceed 10mm when fully loaded.
- be installed parallel or at right angles to the building structure and planning grids.
- be sized so that it is loaded to not more than 80% of its capacity (width) including spaces between cables for derating purposes.

Cable tray shall be:-

- be perforated hot dip galvanised sheet steel with a rolled return edge with 40% (minimum) of its surface area open for air circulation.
- epoxy painted.

Cable ladder shall be:-

- hot dipped galvanised, steel ladder.
- equal to Burndy Inc.
- Only be used for cables which are self supporting between rungs.

Cable laddertray shall be:-

- hot dipped galvanised steel.
- equal to Burndy Inc. laddertray, type LT2 or LT5.

15 LIGHTING INSTALLATION

Provide luminaires to all areas requiring artificial illumination in accordance with the intent specified herein with the minimum design requirement being AS1680 and the schedule herein.

All luminaires shall:

- be mounted in straight lines.
- be compatible with the building structure and clearances in all positions where they are located.
- be regularly and uniformly spaced with respect to the areas in which they are installed.
- have lamps, chassis, diffusers and reflectors thoroughly cleaned just prior to practical completion.
- be installed subject to the agreement of the Project Manager and to the approval of the Architect immediately prior to the final paint application.
- be installed parallel or normal to the building structure.
- be left in a clean, operating and undamaged condition at the time of Practical Completion. Clean, repair and/or replace any luminaires which are damaged.
- be supported from rigid and permanent sections of the building, such as primary ceiling rails, rafters, slabs, etc.
- be supported from the ceiling suspension using purpose made fixings where installed on false ceilings. Fixing directly to ceiling or plasterboard shall NOT be permitted.

Surface mounted luminaires shall:

- be provided with packing pieces of approved material to level the luminaire and prevent distortion of the luminaire.
- be fixed with two (2) screws at each end of the luminaire, where wider than 150mm, elsewhere one (1) screw at each end.
- be fixed to suspended ceilings by wood screws into timber battens or be metal screws into furring channels or by using "Caddy" clips onto primary tee rail.

All recessed luminaires shall:

- be connected to the building wiring via a 3-core flexible cable and plug top into a 3-pin plug socket connected to the building wiring. Plug adapters are NOT acceptable for this purpose.
- be installed within ceiling openings of a size nominated by the Sub-contractor and provided by the Project Manager.
- be arranged with suitable fixing brackets so that the luminaire can readily be removed from beneath the ceiling.
- be complete with a separate ventilated control gear box where used with mercury vapour, metal halide or sodium vapour lamps. The control gear shall be connected to the building wiring by a 3 core flex and plug; the luminaire shall be connected to the control gear 3 core flex and plug; the plugs shall have different pin configurations.
- Control gear shall be fixed to the building structure, in the ceiling space, clear of the ceiling.

Pendant or suspended luminaires shall:

- be rod suspended with swivel joints.
- have equipment mounted to achieve balance about the longitudinal axis such that the units hang horizontal and perpendicular to the floor.
- be chain suspended in plantrooms and warehouse.

NOTE: Refer to "Emergency Luminaires" section for additional requirements for emergency and exit lights.

16 LUMINAIRES

.01 General

All luminaires shall:

- be complete with lamps specified.

- have replacement lamps supplied for any fluorescent or discharge lamps which fail during the defects liability period.
- comply with the clauses of this specification regardless of whether they are standard luminaires as manufactured or not.
- be of the catalogue numbers or Trade designations and descriptions as specified herein which are intended to indicate the type and style of luminaire required.
- comply with AS 3137.
- comply with AS 1044 for radio interference suppression.

.02 Samples

Samples shall:

- be production made luminaires; however, drawings and/or prototypes may be submitted prior to submission of production samples provided they are sufficient in detail to give clear indication of final appearance and suitability for the required application in regard to ceiling co-ordination and/or special locations.
- be complete with lamps, starters, diffusers and supports.

.03 Light-Emitting Diode Luminaires

- General: Light-emitting diode luminaires include integral LEDs, reflectors, lenses, heatsinks and drivers.
- Performance: Provide LED luminous efficacy of the LED luminaire at normal operating temperature in its normal position and enclosure of > 60 lumens per watt.
- Life of the LED in the complete luminaire: L70 to IES LM-80-2008, unless documented.
- Be provided with a safety chain suspension in addition to normal fixing for high bay type pendant luminaires.
-

Colour: CRI > 80.
CCT: 3000K.

Light-emitting diode lamp replacement modules

General:
- General: Provide light emitting diode (LED) luminaires, as documented.

Light-emitting diode luminaires:
- General: Light-emitting diode luminaires include integral LEDs, reflectors, lenses, heatsinks and drivers.
- Performance: Provide LED luminous efficacy of the LED luminaire at normal operating temperature in its normal position and enclosure of > 60 lumens per watt.
- Life of the LED in the complete luminaire: L70 to IES LM-80-2008, unless documented.
- Colour: CRI > 80.
- CCT: 3000K.

Light-emitting diode lamp replacement modules
- Performance: Conform to the following:
  - Reflector lamps: Provide luminous efficacy of the LED replacement modules at operating temperature in normal position and enclosure of > 40 lumens per watt where the quoted beam angle is the angle between the points of 50% of maximum luminous intensity.
  - Linear fluorescent lamps: Provide luminous efficacy of replacement modules of > 80 lumens per watt.

.06 Labels

Labels shall:

- be provided on ALL luminaires.

- comply with AS 3137.
- indicate the manufacturer's name and lamp size, type and colour as specified herein.
- be concealed from normal view where practicable, e.g., behind diffuser.

17 LIGHT SWITCHES

Light switches shall:

- comprise a 15A minimum mechanism of rocker operation mounted on an impact resistant plastic grid which can be fixed in position (before final painting of walls) then have its matching snap on cover, fitted (after painting is complete).
- Comprise a 15A mechanism for fluorescent loads.
- be of a type designed to withstand large inrush currents where used to switch fluorescent and/or discharge luminaires (inrush currents may exceed 15 times full load current).
- be ganged under a common flushplate where multiple switches are located together.
- be located on the lock side of door frames.
- be protected type where located in plant areas and carparks.
- comply with IP55 to AS 1939 where located externally to the building or in damp situations.
- be of Clipsal manufacturer. C2000 Series.
- be of selected standard colour range. (white)
- be located clear of building planning modules and grid lines so that future partition walls shall not conflict with switch positions.
- have standard plate size 115mm x 70mm or be of architrave type where standard size plates cannot be fitted.
- be flush mounted within pressed steel wallbox where located in masonry walls.
- be flush mounted in a fire rated acoustic wall box where mounted in fire rated or acoustic walls.
- be flush mounted within a metal bracket fixed to a stud or noggin where located in stud partitions. (Clip-on metal brackets to gyprock are not acceptable).
- be of the same type and manufacture as G.P.O's.
- be installed at a mounting height as shown on the drawings or directed on site.
- be stainless steel where installed in food preparation areas.
- be fitted with shrouds where located within metal door frames or metal mullions of demountable partitions or where adjacent switches are on different circuits.

Switchpanels shall:

- be flush mounted within a metal wallbox.
- be fitted with a stainless steel flushplate 2.5mm in thickness.
- be arranged so that the switches are individually secured within a mounting plate behind the flushplate.
- have the flushplate engraved to indicate the purpose of each switch.
- be suitable for accommodating switches connected to separate circuits and phases.

Light sensitive switches shall:

- comprise a remote mounted sensor head with control unit mounted within switchboard.
- be suitable for switching the controller lighting systems at an adjustable illuminance of 10 -1000 lux.
- have three (3) separate output contacts each with a variable trigger settings.
- incorporate a time delay to prevent spurious operation during transient lighting conditions.
- be weatherproof within a plastic housing.
- be installed in a suitable position.
- be positioned or shielded so that their operation is not affected by artificial lighting sources.

NOTE: Allow for final adjustment during the hours of darkness.

18 EMERGENCY LIGHTING SYSTEM

.01 General

All emergency luminaires and illuminated Exit signs shall:

- be of the self-contained single point type
- comply with all relevant clauses in the "Luminaires" section of this specification.
- comply with AS 2293 Part 1.
- be classified by an approved Authority in accordance with AS 2293 Part 1. The classification shall be clearly marked on the luminaire label.
- Testing facilities in accordance with AS 2293 Part 1.

The installation shall:

- comply with the "Lighting Installation" section of this specification. Each emergency luminaire and illuminated exit sign shall be connected to an unswitched active from the adjacent normal lighting circuit.
- have maintained type self contained illuminated exit signs with 240 volt lamp connected to an unswitched active.
- have recessed emergency luminaires, provided with 3 core PVC/PVC flexible cable, fitted with a polarised 3 pin plug top.

.02 Emergency Luminaires

Emergency luminaires shall:

- be either a non maintained separately mounted luminaire or incorporated within a standard luminaire in the form of a self contained maintained emergency pack to operate one lamp.
- contain a mains failure relay.
- be adequately ventilated.
- contain sealed nickel cadmium cells with the following features:-
  - securely fastened in position with purpose made clamps separately housed in a battery pack.
  - located clear of any heat source.
  - positioned to permit removal and replacement without removing other components, and with the luminaire mounted in position.
  - minimum installation life of seven (7) years and a guaranteed life of 3 years when operated in accordance with manufacturer's directions in the proposed emergency luminaire.
- have reverse battery polarity protection.
- have lamp removal protection.
- LED indication of charging mode.
- be provided with a test switch to simulate mains failure.
- be numbered with legible label.

.03 Illuminated Exit Signs

Emergency Exit luminaires shall:

- be of the LED or fluorescent lamp type.

- incorporate running man picture and directional arrows as detailed in the Schedule or as determined on site.
- contain a mains failure relay.
- be adequately ventilated.
- contain sealed nickel cadmium cells with the following features:-
  - securely fastened in position with purpose made clamps separately housed in a battery pack.
  - located clear of any heat source.
  - positioned to permit removal and replacement without removing other components, and with the luminaire mounted in position.
  - minimum installation life of seven (7) years and a guaranteed life of 3 years when operated in accordance with the manufacturer's directions in the proposed exit luminaire.
- have reverse battery polarity protection.
- have lamp removal protection.
- LED indication of charging mode.
- be provided with a test switch to simulate mains failure.
- be numbered with legible label.

.04 Log Book & Maintenance Manuals

The log book and maintenance manuals for the emergency lighting system shall be provided as a part of the manual for the whole project. Details shall be as required in AS 2293 Part 1 Section 6.

The log book and maintenance manuals shall comprise:

- hard cover plastic ring binder.
- embossed lettering for project title and manual title on the front cover.
- front page with Project, Proprietor, Sub-contractor, Architect's and Consulting Engineers names and addresses.
- index.
- sections as required and separated by indexed section dividers.
- reduced size copies of all floor plans showing locations of emergency lights and illuminated exit signs (individually numbered).
- description and manufacturer's brochures and catalogue number of all emergency luminaires and illuminated exit signs in the project.
- a schedule of all emergency luminaires and illuminated exit signs depicting location, manufacture, catalogue number, circuit and switchboard origin.
- log sheets for six and twelve monthly test of functions as described in AS 2293 Part 2. Each luminaire shall be listed in the log sheet and sufficient sheets shall be provided for recording test results over a 5 year period.

.05 Testing & Maintenance

- Test the emergency lighting system to the satisfaction of the Inspecting Authority and the Project Manager.
- Demonstrate the operation of the emergency lighting system by performing the 12 monthly test as specified in AS 2293 on completion of the installation and just prior to the date of practical completion.
- Replace all units which fail to operate for the required period with new units which shall be similarly tested in situ.
- Record results of the test at practical completion in the log book.
- Perform the six and twelve monthly tests as specified in AS 2293 Part 2 and record the results in the log book.

- Rectify all defects, including replacement of failed lamps during the defects liability period.
- The log book shall be retained on site by the Proprietor.

19 POWER OUTLETS

Single phase outlets shall:

- for general purpose outlets (GPO's) shall comprise a 10A rocker operated switch and 3 pin plug base with flat earth pin, mounted on an impact resistant plastic grid which can be fixed in position (before final painting of walls) then have its matching snap on cover, fitted (after painting is complete).
- For general purpose outlets in external areas (GPO's) comprise a 10A switch and 3 pin plug base with flat earth pin. The outlet is to be a minimum IP44 high impact chemically resistant where installed in outdoor undercover areas. For fully exposed outdoor areas the outlet is to be a minimum IP56 high impact chemically resistant. The outlet is to be a Clipsal..
- For special purpose outlets be provided with 15A or 20A mechanisms as specified.
- comprise two (2) switches and plug bases within as common standard sized flushplate for double GPO's.
- be of the protected type where installed in plant areas and carports.
- be metal clad in lift motor rooms.
- comply with a minimum IP55 to AS 1930 where located externally to the building or in damp situations.
- be of colour selected from the standard colour range (white).
- be located clear of building planning modules and grid lines so that future partition wall shall not conflict with outlet positions.
- be horizontally mounted Clipsal C2000 Series.
- have standard plate size 115mm x 70mm.
- be flush mounted in a pressed metal or P.V.C. wallbox where located in masonry walls.
- be flush mounted in fire proof/acoustic wall box where mounted in fire rated or acoustic rated walls.
- be flush mounted and fixed to a wall bracket fixed to a stud or noggin where located in stud partitions. (Clip on metal brackets are not acceptable).
- be of the same type and manufacture as light switches.
- be installed at a mounting height as directed on site.

3 phase outlets shall:

- be surface mounted where installed in plant areas.
- be flush mounted in polycarbonate enclosure.
- be provided with:
  - press switch operation.
  - 5 pin plug socket.
  - spring loaded flap.
  - screw neck to plug socket.
- have a current rating as shown on the drawings.

Weatherproof socket outlets
Type: Integral switched socket outlet.
Material: High impact plastic.
Size: Standard single gang.
Colour: Grey.
Current rating: 10 A.
Pin arrangement: Mount outlets with the earth pins, at the 6 o'clock position.

Combined RCD switched socket outlets
Type: Integral RCD unit with double switched socket outlet.
Material: High impact plastic.
Size: Standard single gang.
Colour: White electrical.
Current rating: 10 A.
RCD trip current: Conform to the following:
- General light and power: 30 mA Type II to AS/NZS 3190.

Pin arrangement: Mount outlets with the earth pins, at the 6 o'clock position.
Plugs – 230 volt
General: Provide plugs with integral pins of the insulated type to AS/NZS 3112.
230 volt combination switch and permanently connected cord outlet
Type: Three terminal flush mounted switch and flex-lock insert assembly.
Material: High impact plastic.
Size: Standard single gang.
Colour: White electrical.
Current rating: 10 A.
Neon Indicator: Provide neon indicator, where nominated in the project documents.
Flex-lock assembly: Match and securely grip the size and type of flexible cable to be used.
Mounting configuration: Horizontal.

Isolating switches
Standard: To AS/NZS 3133.

Emergency stop switches
Standard: To IEC 60947-5.5.

20 PERMANENTLY CONNECTED EQUIPMENT

Permanently connected equipment shall be supplied and set into position and connected to other services by others unless otherwise specified, provide all wiring and connection to equipment as required.

Provide isolating switches for each item of equipment. Isolating switches shall:

- be of the same current rating as the circuit wiring.
- be mounted adjacent each item of equipment.
- be weatherproof where installed externally to the building or in damp situations.
- be flush mounted in a metal wallbox under a plastic flushplate of selected colour.
- be protected type and surface mounted where located in plant areas, roof spaces and service ducts.

Conductors between fixed conduit and equipment shall be enclosed in a length of PVC flexible conduit fitted with brass grip type fittings and of sufficient length to enable the equipment to be withdrawn for servicing. Direct connect roller shutter door using controls supplied with the door and adjust as required.

21 NBN FIBRE NETWORK

All design, supply and installation works shall be in accordance with the latest NBNCo Building Design Guide – New Developments. This design guide can be downloaded from Internet from the NBN Co webstie which is at the following link http://www.nbnco.com.au/develop-or-plan-with-the-nbn/new-developments/builders-contractors/builders-contractors-guidelines.html.

The contractor is responsible for the following:-
- Provision of a suitable lead-in from the property boundary to the building entrance facility through to any area designated for Telecommunications services. Where diversity or other special needs exist, an alternative entry location may also be required.

- Provision of suitable space and access for the installation, maintenance and repair of all NBN Co. network elements up to and including the Network Termination Device (NTD) and Power Supply Unit (BBPSU).
- Provision of cable trays where required through carpark level and in riser cupboard.
- Provision of a minimum of P23mm nominal inside diameter, white, rigid communications conduit with draw string, from either the telecommunications room or riser/closet location to each unit NTD location.

NBN Co is responsible for:

- The cabling, installation and maintenance of all network elements up to and including the NTD and BBPSU, with the exception of the BBPSU batteries originally supplied at the time of installation.
- Compliance to the Building Code of Australia for all cabling and with reasonable directions provided by authorised developers, builders, owners, managers and customers in respect to building and fire authority requirements. In the cases where requests are received which are regarded as unreasonable, advice may be sought

22 FIRE DETECTION AND ALARMS

General
General: Provide fire detection and alarm systems as follows and as documented.
System description
System type: Addressable.
Interface: EWIS.
Surge protection devices (SPD)
General: Provide all mode metal oxide varistor based series connected SPD to protect final equipment in racks and cabinets.
Standard: To AS 4262.1 and AS 4262.2.
Surge Rating: $I_{max} \geq 20$ kA per phase.
Residual Voltage: $U_p < 60$ 0V.
Visual indicator: Provide visual indication of SPD status.
Enclosure and installation: House SPD in a metal enclosure and protected with a suitable rated circuit breaker equal to or less than the load current rating of the SPD.
Standard
Standard: To AS 1670.1 and AS 7240.13.
Submissions

- Technical data
  Product data: Submit for the following:
  - Fire indicating panel.
  - Detectors.
  - Manual call points.
  - Alarm bells.
  - Magnetic door holders.
- Samples: Submit for the following:
  - Detectors.
  - Manual call points.
  - Alarm bells.
  - Magnetic door holders.
- General: Submit showing the following:
  - Fire detector layout.
  - Dimensions and details of control and indicating equipment.
  - Location.
  - Circuit identification.
  - Labelling details.

Authorised products
Equipment: Provide equipment listed in the ActivFire Register of Fire Protection Equipment.
Control and indicating equipment

- Standards

- General: To AS 7240.2.
- Air-handling fire mode control panels: To AS 4428.7.
- Alarm investigation facility (AIF): To AS 4428.10.
- Alarm signalling equipment: To AS 4428.6.
- Power supply units: To AS 4428.5.
- Fire brigade panel: To AS 4428.3.
- Routing equipment: To AS 7240.21.
- Wire-free alarm zone circuits: To AS 4428.9.

Fire indicator panels
General: Provide metal cubicle-type enclosures.
Isolation
Isolating facilities: Provide on fire indicator panels to enable testing without the transmission of alarm signals to the fire brigade.
Capacity
Spare zones: 50% minimum.

Detectors
- Carbon monoxide (CO) fire detectors: To AS 7240.6.
- Duct sampling units (DSUs): To AS 1603.13.
- Heat detectors: To AS 7240.5.
- Point type smoke detectors: To AS 7240.7.
- Integral heat detector/alarm units: To AS 1603.3.
- Integral smoke detector/alarm units: To AS 3786.
- Multi-sensor fire detectors: To AS 7240.15.
- Multi-point aspirated smoke detectors: To AS 1603.8.
- Optical beam smoke detectors: To AS 1603.7.
- Point type smoke detectors: To AS 1603.2.
- Remote indicators: To AS 1603.15.
- Visual warning devices: To AS 1603.11.

Self-indicating detectors
General: Provide a light emitting diode mounted in a clearly visible position, which illuminates whenever detector operation causes an alarm condition to register on the fire indicator panel. Provide self-indicating devices which, if faulty, will not render the detector inoperative under fire conditions.
Mounting positions of light emitting diodes: Conform to the following:
- Visible detectors: On the outside of the detector or its base.
- Detectors concealed above ceilings: On the underside of the ceiling immediately below the detector.
- Detectors in other concealed spaces: On a visible panel close to the entry to the concealed space housing the detector.
- Remote indicators: To AS 1603.15.

Manual call points
Standard: To AS 1603.5 and AS 7240.11.
External alarm indication
Bell circuits: To AS 4428.1.
Strobe lights: To AS 1603.11.
- Power supply
  - To the strobe light and ≤ 2 others: From the fire indicator panel battery power supply.
  - To additional strobe lights: From the mains supply. Provide appropriate interface relays, operated by the fire indicator panel.

Magnetic door holders
Standard: To AS 4178.
Control facilities
Standard: To AS/NZS 1670.1.
Signals: Provide ancillary control device circuits and connections for automatically controlling and releasing magnetic door holders to operate the relevant doors under fire alarm conditions.
Warning system
EWIS : To AS 1670.1, AS1670.4
Power supply

Surge protection: Ensure that normal operation is maintained and that voltage surges in the power source do not damage the control and indicating equipment.
Sealed batteries: Cycle the batteries before practical completion so that ≥ 100% of nominal capacity is available at practical completion.

Fire alarm monitoring

Where required by the NCC provide fire alarm monitoring.
Standard: To AS 7240.21.
Connection: Connect the installation to a monitoring service provider. Connect using telecommunications fixed wire carrier lines.

Detectors

General: Install detectors so they can be easily inspected and tested in situ, and readily withdrawn from service.
Integral smoke detector/alarm units: To AS 1670.6. and AS 3786

Installation wiring

To AS 1670.1 Section 3.24.

Air handling systems

- Fire fan control and indication panels (FFCP)
    - Standard: To AS/NZS 1668.1.,AS1670.1
    - Signals: Provide fire detection and alarm signals for the fire fan control and indication panel (FFCP).

Testing

Tests: Carry out tests, including out-of-hours tests, to demonstrate the automatic fire detection and alarm system's performance to AS 1670.1 Section 7 and the compliance Sections of the relevant parts of the AS 1603 series. Include the following:

- Test components for correct function and operation.
- Demonstrate detection and alarm performance on site, to at least the level stated in the manufacturer's performance specification for that device.
- Test alarm zone identification.
- Demonstrate air sampling system operation for 14 days with data logger to verify stability of detectors and devices.
- Demonstrate addressable device operation for 14 days with data logger to verify stability of detectors and devices.
- Test interface to interconnected systems.
- Demonstrate correct shutdown sequences during fire mode.
- In situ testers: To AS 1603.16.

Operation and maintenance

Maintenance and records: To AS 1851.

23 BUILDING OCCUPANT WARNING SYSTEM

.01 General

Responsibilities

General: Provide BOWS for emergency purposes as follows and as documented.

Standards

Intercommunication system: To AS 1670.4, AS 1428.5 and AS 4428.4.
Sound system: To AS 1670.4 and AS 60849.

Submissions

Technical data

- General: Submit product data for all components.

Samples

- General: Submit samples of the following:
    - Visual alarm devices.
    - Speakers.

Shop drawings

- General: Submit shop drawings showing the following:

- Panel layouts and enclosures including associated building works.
- Cabling diagrams.
- Equipment layout.
- Speakers, handsets, visual alarm devices and wiring layouts.
- Loudspeaker enclosures.

Test reports
- General: Submit test reports as follows:
  - Sealed batteries test report.
  - Commissioning test report.
  - System installer's statement.
  - System test certificates.
  - System information in the forms provided in AS 1670.4.

Authorised products
General: Provide equipment listed in the ActivFire Register of Fire Protection Equipment .
Control and indicating equipment (CIE)
Type: Common unit for building occupant warning systems.

Sound system
System
- Type: 100 volt.
- Zoning: ≥ 1 per building, level and fire zone.
- Signal source: Automatic and local microphone at CIE.

Amplifiers
- Selection: Select and adjust to meet performance requirements.
- Type: 100 volt.
- Quantity: ≥ 1 per zone.
- Non-emergency input terminals: ≥ 1 per amplifier.
- Location: within CIE.

Speakers
Selection: Select and adjust to meet performance requirements.
- Quantity: Provide additional loudspeakers as necessary to achieve the documented system performance.
- Type: Tapped 100 volt.

Emergency call points
- General: Required.

.02 Execution

Control and indicating equipment (CIE)
Mounting: Flush mount in location as documented.
Enclosure: Coordinate with surrounding building works.
Sound system
- Loudspeakers
  - Mounting: Securely fix to building elements.
  - Flush mounting: Required in suspended ceilings.
  - Wall mounting: 150 mm below finished ceiling level to top of speaker enclosure.

Operation and maintenance
- Operational and maintenance manual
  - Standard: To AS 4428.4.
- Maintenance
  - Standard: To AS 1851.
  - General: Perform Level 2 maintenance routines.

24 TELEVISION DISTRIBUTION SYSTEMS

.01 General

Responsibilities
Requirement: Provide a system suitable for the reception and distribution of digital television, video, radio and sound signals, as documented.
Network connection: Arrange with the network operator(s) for the connection of their network. Comply with the network operators' requirements.
Designer: Network operator's Approved Design Partner.
Survey: Confirm location and height of Free-to-air (FTA) antenna by on-site measurements.
Performance
A system that receives and distributes all off air television services shall be provided. Digital terrestrial channels shall be provided in accordance with ACA planning guidelines.
The system will also receive and distribute Satellite IF signals from a Pay TV provider to all points in the system in accordance with Foxtel specifications.
Off-Air TV Description
Digital signals shall be received on separate antennae. Digital compatible antennae from the Matchmaster Digimatch series or equal shall be used.
Where the signal level at the channel processor input is < 60 dBμV an F connected masthead amplifier with interstage gain controls such as the Johansson J series shall be used.
Satellite TV Description [Dvb-S]
Appropriate dish for reception area satellite antenna and LNB shall be provided in accordance with the Foxtel/Austar planning guidelines for commercial grade reception of Pay TV channels and reticulated to the headend interface port by the *Pay TV provider.* The delivered signal level at this point shall be greater than 75 dBμV.
Reception
For the DVB-T television channels the received signal at any point within the MATV system shall have a signal to noise ratio of greater than 34 dB and a measured bBER of greater than 2^E7. The flatness of any channel multiplex shall be < 5 dB at the antenna terminals and 5dB at any other point in the system. [bBER = before Viterbi]
For the DVB-S television channels the received signal at any point within the MATV system shall have a signal to noise ratio of greater than 15 dB and a measured bBER of greater than 2^E4.
All signal analysis shall be completed using a combined analogue/digital analyzer made specifically for analogue and digital measurement such as the Rover Instruments DL Range.
Frequency Spectrum
All passive broadband components shall operate with a frequency range of 5 to 2,150 MHz.
Impedance
The nominal impedance of all cables, connectors, passive and active components is 75 Ohms.
Maximum Level
The maximum level of any DVB-T signal at any point within the MATV System shall not exceed 110 dBuV (0.5 volt) RMS.
The maximum level of any DVB-S signal at any point within the MATV system shall not exceed 100 dBuV (0.1 volt) RMS.

.02 General Specifications

The DVB-T average signal power at all of the service outlets shall be a maximum of 65 dBμV and a minimum of 50 dBμV.

The DVB-T average signal power of any two channels at one service outlet shall not differ by more than 3 dB.

The DVB-S signal level at all of the service outlets shall be a maximum of 74 dBμV and a minimum of 55 dBμV.
The level of any two DVB-S transponders at any service outlet shall not differ by more than 6 dB

The level relationship between the analogue peak power shall be maintained at 8 dB +/- 2 greater than the digital average signal power at all points within the system.

.03 Standards

The master antenna television system shall comply with the following standards:

- AS1367-2000 - Coaxial cabling Systems for the Distribution of Television and Sound Signals in Single and Multiple Unit Installations.
- *AS3000 - SAA Wiring Rules*
- *IEC-169-2 - Coaxial Unmatched Connector*
- *IEC-169-2 - RF Coaxial Connectors with Screw Coupling*
- *IEC – 728 -Measurement Procedures for Cabled Distribution Systems*
- CCIR -Recommendation 500 - 1 (KYOTO, 1978, Vol. X1

.04 Submissions

- Certification
  - Designer: Network operator's Approved Design Partner approval.
- Correspondence with network operators
  - Correspondence: Submit copies of correspondence and notes of meetings with all subscription network operators.
  - Service agreements: Arrange for each service provider to submit service agreements for execution by the principal.
- Documentation
  - Standard: To AS/NZS 1367 Appendix D.
- Products
  - Product data: Submit for all system components.
- Record drawings
  - General: Include minimum and maximum signal frequency (channel) and their levels at the input and output of amplifiers, splitters, taps, tap ports and outlets.
- Samples
  - System components: Submit samples that are visible after installation, including but not limited to:
  - Outlets.
  - Labelling.
- Shop drawings
  - General: Before commencing the work submit the following in accordance with AS/NZS 1367 clause D3 and D4:
  - Schematic diagram, proposed location of all components and interconnecting cabling.
  - Antennae types and their method of mounting.
- Technical data
  - General: Before commencing the work submit the following:
  - Design frequencies.
  - Free-to-air reception quality report, citing methods used for determination. Address all signals that the system is to receive.
  - Calculations of signal levels at outlets and at the input and output of amplifiers, splitters and taps.
- Tests
  - Other tests: Submit results of system testing.

.05 Technical Performance Requirements

- General

  The distribution System shall conform with manufacturers specifications, Australian Standard AS1367-2000 and the following parameters:
- Signal Levels

  The maximum level of any DVB-T signal at any point within the MATV System shall not exceed 110 dBuV (0.5 volt) RMS.

  The maximum level of any DVB-S signal at any point within the MATV system shall not exceed 100 dBuV (0.1 volt) RMS.
- Outlet Levels

  The DVB-T average signal power at all of the service outlets shall be a maximum of 65 dBμV and a minimum of 50 dBμV.

  The DVB-T average signal power of any two channels at one service outlet shall not differ by more than 3 dB.

  The DVB-S signal level at all of the service outlets shall be a maximum of 74 dBμV and a minimum of 55 dBμV.

  The level of any two DVB-S transponders at any service outlet shall not differ by more than 6 dB

The level relationship between the analogue peak power shall be maintained at 8 dB +/- 2 greater than the digital average signal power at all points within the system.

- Noise Performance
  For the DVB-T television channels the received signal at any point within the MATV system shall have a signal to noise ratio of greater than 34 dB and a measured bBER of greater than 2^E7.
  For the DVB-S television channels the received signal at any point within the MATV system shall have a signal to noise ratio of greater than 15 dB and a measured bBER of greater than 2^E4.
- Multiplex Flatness
  The flatness of any channel multiplex shall be < 3 dB at the antenna terminals and 5dB at any other point in the system.
- Isolation
  The RF mutual isolation between any two outlets shall not be less than 27 dB within the band 5 MHz to 860 MHz and not less than 17 dB within the band 950 to 2,150 MHz.
- Cross Modulation
  The modulation of any signal by the other signals shall be less than or equal to -48 dBc at any service outlet.
- System Immunity
  The levels of any signal other than the specified services shall be below 48 dBc at any point in the system.
- System Equalisation
  The broadband signal shall be launched from the headend with flat response characteristics. All trunk cable equalisation correction and tilt compensation shall be achieved in the active node distribution amplifiers. The node amplifiers shall be adjusted for flat response characteristics at the design output level. Passive lateral and drop cable equalisation shall be utilised as required.
- Cable Installation
  All trunk & lateral coaxial cable installation is to be completed with continuous lengths and no kinks. No in-line cable splices or joints are to be employed.

.06 Products

Free-to-air antenna
Standard: To AS 1417.1 (Int).
Material:

- Boom: Galvanized steel.
- Elements: Aluminium ≥ 12 mm.

Connection: F type to IEC 60169-24.
Mounting hardware: Proprietary to suit antenna.

Television and radio receiving antennas shall be sited to achieve the best balanced digital channel performance. Particular attention shall be paid to the CNR, BER and flatness of each multiplex. This position shall be selected from the results of a site survey and through liaison with the Design Consultant and building contractor.

Supports
The antennas and their associated supports shall be designed to withstand sustained wind velocity of 150 km/h without incurring any damage or change in orientation.

Antenna Down lead Cables
Antenna down lead cables shall be correctly terminated and suitably protected from the environment. Antenna down leads shall be Quad-shielded cable with high return loss.

Active equipment

- Masthead amplifier(s)
  A fully screened masthead amplifier with interstage gain control and F type connections shall be used.
  - Noise Figure < 3.5 dB
  - Screening Factor > 65 dB
  - Power Supply 22 VAC / 14 VDC

Headend Components
The headend shall accept the off air television and if required, radio signals while producing the in house television and in house music signals. Within the headend the off air radio, in house television and in house music signals shall be converted to radio frequency (RF) signals and combined with the processed off air television signals. The RF signals are then broadband amplified before being inserted onto the MATV distribution network.

Terrestrial Converters
WISI Topline OV-45D or equivalent terrestrial channel processors shall be used.
Separate converters shall be provided for each channel that requires conversion. DVB-T off air received television channels shall be processed on their original frequencies.

Headend Channel Combiners
A high isolation, high return loss passive combiner shall be utilised to combine channel module outputs.
Input port isolation >40dB.

Input/output return loss > 18 dB at 1 GHz.

Headend Broadband Amplifiers
Launch and distribution amplifiers shall be used with a 6 dB slope output level capability of 109 dBµV, 36 dB gain and CSO, CTB & CMR performance of -60 dB with 42 CENELEC analogue channel loading. All amplifiers shall have a noise figure of < 8 dB. Amplifiers shall be Matchmaster VX22 or similar.

Satellite If Amplifiers
Satellite IF distribution amplifiers with an output level capability of 106 dBµV, 20 dB minimum gain and 7 dB intrinsic slope from 950 to 2150 MHz shall be used. Amplifiers shall have a noise figure < 9 dB and be Digimatch STA-40 or similar.

Passive equipment
- Splitters
  Selection: To meet system performance requirements.

Couplers
Selection: To meet system performance requirements.

Taps
Selection: To meet system performance requirements.

Coaxial cable
MATV coaxial cable with a Structural Return Loss [SRL] of >26 dB and a Velocity of Propagation [Vp] of .85 C shall be utilised. All lateral & drop cabling shall be RG-6 Quadshield & all trunk cables RG-11 Quadshield and approved for installation by Foxtel
- Attenuation Characteristics:
  RG-6Q < 20 dB/100M @ 862 MHz
  < 32 dB/100M @ 2,150 MHz
  RG-11Q < 13 dB/100M @ 862 MHz
  < 22 dB/100 M @ 2,150 MHz

Connectors

Cable Type	Connector Type
Type RG-6	.360 compression F type connector
Type RG-11	.360 compression F type connector with separate pin

Splitters and Directional Couplers
Splitters and directional couplers with high input/output Return Loss and high port isolation performance from the WISI: DM or Matchmaster TM series product range shall be used as per the design schematics.
Return loss > 20 dB [@ 45 MHz – 1.5 dB per Octave]
Isolation > 27 dB [45 to 862 MHz]
> 17 dB [950 to 2150 MHz]

Flyleads
Flyleads shall be 1.5 Metres in length and constructed of RG-59 Quad or RG-6 Quad cable with hex compression connectors at each end. One flylead per service outlet shall be provided. All flyleads shall conform to AS1367-2000.

Outlets
Type and construction shall be dual gang outlet plate with incorporated diplex filter for 5 to 860 MHz and 950 to 2,150 MHz.
Frequency Range 5 to 2,150 MHz

Insertion Loss 1.0 dB Maximum
Return Loss > 10 dB
Isolation out to Out > 35 bandstop attenuation 5 to 862 MHz
> 45 bandstop attenuation 950 to 2150 MHz

Terminating Resistors

With the exception of service outlets a 75 ohm F connector terminating resistor shall be connected to all unused RF ports. In cases where a DC voltage is being supplied to an unused output, the terminator shall have DC blocking capabilities.

Multiswitches

Multiswitches shall be standalone or cascadable types as required with high input return loss and port to port isolation.

- Frequency range 5 to 860 MHz
  950 to 2150 MHz
- Return loss – input > 10 dB
  Output > 10 dB
- Isolation – H/V > 25 dB
  – Port/Port > 25 dB
- Maximum output level> 90 dBμV

All multiswitches must be C-tick certified and Foxtel/Austar approved.

External components

- General
  Degree of weather protection: IPX4 to AS 60529.

.07 Execution

- Free-to-air antennae
  Installation: To AS 1417.1 (Int).
- Distribution equipment
  Enclosure: Locate all active and passive distribution equipment in proprietary purpose built enclosures, located as documented.
- Coaxial cable
  Standard: To AS/NZS 1367 Appendix G.
  Conduit: Install coaxial cable in conduit or ducting as follows:
- Coaxial cable table

Cables	Conduit (minimum)
• **2 No. double shielded RG6**	• **20 mm**
• **1 No. RG6 tri or quad shield**	• **25 mm**
• **1 No. double shielded RG11**	• **32 mm**

  Bending radius: Conform to the minimum bending radius manufacturer's recommendations for the size of cable.
- Outlets
  Installation
  - Mounting: Flush mount.
  - Screening: Fully screen all outlets.
- Outlet fly leads
  General: Following commissioning of the system, provide 1500 mm fly leads to all outlets.
- Testing
  Extent: Test 100% of the system to demonstrate compliance with all documented requirements.
  Setup: Use locally generated test signals to provide static conditions for level measurements.
  Carrier-to-noise measurements: Required.

.07 Operation and maintenance

Requirement: Provide all operational and maintenance documentation necessary to operate and maintain the equipment and systems installed.

25 ELECTRONIC SECURITY

.01 General

Requirement: Provide electronic security systems as documented and as follows:

- Card Key Access control system.
- Audio Intercom system.

System provider

Electronic security system provider: A licensed security organisation only.

Surge protection devices (SPD)

General: Provide all mode metal oxide varistor based series connected SPD to protect final equipment in racks and cabinets.
Standard: To AS 4262.1 and AS 4262.2.
Surge Rating: $I_{max} \geq 20$ kA per phase.
Residual Voltage: $U_p < 600$ V.
Visual indicator: Provide visual indication of SPD status.
Enclosure and installation: House SPD in a metal enclosure and protected with a suitable rated circuit breaker equal to or less than the load current rating of the SPD.

Submissions

- Records
  General: Submit records to AS/NZS 2201.1.
  Licence: Submit copy.
- Samples
  General: Submit samples of the following:
  - Door contacts and reed switches.
  - Key or card readers.
  - Electric door strikes and door release devices..
- Shop drawings
  General: Before commencing work submit shop drawings showing the following:
  - Schematic diagram of all systems.
  - Panel layouts and dimensions.
  - Power supply requirements.
  - Wiring access necessary for door frames.
  - Cut out dimensions.
- Technical data
  General: Submit data showing dimensions and space requirements for the following:
  - Door contacts and reed switches.
  - Detection devices.
  - Activation devices.
  - Electric door strikes and door release devices.
  - Television monitors, cameras and associated equipment.
  - Intercom stations.
  - Vehicle control systems.
  - Duress alarm switches.

.02 Products

Card Key System

- A complete card key system shall be provided to control access to the areas as documented:
- All remote card readers, control devices, data gathering panels and output interfaces shall be interconnected to a Central Processing Unit (C.P.U.) to provide a completely intergrated system with remote control and report generation facilities.
- Capacity shall be built into the system to allow for the addition of the future towers 3 and 4.

Card Readers

- Supply and install card readers. Supply to the lift sub-contractor readers and interface panels for the installation within each passenger lift.
- Readers shall be flush mounted, tamper proof to prevent compromising the system from the reader head.
- Each reader or remote system shall be capable of stand alone operation in the event of failure of the C.P.U. Upon restoration of the C.P.U, it shall be automatically updated with any transactions during the period of C.P.U malfunction.

- Where card readers are mounted remote from building elements, provide 50mm S.H.S steel upstand and enclosure to mount the reader head.

Card Keys

- Card keys shall be of the plastic fob type.
- Card key shall be capable of being programmed on site without recourse to the equipment supplier; provide 2 card keys per unit to the Principal plus 50%.
- Any card shall be capable of being programmed for entry into one or many possible combined areas.

Card Key Programmer

- Provide a card key programmer for onsite programming of Card Key.

Carpark Control

- The card key system shall be interfaced to operate the roller shutter 24 hours a day via a card key and and an RF air key.. Closure of either the boom gate or roller shutter shall be by a magnetic loop cut into the floor slab.
- On exit from the carpark, provide a magnetic loop to open and close either the boom gate or roller shutter. Provide all safety devices to prevent closing of boom gate or roller shutter on any object including control and power connections.

Foyer Entry Control

- Entry to the foyers shall be via the use of card key readers installed in the location shown on the drawings. The reader shall operate both the door opening mechanism or release the floor mounted locking device installed by this contractor. For the internal operation of the door the door hardware shall be free handled to release the electric locking device on exiting thru these doors.

Lift Control

- Supply card readers to the lift sub-contractor for installation within each lift. Lift interface shall be provided outside the lift motor room.
- The system shall be fail safe and de-energise all relays on fire alarm override.
- Liaise with the Lift sub-contractor to ensure compatibility of cabling and connections.

.03 Access Control

Front Entry Door - Access

- The building front entry door shall be electrically locked 24 hours a day.
- Presentation of an authorised car key at the card key reader shall result in the release of the door electric lock.
- Egress via the door will require the door hardware to be free handled to release the electric locking device on exiting thru these doors.

Visitors Front Entry Door Access

- The building front entry door shall be electrically locked.
- The tenant's guest/visitor will be required to call the apartment via the intercommunication system station located adjacent to the front entry door.
- Upon answering the call at the apartments audio intercom station and audio identification of the visitor by the tenant, the tenant shall be able to push a button at the apartment intercom station to remotely release the building front entry door electric lock for the visitor to enter the building.
- Entry into the building will enable the visitor to call a lift for uninhibited access to the level of the apartment being visited within three minutes.
- Egress via the door will require the door hardware to be free handled to release the electric locking device on exiting thru these doors.

Vehicle Access to the Site and Carpark Area

- The building vehicle entry/exit carpark gate and door shall be closed 24 hours a day.
- Presentation of an authorised card key at the vehicle entry card key reader shall result in the opening of the building entry vehicle door.

- The gate and door shall automatically close after a time period (adjustable) following opening. Should the photo-electric beam detect an obstruction, the gate and door shall not close.
- Should the door remain open in excess of the period of time for when it should be open after a valid entry, a gate open "too long" alarm shall be activated on the central equipment (if programmed to do so).
- A Radio Frequency remote control system shall also incorporated into the building vehicle entry door system. Coordinate works with the vehicle door contractor. Allow to provide to the principal one (1) remote controller for each one bed unit and two (2) remote controllers for each two bed room unit.

Vehicle Egress from the Carpark

- Vehicle Egress from the building will be by a magnetic loop to open the vehicle door.
- The door shall automatically close after a time period (adjustable) following opening. Should the photo-electric beam detect an obstruction, the door shall not close.
- If the door remains open in excess of the period of time for when it should be open after a valid exit, a "door open too long" alarm shall be activated on the central equipment (if programmed to do so).

Residential Colour Video Intercom System

Provide one common digital colour video intercom system throughout both buildings to allow identification of visitors and allow visitors to gain entry into the site and building. The intercom system central headend shall be install with the capacity for the tower building plus 20% spare capacity
The colour video intercom security system comprising of

- Visitor access intercoms equal to Urmet, Fermax and Aiphone at the main entry, operating all residential apartments. External call stations shall be weatherproof with anodised aluminium face plates with illuminated push button and label windows c/w integral camera. Instructions shall be engraved on the faceplate.
- Colour video intercom handsets equal to Urmet, Fermax and Aiphone located in the kitchen/dining room to each of the apartment at a mounting height of 1450 A.F.F.L. or as agreed.
- provide for a set of voltage free changeover contacts, per lift per floor, in a box on the outside of the lift motor room to over-ride the lift security system for a preset adjustable time after the door release button is pushed on the intercom handset in any of the apartments.
- provide for a set of voltage free changeover contacts in the transom panel adjacent to each foyer door and basement visitor entry door to override the door access key switch after the door release button is pushed on the intercom handset in any of the apartments after the correct visual and audio identification of the visitor by the tenant is made.
- all other associated modules, transformers, electric locks, wiring and cabling etc., for the intercom system to be complete.
- The operation of the system shall be as follows:
- The system shall allow one way video and two way audio communication without any further action from the caller. The called party may grant the caller entry by pressing a button on the handset panel.

This action shall initiate the following:

- Unlatch the front pedestrian gate or front door electrical latch. This is dependent at which entry point the visitor makes the call.
- When the call is made from the front entry door to the building, allow caller to travel to the lifts for resident's floor access only.
- Extinguish handset illumination.
- will require interfacing with lift control system and access control. Make all necessary arrangement as required.

Video monitoring

CCTV system

General: The integrator/contractor must design a new IP PoE commercial grade Closed Circuit Television (CCTV) system complete with 4 channel of spare capacity pursuant to the current electrical drawings. Design, supply, install and program the colour IP PoE CCTV cameras to provide coverage of the areas as documented,

- Supply and install high performance, high resolution colour CCD IP PoEcameras complete with variable focal length, auto-iris lens in locations as specified in the drawings.
- Cameras must be mounted complete with brackets and camera housings.
- Cameras mounted externally must be installed in external weatherproof and vandalproof camera housing and appropriate accessories to suit the local environment.
- Connect into new rack mounted Digital Video Recorder (DVR)
- Supply and install high resolution LCD monitors as specified.
- Supply and install all brackets, mounting hardware, conduiting, ducting and cabling using approved types.

Standards

The work must comply with the requirements of the following Australian Standards (AS):

- AS2201, Parts 1 and 2 provide the standards are relevant and not overridden by a requirement specified in this document, and
- The relevant State or Territory Electrical Supply Authority, and
- Relevant telecommunications provider for connection to their communication network.

The design shall comply with the latest versions of all relevant codes and standards in force at the time of specification. Where the Contractor considers a standard to be inappropriate to the circumstances, the Contractor shall advise the Consultant and seek direction. Below contains a list of the relevant codes and standards.

Issuing Body	AUSTEL	Title
AUSTEL	AUSTEL	Australian Telecommunication Authority Standards
Australian Communications Authority	TS 008/9	ACA Standards for cabling Requirements
BCA	BCA	Building Code of Australia Requirements
CIBSE	LG6:1992	Chartered Institution of Building Services Engineers. The outdoor environment.
Institute of Electrical and Electronics Engineers	IEEE 802.3 IEEE 802.5 IEEE 802.af	Broadband applications Power over Ethernet
Standards Australia	AS/NZS CISPR 14.1:2003	Electromagnetic Compatibility Requirement for household appliance, electric tools and similar apparatus – Emission
Standards Australia	AS/ACIF S009:2006	Installation requirements for customer cabling
Standards Australia	AS/NZS 1102.103:1997	Conductors and connecting Devices
Standards Australia	AS 1125	Conductors in insulated electric cables and flexible cords
Standards Australia	AS 1345	Identification of the contents of pipes, conduits and ducts
Standards Australia	AS 1367:2000	Coaxial cabling systems for the distribution of analogue television and sound signals in single and multiple unit installations

Standards Australia	AS 1939	Degrees of protection provided by enclosures for Electrical equipment.
Standards Australia	AS 2053	Conduits and fittings for electrical installations
Standards Australia	AS 2220	Emergency warning and Inter-communications systems in buildings.
Standards Australia	AS 2834 – 1995	Computer accommodation
Standards Australia	AS 3000	Wiring Rules
Standards Australia	AS 3008	Electrical installations - Selection of cables
Standards Australia	AS 3011	Electrical installations – Secondary batteries installed in buildings
Standards Australia	AS 3080	Telecommunications installations - Generic cabling for commercial premises
Standards Australia	AS 3084	Telecommunications installations – P and B
Standards Australia	AS 3085	Telecommunications installations – Administration of communications cabling systems – Basic requirements
Standards Australia	AS 3768 – 1990	Guide to the effects of the temperature on electrical equipment
Standards Australia	AS 4251	Electromagnetic compatibility (EMC) – Generic Emission Standard
Standards Australia	AS 4252	Electromagnetic compatibility – General immunity Standard
Standards Australia	AS 4806	Closed Circuit Television (CCTV) Standards
Standards Australia	AS 61000	Electromagnetic compatibility
Standards Australia	AS 2201.1	Intruder Alarm Systems – Part 1: Client's premises – Design, installation, commissioning and maintenance
Standards Australia	AS 2201.2	Intruder alarm systems Part 2: Monitoring centres

Cabling

The Contractor must determine the best methods of installing cables and access through floors and ceilings.
Unless otherwise approved, all cabling must be concealed.
Cable joints are not permitted, except to terminate in items of equipment. This applies to all cables in all situations.
In the selection of cables, due consideration must be given to the signal type, mechanical strength and separation from other services.
The selection of all cabling and conduit must be ACMA approved.
It is the Contractor's responsibility to ensure no adverse effect to the system must be encountered due to voltage induction or signal interference from adjacent services.

Camera Locations

Cameras must be located in positions as shown on drawings and as tabulated below:

Camera Description	Enclosure Type
External – Vandal Proof	Outdoor environmental dust proof, weatherproof & vandal resistant housing*
Internal –Vandal Proof	Corner Mount – Dome vandal proof housing

Locations of cameras stated in the Specification are provisional and subject to the final approvals of the Principal's Authorised Person.

Internal Day/night dome Camera

Contractor shall supply and install cameras which are equal to ISCS CNB IDC4050VR IP vandal resistant with 3 – 10mm lens dome camera.
Surveillance of areas of interest in and around the hospital must be achieved using a number of dome day/night cameras strategically located to provide the desired coverage.
Camera images must be able to provide sufficient information necessary to allow a basic description of a person.
Cameras at each location must be mounted on structures (with approval) in such a position to provide surveillance of:

- general activity within the area of coverage,
- incidents and unauthorised activities

It must be noted that surveillance is required under all light and environmental conditions likely to be experienced, day and night. Reliance on the surveillance system's ability to produce useful images is likely to become critical under the most adverse conditions. That is to say, cameras must possess a wide operating dynamic range to accommodate the extremes of light levels that may be encountered in this application. Resulting images must free from blooming or similar effects and image motion must be lag free.
Full body cameras must utilise solid-state colour CMOS sensors and feature the following characteristics as a minimum:

IDC4050VR		Specifications
Camera	Signal System	Progressive image processing
	Scanning System	16:9 Progressive
	Pixel Clock	80MHz
	Image Sensor	1/3" Progressive CMOS Sensor
	Sync. System	Internal
	Effective Pixels Number	1920 (H) x 1080 (V) 2.0 Mega
	Horizontal Resolution	1100 TV Lines
	Video Output Level	Select NTSC/PAL 1.0Vp-p (BNC 75Ω, composite)
	Lens	Built-in DC Iris Vari-focal Mega Pixel Lens (f=3~10mm)
	Day & Night System	ICR (AGC Type)
	IR LED and Sensor	1BEA (850nm, 45°) & Sensor 1EA
	Min. Illumination	1Lux (Color), 0.1Lux (B/W), 0.05Lux (B/W, DSS On), 0.00 Lux (IR LED On)
	Back Light Compensation	On/Off
	Flickerless	On/Off
	White Balance	Auto/Manual
	Exposure	Auto/Manual
	Functions	B/W
	Electronic Shutter Speed	NTSC : 1/7.5~1/8,000 (21 Step) | PAL : 1/7.5~1/8,000 (21 Step)
Video / Audio	Compression	H.264 / MJPEG
	Frame rate	Dual Mode : H.264 (30fps) MJPEG (30fps)
	Resolution	Full HD(1920 x 1080), SXGA(1280 x 1024), 720P(1280x720), D1(720 x 480 / 720 x 576), VGA(640x480), CIF(352 x 240 / 352 x 288)
	Audio	Two-way (full duplex / ADPCM G.711)
Network	Protocol	IPv4, HTTP, TCP, RTSP, RTP, RTCP, UDP, SMTP, FTP, ICMP, DHCP, UPnP, Bonjour, AFP, DNS, DynDNS
	Supported DDNS	1. CNB DDNS 2. DynDNS.org 3. Reference code with SDK
	LAN Interface	Ethernet 10/100 Base-T (RJ-45 Type)
	Support PoE	Standard IEEE 802.3af supported
Security	Access level setup	Multiple user access levels with password protection
	Network Security	IP Filtering
Alarm and Event Management	Image detection	Motion detection (Select 3 Regions - each area)
	Sensor detection	Sensor In, Scheduling, Alarm out
	After Event process	JPEG image upload over FTP server / SMTP (E-mail server)
Applications	Browser	Internet Explorer 6.0 or Higher
	Monitoring Application	XNVR, CNB CMS and Utility (IP-Installer, etc)
Maintenance	System Upgrade	Firmware upgrade over HTTP
Mechanical	Pan/Tilt/Horizontal	3-Axis Movement for Free Lens Rotation
	Dimensions	135.8(Ø) x 102.2(H)mm
	Operating Temperature	0℃ ~ 40℃
	Power	DC 12V Max. 7 W

External Day / Night Camera & Lens - Performance Characteristics

Contractor shall supply and install cameras which are equal to ISCS CNB IW-CD-CNB-2MP-weatherproof vandal resistant with 3 – 10mm lens camera.
Surveillance of areas of interest in and around the building must be achieved using a number of day/night cameras strategically located to provide the desired coverage.
Camera images must be able to provide sufficient information necessary to allow a basic description of a person.
Cameras at each location must be mounted on structures (with approval) in such a position to provide surveillance of:

- general activity within the area of coverage,
- incidents and unauthorised activities

It must be noted that surveillance is required under all light and environmental conditions likely to be experienced, day and night. Reliance on the surveillance system's ability to produce useful images is likely to become critical under the most adverse conditions. That is to say, cameras must possess a wide operating dynamic range to accommodate the extremes of light levels that may be encountered in this application. Resulting images must free from blooming or similar effects and image motion must be lag free.
Full body cameras must utilise solid-state colour CMOS sensors and feature the following characteristics as a minimum:

NXE3055VR		Specifications
Camera	Signal System	Progressive image processing
	Scanning System	16:9 Progressive
	Image Sensor	1/3" Progressive CMOS Sensor
	Sync. System	Internal
	Effective Pixels Number	1920 (H) x 1080 (V) 2.0 Mega
	Horizontal Resolution	1150TVL
	Video Output Level	Select NTSC/PAL 1.0Vp-p (BNC 75Ω, composite)
	Lens	Built-in DC Iris Vari-focal Lens (f=3~10mm, F1.2)
	Day & Night System	TDN(ICR)
	Digital Slow Shutter	On/Off (x4)
	IR LED	IR LED 36 EA (45°/850nm)
	Min. Illumination	0.01Lux (Color) / 0.001 (B/W, DSS On) / 0.0Lux (IR LED On)
	OSD	Control On/Off over IP (Menu, Time/Date)
	Back Light Compensation	On/Off
	Flickerless	On/Off
	White Balance	Auto/Manual/Push
	Exposure	Auto/Manual
	WDR	On/Off
	3D-DNR / 2D-DNR	On/Off (20 Step)
	Privacy Zone	Select 10 Zone – each area
	Functions	Color, B/W
	Electronic Shutter Speed	NTSC : 1/30~1/30,000 (12 Step) | PAL : 1/25~1/30,000 (12 Step)
Video / Audio	Compression	H.264 / MJPEG
	Frame rate	Channel 1 Mode : H.246 * Support 1080P Mode Channel 2 Mode : H.264/MJPEG(30fps) * Support 720P Mode Channel 3 Mode : H.264/MJPEG(30fps) * Support D1 Mode
	Resolution	Full HD(1920 x 1080), SXGA(1280 x 1024), 720P(1280x720), XGA(1024x768), D1(720 x 480 / 720 x 576), VGA(640x480), CIF(352 x 240 / 352 x 288), QVGA(320x240)
	Video Streaming	Channel 1 Mode : H.246(1080P) CBR/VBR Channel 2 Mode : H.264/MJPEG(720P) CBR/VBR Channel 3 Mode : H.264/MJPEG(D1) CBR/VBR
	Max. Upload speed	Constant and variable bit rate in H.264 (up to 64kbps ~ 10Mbps by 10 user client) Controllable frame rate and bandwidth * Upload bandwidth Max. 16Mbps
	Audio	Two-way (full duplex / ADPCM G.711)
Network	Protocol	IPv4, HTTP, TCP, RTSP, RTP, RTCP, UDP, SMTP, FTP, ICMP, DHCP, UPnP, Bonjour, ARP, DNS, DynDNS, NTP, Multicast *) Onvif, IPv6, HTTPS, QoS, SNMP
	Supported DDNS	1. CNB DDNS 2. DynDNS.org 3. Reference code with SDK
	LAN Interface	Ethernet 10/100 Base-T (RJ-45 Type)
Security	Access level setup	Multiple user access levels with password protection
	Network Security	IP Filtering
Alarm and Event Management	Image detection	Motion detection (Select 3 Regions - each area)
	Sensor detection	Sensor In, Scheduling, Alarm out
	Local Storage	SD/SDHC Card Memory : Max. 32GByte (Class 4 or Higher)
	After Event process	JPEG Image upload over FTP server / SMTP (E-mail server)
	Pre/Post alarm	Detail time-set : Max. Pre alarm 5sec. / Post alarm 5sec. : Storage (SD card : JPEG Image, H.264 Movie file)
Applications	Browser	Internet Explorer 6.0 or Higher
	Support User Client	Camera Live viewer for up to 10 Clients (by 64kbps~ 1Mbps)
	Monitoring Application	Web Viewer (Window Web Browser Base), Video Snapshot to file (JPEG), XNVR, CNB CMS and Utility (IP-Installer, etc)
Maintenance	System Upgrade	Firmware upgrade over HTTP
Mechanical	PoE	Standard IEEE 802.3af supported, End-Span type
	Power	24VAC or 12VDC Dual Voltage / Max. 13W
	Operating Temperature	-20℃ ~ 40℃
	Dimensions	108.4(W) x 122.4(H) x 343.5(D)mm

Camera Mounting

All camera mountings must be firmly made so as eliminate unnecessary camera movement or vibration.
High quality steel mounting hardware must be used throughout.
Cameras must be mounted on structures sufficiently clear of light sources that might attract insects to fly across the face of the camera or affect the useful operation of the camera's lens iris mechanism.
These cameras are intended to provide a good ID of a person of interest involved in any incident at these locations.

DIGITAL VIDEO RECORDER (DVR)

The contractor shall supply and installed an PSA PINDG6 or equal DVR complete with in the Building distributor equipment rack to enable images from all operational cameras to be simultaneously recorded to the DVR
The DVR main features are as follows:

- Advance H.264 video compression and web transmission
- Live display, record, playback, backup and mouse control
- Built in 2 x USB port for backup and mouse control
- High resolution VGA output and composite output
- HDMI output
- Real time live viewing and recording 100 fps at D1
- USB mouse control and IR remote control
- Advanced friendly Graphic User Interface
- Remote log-in via IE or licensed software
- iPad, iPhone or Android, search, playback and remote viewing via iWatch DVR 2 app or equal.
- Built-in e-SATA port for external recording
- Support 1 x SATA HDD over 2TB
- Motion PopUp and PIP function.

The DVR shall be connected internet so that persons with authorisation via password can view either recorded or real time images on the person personal computer/laptop. All software for the CCTV system is to be compatible with either Windows or Mac operating systems. All software is to provided and cost for licenses to be paid. Provide full on site set up, training and installation of software onto computers/smart devices as directed by the client.

POE SWITCH

The contractor shall supply and install where require Cisco Layer 2 Stackable 24 port Fast Poe Ethernet Switch or equivalent and shall have the following minimum requirements:

- Industry standard CLI
- Simple intuitive, fully featured Allied Telesis
- Web Interface
- Secure encrypted Web and CLI management
- with SSHv2 and SSL
- SNMP
- Two level access privileges
- Provides standards based IEEE 802.3af
- Power over Ethernet to all 24 10/100 ports
- Support for up to 24 class 2 powered devices at 7.3 watts
- Support for up to 12 class 3 powered devices at 15.4 watts
- Single IP address stack management.
- 4G resilient ring stacking architecture
- Across stack link aggregation
- Across stack VLAN configuration
- Across stack port mirroring
- IEEE 802.1x and RADIUS network
- Redundant standby stack master

MONITORING DEVICES

Video Monitors

- Provide multi quantities of 32" LCD Monitors at the DVR location to ensure all cameras are onscreen at all times.
- All LCD monitors supplied, as part of the CCTV System shall be high quality displays. The monitors shall be a flat screen, low power, high resolution, with 500 TV lines and 1280 x 1024 (@ 75Hz) pixel resolution, multiple inputs including analogue, digital & video and associated display modes, 250 cd / m2 luminance, on screen display settings, with front panel controls and suitable for direct wall mounting using brackets.
- The final arrangement shall provide clear, sharp images free of distortion of any type.
- The monitors shall come complete with customised mounting kits to permit the displays to be tilted forward (downwards) for optimum viewing.

SPECIFIC PERIODIC MAINTENANCE

Maintain CCTV System in accordance with the manufacturer's requirements, however, work must be undertaken to ensure the video images are recording to disc and playback functionality is satisfactory – test both systems for recording& playback performance.

26 LIGHTNING PROTECTION

.01 General

Design and provide a lightning protection system. Confirm prior to construction based on the AS/NZS 1768 lightning risk assessment spreadsheet the method required to provide lightning protection

.02 Standard

Lightning protection system: Conform to the recommendations of those parts of AS/NZS 1768 which are referenced in this worksection.

Surge protection: To AS/NZS 4117, AS/NZS 60950.1 and AS 4262.2.

.03 Definitions

General: For the purposes of this worksection the definitions given in AS/NZS 1768 and the following apply:

- Bonding conductor: Provides electrical connection between the lightning protection system and other metalwork and between various metal parts of a structure or between earthing systems.
- Earthing boss (terminal lug): A metal boss specially designed and welded to process plant, storage tanks, or steelwork to which earthing conductors are attached by means of removable studs or nuts and bolts.
- Connecting strap: A short conductor for the connection of structures to the lightning protection system.
- Strip: Rectangular cross-section bar/strip.

.04 Shop drawings

General: Submit layout drawings of the lightning protection system showing the following information:

- Details of the locations and types of joints, air and earth terminations.
- Alternative: If bonding strips are inappropriate, use smooth weaved copper cable.
- Downconductors, materials and the provisions for minimising galvanic action.
- Arrangement of components in earthing pits.
- Provision for building movement and building penetrations.
- Details of bonding to other high level and in-ground services entering, or in the vicinity of, the building.

.05 Records

General: Provide records to AS/NZS 1768.

.06 Testing

Site tests: Submit results of completion tests to AS/NZS 1768 clause 8.3.

.07 Products

General

General: Utilise custom designed or propriety components to form the downconductor, bonding and air terminal lightning protection system.
Material: Annealed copper.

Air Terminals

Type: Provide air terminals, mounting bases and accessories coordinated with building structure and roof top plant equipment.
Material: Copper.
Vertical air terminal size: 16 mm diameter x 600 mm high.
Supports: Provide mounting bases and assemblies to support the air terminals under the wind load and natural harmonic resonance conditions expected at the site.
Active air terminals: Proprietary active air terminals can be provided

Downconductors

General: For building structures with reinforcement steel encased in concrete, use the reinforcement steel as lightning protection downconductors.

Independent downconductors

General: Provide strip or smooth weaved copper cable conductors and support accessories to AS/NZS 1768 Table 4.6.
Strip conductor size: Cross section 25 mm x 3 mm minimum.
Cable conductor size: 35 mm^2.
Material: Annealed copper. If the environmental conditions will adversely affect annealed copper, use tinned copper, aluminium or stainless steel.
Finish: Where visible, provide a finish to match the finish of the building.

Equipotential bonding conductors

General: Provide bonding conductors and support accessories to bond roof mounted structures and external services to the lightning protection system. External steel structures including:

- Ladders and handrails,
- Aerial supports.
- Roofing structures.
- Cladding.
- Piping systems.

Bonding conductors size: Cross section 25 x 3 mm minimum.
Material: Annealed copper. If the environmental conditions will adversely affect annealed copper, use tinned copper, aluminium or stainless steel.

Earthing electrodes

General: Provide a dedicated earthing system consisting of a driven copper electrode for each downconductor.
Earthing electrodes pits: Provide proprietary polycrete or moulded fibre cement pits for each earth electrode.

.08 Execution

Installation

Standards: To AS/NZS 1768, AS/NZS 3000 and AS/ACIF S009.
Pre-installation: Before commencing installation, provide earth resistance measurements for the site.
Dissimilar metals: Join dissimilar metals with fittings of electrolytically compatible material.

Lightning protection earthing system

General: Maintain separation of the lightning protection earthing system from:

- Electrical distribution protective earth.
- Telecommunications earth.
- Functional earths.

Thermal expansion

General: Provide expansion loops in horizontal air terminations between fixing points.

Air terminations

Mounting: Mount air terminals to the building structure and connect to the downconductor or bonding conductors using propriety air terminal bases and connecting accessories.
Connecting: Connect air terminals to the downconductor system to AS/NZS 1768.

Active air terminals

Mounting: Mount the active air terminals using proprietary masts, mounting bases and guy wires complete with mounting accessories.
Connecting: Connect to the down conductors and bonding conductors utilising propriety fixtures.

Downconductors

Structural reinforcement encased in concrete

Test link: Provide an earthing test link tag of stainless steel, welded to the column reinforcement steel at the base of the building. Provide a 10 mm threaded hole in each tag for the connection of testing cables.
Protection: Install or enclose the earth test link to prevent injury to persons near the tags.
Number: Provide a sufficient number around the perimeter of the building to allow satisfactory testing of the earthing continuity and resistivity.
Cross-section: 50 x 6 mm.
Electrolytic action: If metals of different types are connected together, or in close proximity, prevent electrolytic action.
Earthing electrodes: Measure the reinforcement steel to ground resistance. If it is not conforming to the recommendations of AS/NZS 1768, provide additional earth electrodes or an earthing mat.

Independent downconductors

Fixing of downconductors and bonding conductors: Screw fix conductors to the building structure with propriety metal saddles, compatible with the strip downconductor material.
Saddle installation: Allow for thermal expansion of the downconductors. Provide support of downconductors in both the vertical and horizontal configuration.
Spacing: To AS/NZS 1768.
Cable conductors: If cable conductors are necessary, use copper cable supported and joined with propriety cable support brackets, saddles, clamps and fittings, installed and fixed to the manufacturer's recommendations.
Protection of downconductors system exposed to mechanical damage: Cover with a moulding or tubing of non-conductive material.

Equipotential bonding conductors

General: Provide earthing bosses and connecting straps as required for the connection of external structures to the lightning protection system.
Earthing boss: Provide welded tags, studs or nut and bolt arrangements, sized to satisfy the mechanical and electrical requirement for bonding structures to the lightning protection system. Earthing boss materials: Use materials which are compatible with one another to prevent corrosion and to make a sound electrical connection.
Connecting Strap: Provide copper, flexible or rigid connection straps or cables to allow connection from the earthing boss provided on structures to the general lightning protection system.
Connecting strap material: Use materials which are compatible with the materials in use.

Earthing electrodes

Earthing electrode: Provide copper bonded steel earthing electrodes located at the perimeter base of the building to suit the downconductor system. Terminate downconductors using propriety cable and strap accessories.
Earthing system resistance: To AS/NZS 1768. If electrodes cannot be driven into the ground, install the electrodes in predrilled holes backfilled with a low conductive, non-corrosive, carbon based, conductive concrete mix.

Electrode pits

General: Install driven earth electrodes in dedicated pits.
Installation: For pits installed in concrete, bond any reinforcement steel to the earth electrode.
Marking: Mark pit covers with the words:

- LIGHTING PROTECTION EARTH.

27 TELECOMMUNICATIONS CABLING

.01 General

General: Provide a passive telecommunications cabling network system as follows and as documented.

System description

- Building distributor
  General: Provide building distributor as documented.
- Backbone cabling
  General: Provide backbone cabling as documented.
- Floor distributors
  General: Provide floor distributors as documented.
- Telecommunications outlets
  General: Provide telecommunications outlets as documented.
- Patching
  General: Provide patching of telecommunications outlets and equipment as documented.
- Surge protection devices (SPD)
  General: Provide all mode metal oxide varistor based series connected SPD to protect final equipment in racks and cabinets.
  Standard: To AS 4262.1 and AS 4262.2.
  Surge Rating: $I_{max} \geq 20$ kA per phase.
  Residual Voltage: $U_p < 600$ V.
  Visual indicator: Provide visual indication of SPD status.
  Enclosure and installation: House SPD in a metal enclosure and protected with a suitable rated circuit breaker equal to or less than the load current rating of the SPD.
- System performance
  Application class to AS/NZS 3080 clause 6.3: E.
  Balanced system to AS/NZS 3080 clause 7 (data): Category 6.
  Balanced system to AS/NZS 3080 clause 7 (voice): Category 6.
  Fibre system class: To AS/NZS 3080 clause 8.
  System warranty: 15 years minimum.

Standards

Authorities: To the requirements of the Australian Communications and Media Authority (ACMA).
Cabling products: To AS/ACIF S008 and AS/NZS 3080.
Installation of cabling: To AS/ACIF S009, AS/NZS 3080, AS/NZS 3084, SAA HB 29 and SAA HB 243.
Installation of small office/home office cabling: To AS/ACIF S009, AS/NZS ISO/IEC 15018 and SAA HB 29.
Cable management and documentation: To AS/NZS 3085.1.
EMC: To the recommendations of AS/NZS 3080.

Interpretation

General: For the purposes of this worksection the following abbreviations apply:

- EMC: Electromagnetic compatibility.
- EMI: Electromagnetic interference.
- EMR: Electromagnetic radiation.
- RU: Rack unit.
- CES: Communication earth systems.
- TRC: Telecommunications reference conductor.

Submissions

General: Submit technical data including the following:

- System design parameters: Performance.
- Voice and/or data transfer rate.
- Cable type and characteristics.
- Segregation requirements for EMI/EMR.
- Maximum length of cables.

- Cross-connect type and characteristics.
- Cross-connect block.
- Patch cords.
- Fibre optic terminations.
- Patch panel module.
- Cable management for racks.
- Rack.
- Fly leads.

Samples
Product data and samples: Submit for the following:
- Telecommunications outlet.

Shop drawings
General: Submit showing the following:
- Layouts of equipment racks.
- Cross-connect layout.
- Cabling diagram for complete system.
- Cable management system.

Certification
General: Submit product and installation certification for the installation.

.02 Products
Network termination
General: Provide network termination device as documented.
Equipment racks
General: Provide equipment racks to the **Equipment racks schedule**.
Equipment racks schedule

Type	≤ 18 RU: wall mounted, 600 depth > 18 RU: floor mounted, 900 depth 19 inch Campus distributor: ≥ 45 RU
Access	Front and sides
Enclosure	Enclosed
Doors	Required Transparent, lockable.
Power provisions	1 socket outlet per 3 rack units minimum on vertical rail
Cable Management	1 module per 2 patch panels 1 module per fibre termination panel Vertical: Both sides
Provisions for active equipment	25% minimum 1 fixed shelf per 4RU of active equipment space
Ventilation	Fan assisted
Earthing	CES earth bar required

Cross connect patch panels
General: Provide cross connect patch panels as documented.
Terminations: Terminate directly to the modular connector.
Fixed terminations:
- Rear terminals: 45° IDC punch down type.
- Front terminals: RJ45 modular connector.

Patch cords: Terminate cord ends with appropriate registered jacks.
Cable management
Record book: Provide a record book at each cross-connect.
Location: Secure log books in each distribution frame records holder.
Identification, labelling, and record documentation: To AS/NZS 3085.1.
Cables
- Copper
  Standard: To AS/ACIF S008.

Balanced system cables: UTP.

External

Standard: Water penetration resistance to IEC 60794-1-2.

Telecommunications outlets

Outlets: Provide RJ45 8 way modular jacks except where documented otherwise.
Standard: To AS/ACIF S008.
Pinouts: T568A to AS/NZS 3080

Fly leads

Type: Stranded.
Length: 1200 mm.
Quantity: Provide fly leads to 50% of outlets installed.

Patch cords

Type: Stranded.
Length: 900 mm.
Quantity: 100% of outlets installed.
Termination: Registered jacks.

.03 Execution

General

Standard: To AS/NZS 3084, AS/NZS 3080 and AS/ACIF S009.
Procedure: The space requirements as documented take precedence over the specific space requirements of AS/NZS 3084.

Cables

- Installation
  General: To manufacturers recommendations.
  Crossover: Install cables neatly and without crossovers between cables.
  Loom size: Loom cables into groups not exceeding 50 cables, and hold looms in place using reusable cable ties at least 20 mm wide. Do not exert compressive force on the cables when installing cable straps.
- Cable separation
  For safety: To AS/ACIF S009, and by at least 150 mm.
  Electromagnetic interference(EMI): To SAA HB 29.
  Fluorescent luminaires: Maintain a clearance of ≥ 300 mm.
- External cables
  External cables: To ACIF C524.

Telecommunications outlets

- Installation
  Mounting: Flush mount.
  Style, material and colour of plates: To match adjacent power and switch plates.

Earthing system

Standard: to AS/ACIF S009 and SAA HB 29.

Communication earth system

Communication earth system (CES): Provide a communications earth terminal (CET) adjacent to each electrical switchboard. Connect the CET to the local protective earth (PE) system at the switchboard.
Distributor: Provide an earth bar within each distributor and connect to the local CET in accordance with SAA HB 29.
Interconnections: Verify that there are no interconnections between the lightning protective earthing system and the telecommunications earthing system.

Labels

- Labelling
  Telecommunications cables: Label cross-connects and outlets in accordance with the requirements of AS/NZS 3080 and SAA HB 29 Figures 5 – 18.
  Cables: Label to indicate the origin and destination of the cable.
  Outlets: Label to show the origin of the cross-connect, the workstation or outlet number and the port designation.

Label type table

Component	Label scheme	Type
Cables	Origin and destination	Self adhesive – wrap on

Component	Label scheme	Type
Cross-connects	Port Number	Proprietary
Outlets	SAA HB 29 Fig 5-18	Engraved plate
Wall boxes	SAA HB 29 Fig 5-18	Engraved adhesive label
Patch cords	Type of service	Colour code

Testing

- Standards
  Testing of balanced cabling systems: To AS/NZS IEC 61935.1.
  Testing of patch cords: To AS/NZS IEC 61935.2.
- General
  General: Carry out 100% channel tests.
  Tests: To AS/NZS 3080 in conformance with SAA HB 29 Include the following:
  - Basic Link and Channel transmission tests including the following:
    - Wire map.
    - Length.
    - Attenuation.
    - NEXT.
    - ACR.
    - Propagation delay.
    - Delay skew.
    - Power sum NEXT.
    - Power sum ACR.
    - ELFEXT.
    - Power sum ELFEXT.
    - Return loss.
  - Optical fibre cable: Carry out Basic Link transmission tests including the following:
    - Length.
    - Attenuation.

Completion

- Cable management
  General: Before practical completion submit log books for each distribution frame with details of cable terminations and provisions for recording cable, line and jumper information.
  Identification and labelling, and record documentation: To AS/NZS 3085.1.

28 ELECTRICAL MAINTENANCE

.01 General

Responsibilities
Requirement: Maintain the electrical systems for the documented maintenance period so that the performance, reliability, efficiency and safety of the system is the same or better than that at the beginning of the maintenance period, including:
Periodic maintenance and replacement.
Emergency repairs.
Cleaning.
Maintenance period: As documented.
Standardl
Electrical services: To AS/NZS 3000.
Fire detection, control and warning systems: To AS 1851.
Inspection

- Notice
  Inspection: Give notice so that an inspection may be held simultaneously with the last programmed maintenance visit.

Submissions

- Certification
  Annual certification: Inspect and certify all items required to be inspected annually under statutory requirements including, but not limited to, fire detection and alarms, emergency evacuation lighting and EWIS. Submit certification to the principal.
  Practical completion certification: On satisfactory completion of the installation, and before the date for practical completion, submit certificates stating that each installation is operating correctly.

Maintenance records

General: Submit records of maintenance undertaken. If available, record in the schedules provided as part of the maintenance manuals.
Records: As a minimum, record the following:
Date, time and name of person undertaking the task.
Activities completed including operational and maintenance procedures.
Materials used.
Test results.
Comments for future maintenance actions and notes covering the condition of the installation.
Mandatory maintenance records: Include mandatory maintenance record forms with completed project specific information.
Service visits: Record comments on the functioning of the systems, work carried out, items requiring corrective action, adjustments made and name of service operator. Obtain the signature of the principal's designated representative.
Log books: Record maintenance in the log book pages provided in the Operation and maintenance manuals to *General requirements*.

Periodic maintenance and performance report

General: Provide a report summarising the maintenance performed and the performance of the electrical services in the preceding period. Set out the report in a form that permits comparison with previous reports. Include the following as minimum requirements:
Dates and number of site labour hours for programmed maintenance. Exclude travelling time.
Dates, number of site labour hours and nature of work for corrective maintenance. Exclude travelling time.
Dates and number of site labour hours for defects liability rectification if within the defects liability period. Exclude travelling time.
Peak load and load profile for electrical power consumed, where metering equipment allows. Where no appropriate metering equipment exists, provide copies of electricity accounts from the electricity service provider.
Results of recommissioning if scheduled for the period.

.02 Products

General

Proprietary items: Select products, as replacement items, of the same make, model and type as those being replaced.
Substitutions: Where the existing product is no longer available, provide products with at least the same performance, energy profile and construction characteristics.
Light fittings and ballasts: If fluorescent tubes or ballasts change due to obsolescence, change should be to the betterment of the installation i.e. equal or lower energy consumption or ballast that improve lamp life, i.e. change to electronic ballasts.

.03 Execution

Maintenance requirements

Requirements: Provide all labour and material necessary to maintain the electrical installation, including all items commonly referred to as consumable.

Site control

General: Report to the principal's designated representative on arriving at, and before leaving the site.

Maintenance during construction

Requirement: Provide all maintenance during the construction period and until all maintenance and operation manuals have been completed and submitted, and all operator instruction is complete, including, but not limited to:
All routine service tasks.
Emergency visits.

Cleaning
Requirement: Progressively clean the interior of the installations.
At practical completion:
- Clean all parts of the installation.
- Remove temporary protective coatings, packaging and labels.
- Clean interior of switchboards, switchgear, contactors and other electrical contacts.

Lighting fittings: Clean the interior of luminaires, including diffusers and louvers, annually for non-air conditioned buildings and every three years for air conditioned buildings. For large air conditioning buildings schedule areas of the building where a third of the fittings are cleaned each year.
Corrective maintenance
Requirement: Respond to call outs for breakdowns or other faults requiring corrective maintenance. Rectify faults and replace faulty materials and equipment.
Remedial work: Carry out any remedial work, including temporary work, necessary to restore the systems to safe and satisfactory operation. Do not leave site until correct operation has been proven. Do not leave the plant in an unsafe condition.
Temporary work: Promptly replace temporary work with permanent rectification.
- Response time
  Period: Attend site for emergency service within the documented time period.
  Calculation of response period: Response period starts at the time of notification to the contactor's nominated contact point.
- Failure to respond
  General: Should the contractor fail to respond to site within the period documented, the principal may, without incurring any liability or obligation and without limiting any other redress, engage persons other than the contractor to undertake emergency work on the systems. Fully reimburse the principal.

Regular maintenance
Requirement: Make routine service visits. Service items of equipment in accordance with the maintenance schedules in the operation and maintenance manuals.
Notification of defects
Requirement: When defects in the installation are identified, notify the principal in writing.
All systems
General: Provide maintenance work including, but not limited to, the following:
The procedures set out in the operational and maintenance manuals provided.
Attend to reported defects and complaints.
Check for and repair corrosion.
Remove rubbish and clean equipment.
Thoroughly check for and rectify any unsafe conditions.
Replace faulty or damaged parts and consumable components.
Check anti-vibration supports, brackets and clamps, holding down bolts and flexible connections, for deterioration and for freedom of movement of assembly.
Safety signs maintenance: To AS 1319.
Electrical general
Tasks: Perform the following tasks:
The procedures set out in the operational and maintenance manuals provided.
Check for hot joints, burnt insulation and burnt contacts.
Check electrical connections for tightness.
Check operation of all electrical components and systems.
Check indicating lights and replace defective lamps.
Check overload settings.
Check and report any changes to controls and wiring.
Provide maintenance in accordance with manufacturer's recommended maintenance program.
Standards:
Electrical equipment generally: To AS/NZS 3760.
Switchboards: To AS 2467.
Switchboard
Standard: To AS 2467.
General: Carry out the following:
The procedures set out in the operational and maintenance manuals provided.

Check for hot joints and burnt insulation. Carry out a thermal scan of joints and cable terminations by use of an infrared temperature detector or cameras and repair any joints showing high temperatures.
Rectify faults, make adjustments and replace consumable and faulty materials and equipment within 24 hours of notification.
Monthly inspections and maintenance work to maintain the assembly, including battery systems.

Emergency evacuation lighting

General: Perform the following tasks:
Inspect and maintain to AS/NZS 2293.2, Sections 2 and 3.
Clean luminaires as set out in clause 3.2 Cleaning.
Follow procedures as set out in the operational and maintenance manuals provided.
Interval: Carry out the 6-monthly procedures before practical completion and again before the end of the maintenance period.

Fire detection and alarms

General: Perform the following tasks:
Inspect and maintain to AS 1851 and to the operational and maintenance manual.
Maintenance records: To AS 1851.

Building Occupant Warning System

General: Perform the following tasks:
Inspect and maintain to AS 1851 and to the operational and maintenance manual.
Maintenance records: To AS 1851.

Electronic security

Standard: To AS/NZS 2201.1.
Requirement: Maintain the system as set out in the operational and maintenance manuals provided.
Breakdown call outs: Attend on site within 24 hours of notification. Rectify faults, and replace faulty materials and equipment.
Frequency of routine visits: ≤ 3 monthly.
Maintenance period performance monitoring:
Monitor: Access control system.
Investigate: Causes of alarms.
Alarm Report: < 2 days after alarm.
False alarms:
Notification of false alarms: On the first working day after a false alarm, submit notification of the circumstances surrounding the false alarm and action necessary to prevent similar occurrences.
Alterations due to false alarms: Carry out alterations necessary to eliminate false alarms due to the following:
Technical faults, selection, siting or aiming of devices.
Environmental conditions evident at the time of installation.
System provider
Electronic security system provider: A licensed security organisation only.

End of maintenance period service

General: Within a month of the end of the maintenance period, undertake all work scheduled to be carried out on an annual basis.

.04 Selections

Maintenance requirements schedule

Provision	Requirement
• **Maintenance period**	**52 weeks**
• **Call out response time not to exceed**	**12 hours**
• **Maximum time between programmed service visits**	**3 months**
• **Frequency of periodic maintenance and performance reports**	**6 months**

TENDER APPORTIONMENT

The following amounts may be used for the purpose of assessing tender submissions.

1	Energex Works	$ _____
2.	Metering	$ _____
3.	Earthing	$ _____
4.	Main Switchboards	$ _____
5.	Consumers Mains	$ _____
6	Distribution Switchboards	$ _____
7	Submains	$ _____
8.	Documentation	
	i) Shop Drawings	$ _____
	ii) As installed	$ _____
9.	Luminaire Supply	$ _____
10.	Luminaire Installation and Associated Wiring	$ _____
11.	Emergency Lighting	$ _____
12.	General Purpose Outlets and Permanently Connected Equipment	$ _____
13.	NBN	$ _____
14.	Fire Alarm System	$ _____
15.	BOWS System	$ _____

NAME OF TENDERER: _____

ADDRESS: _____

SIGNATURE: _____ DATE: _____

TENDER APPORTIONMENT (Continued)

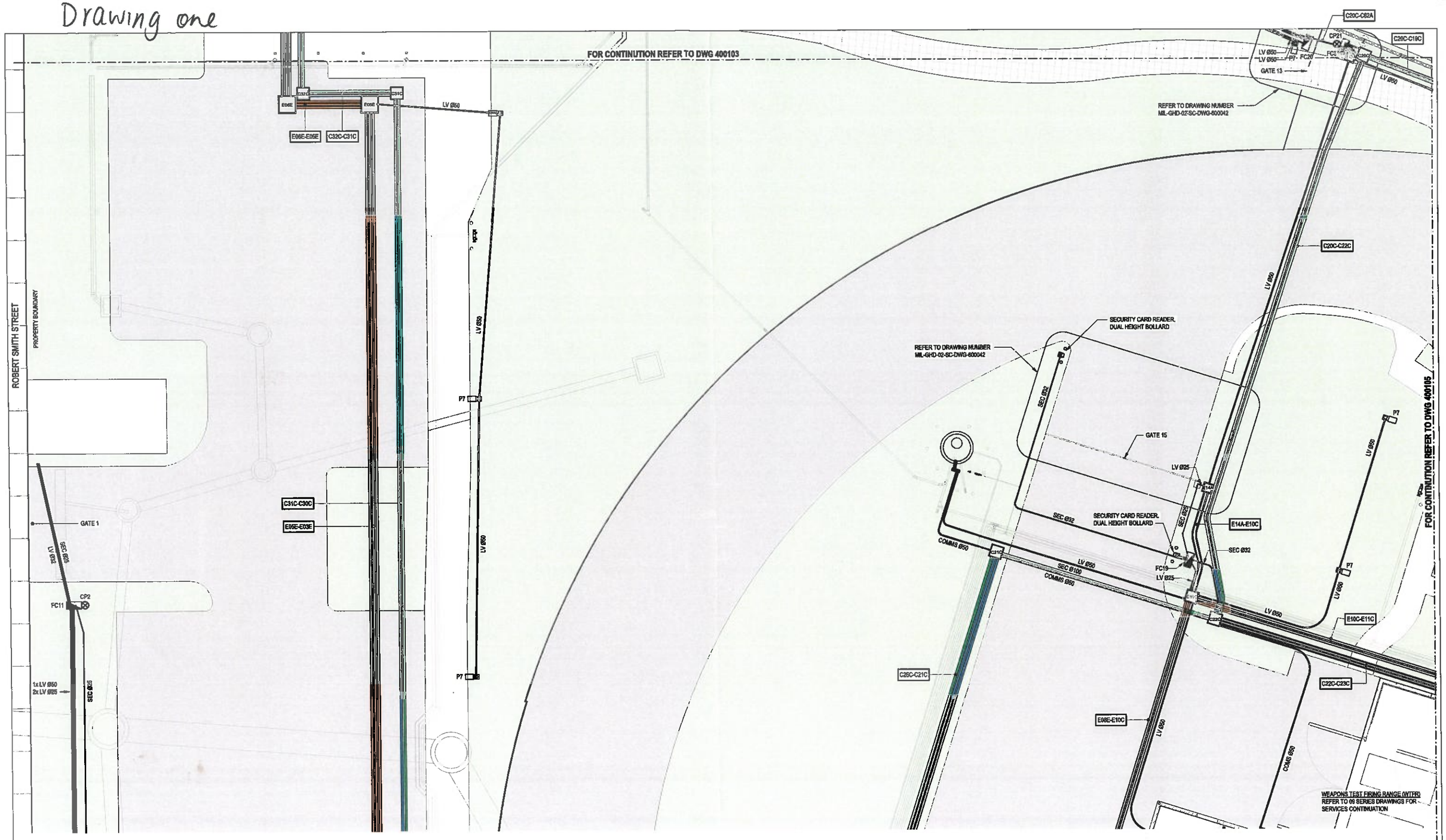
16.	Visitor Intercom System	$_____
17.	Telecommunications Services	$_____
18.	Security Access System & CCTV System	$_____
21.	Lightning Protection System	$_____
22.	Television Distribution System	$_____
23.	Testing and Commissioning	$_____
24.	Maintenance and Defects Liability Period	$_____
25.	Provisional Sum Allowances	
	a. Specialist Lighting not shown on drawings	$ 15,000 _____
	b. Additional Elec/Comms works	$ 10,000_____
26.	(Other) _____	$_____
	TOTAL:-	$

NAME OF TENDERER: _____

ADDRESS: _____

SIGNATURE: _____ DATE: _____

Drawing one



No	Revision	Drawn	Job Manager	Project Director	Date
0	ISSUED FOR CONSTRUCTION	EA	MB*	JT*	21.02.19

Scale Bars

0 1000 2000 3000 4000 5000 mm

SCALE 1:100 AT ORIGINAL SIZE

North Arrow

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DO NOT SCALE

PRINT IN COLOUR

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Drafting Check	D.TURNER	Design Check	P.KNIGHT
Technical Approved	P.KNIGHT*	Project Approved	J. THORBURN*

Title Drawing must not be used for Construction unless signed as Approved

Note: * indicates signatures on original issue of drawing or last revision of drawing

GHD Project No. 41-31776 | Scale @ A1 1:100

Principal: DEPARTMENT OF STATE DEVELOPMENT, MANUFACTURING, INFRASTRUCTURE & PLANNING

Project: MILVEHCOE

Facility: SITE WIDE SERVICES

Discipline: ELECTRICAL SERVICES

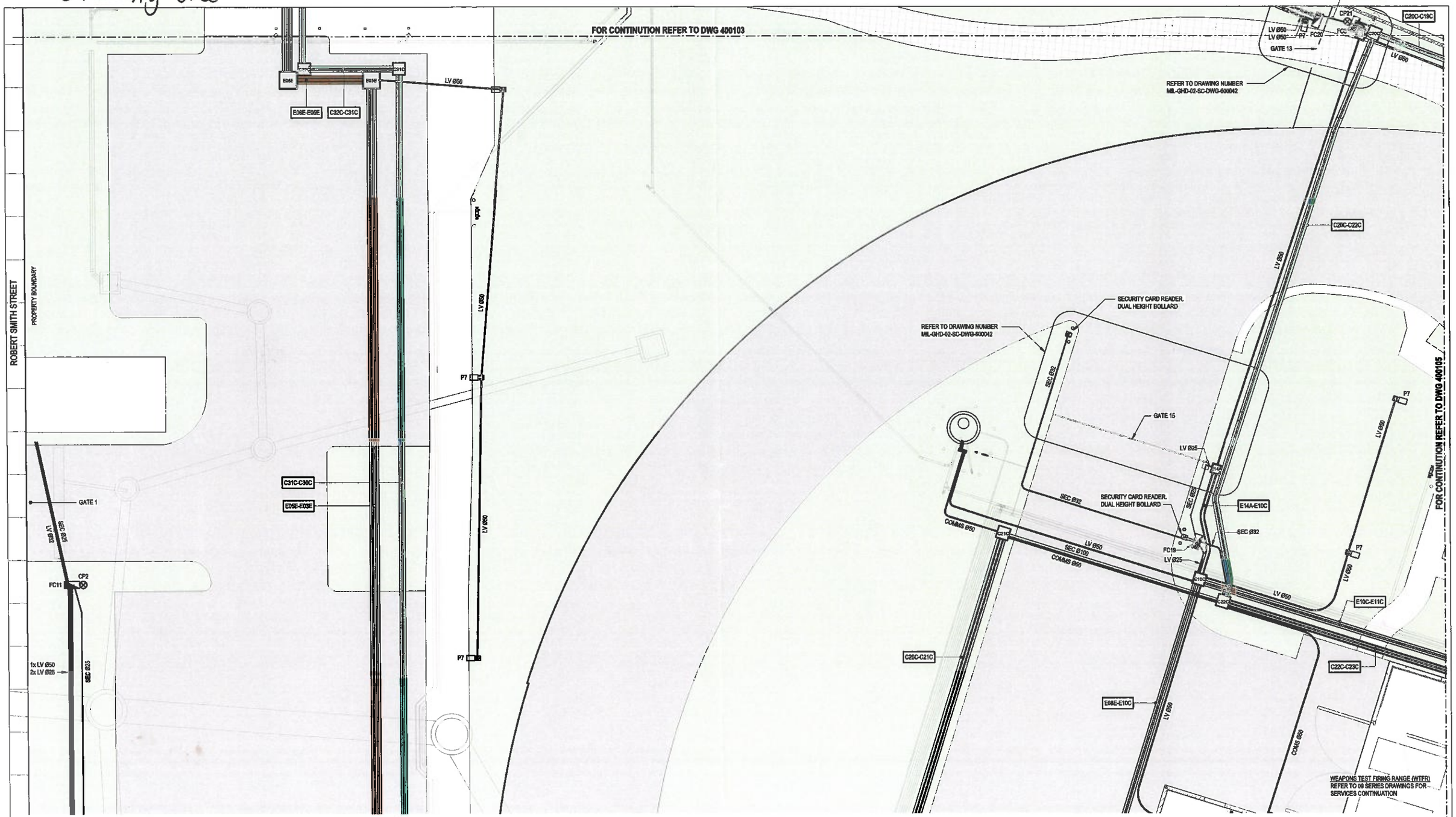
Title: SITE - ELECTRICAL SERVICES PLAN - SHEET 2

Original Size: A1 | Drawing No: MIL-GHD-02-EL-DWG-400104 | Rev: 0

Plot Date: 25/02/2019 11:19:19 AM

Cad File No: C:\Users\shardehurst\Documents\Revit 2018 Local Files\MIL-GHD-01-MD-SITE_Steve.Hazlehurst.rvt

Drawing one



No	Revision	Drawn	Job Manager	Project Director	Date
0	ISSUED FOR CONSTRUCTION	EA	MB*	JT*	21.02.19

Scale Bars

0 1000 2000 3000 4000 5000 mm

SCALE 1:100 AT ORIGINAL SIZE

North Arrow

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Managing Contractor
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QLD, 4006, Australia
PO Box 2053
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W www.watpac.com.au

Principal Consultant
GHD
Architect
GHDWOODHEAD
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Drawn	E. ARCONADO	Designer	B.MATTHEWS
Drafting Check	D.TURNER	Design Check	P.KNIGHT
Technical Approved	P.KNIGHT*	Project Approved	J. THORBURN*

This Drawing must not be used for Construction unless signed as Approved

Note: * Indicates signatures on original issue of drawing or last revision of drawing

GHD Project No. 41-31776 | Scale @ A1 1:100

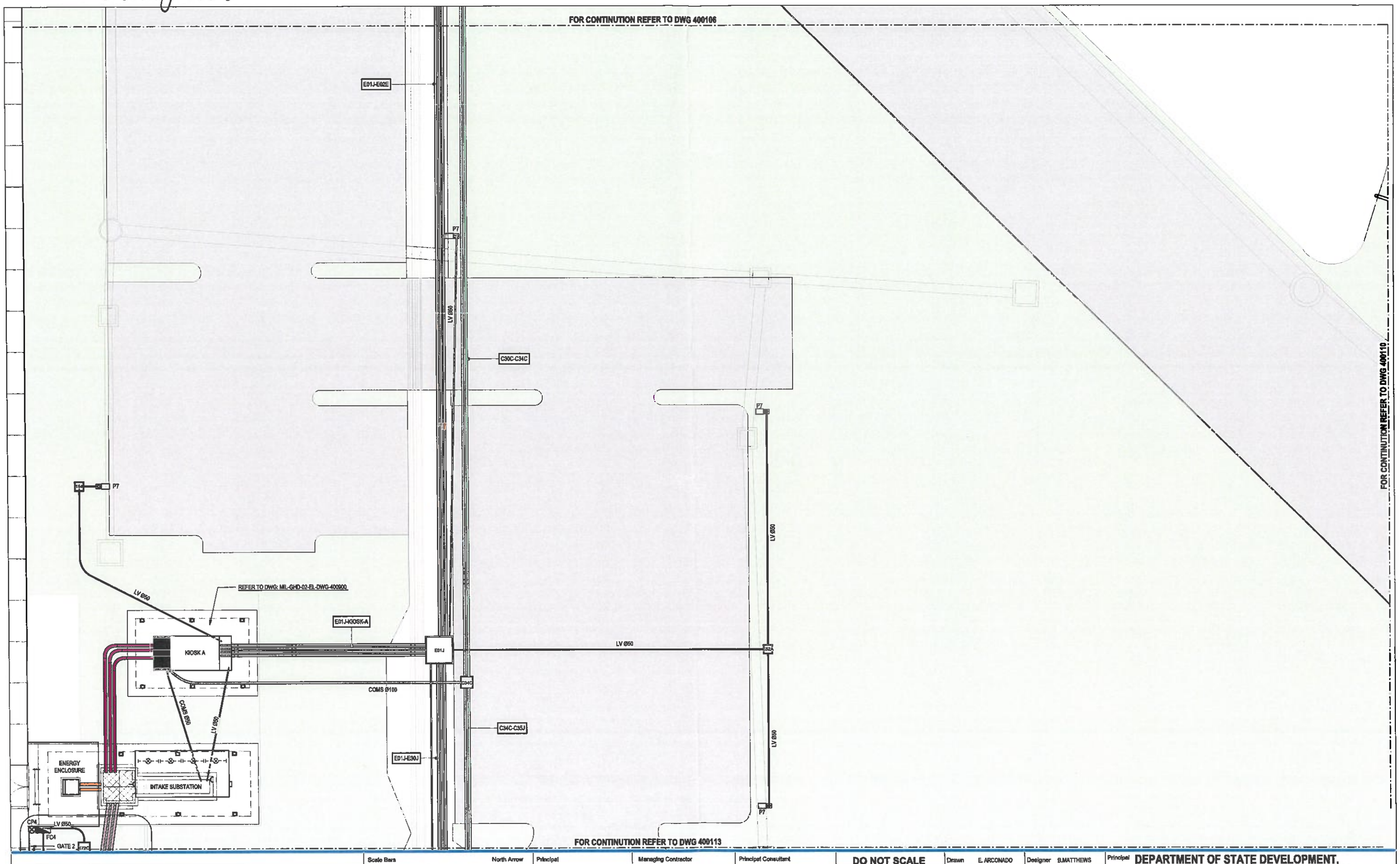
Principal	DEPARTMENT OF STATE DEVELOPMENT, MANUFACTURING, INFRASTRUCTURE & PLANNING
Project	MILVEHCOE
Facility	SITE WIDE SERVICES
Discipline	ELECTRICAL SERVICES
Title	SITE - ELECTRICAL SERVICES PLAN - SHEET 2

Original Size A1 | Drawing No: MIL-GHD-02-EL-DWG-400104 | Rev: 0

Plot Date: 25/02/2019 11:19:19 AM

Cad File No: C:\Users\shadshurst\Documents\Revit 2018 Local Files\MIL-GHD-01-MD-SITE_SteveHadshunst.rvt

Drawing two



No	Revision	Drawn	Job Manager	Project Director	Date
0	ISSUED FOR CONSTRUCTION	EA	MB*	JT*	21.02.19

Scale Bars

LV Ø50

0 1000 2000 3000 4000 5000 mm

SCALE 1:100 AT ORIGINAL SIZE

North Arrow: N

Principal: Queensland Government
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QLD, 4000, Australia
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GHD Project No. 41-31776 | Scale @ A1 1:100 | Original Size A1

Principal: DEPARTMENT OF STATE DEVELOPMENT, MANUFACTURING, INFRASTRUCTURE & PLANNING
Project: MILVEHCOE
Facility: SITE WIDE SERVICES
Discipline: ELECTRICAL SERVICES
Title: SITE - ELECTRICAL SERVICES PLAN - SHEET 7

Drawing No: MIL-GHD-02-EL-DWG-400109 Rev: 0

Plot Date: 25/02/2019 11:23:01 AM Cad File No: C:\Users\ahazlehurst\Documents\Revit 2018 Local Files\MIL-GHD-01-MD-SITE_Steve.Hazlehurst.rvt

To: tessveldink@watpac.com.au
Subject: Site Electrical Service Plan for Military Base
From: Gabrielle Dunning – Blue Star Electrical

Hi Tess,

Thank you for that information.

Did any of the drawings attached have any changes to them yet? If so, can you please send them through and explain.

Thanks,

Gabrielle Dunning
Contract Administrator

To: gabrielle@bluestarelectrical.com.au
Subject: Site Electrical Service Plan for Military Base
From: Tess Veldink – Watpac

Hi Gabrielle.

Please find attached revision 1 of drawing numbers 400109 and 400104.

To avoid any errors occurring with miscommunication, all variation to standard building plans are marked with a clouded area. You can also see the revision on the bottom left hand corner of the legend.

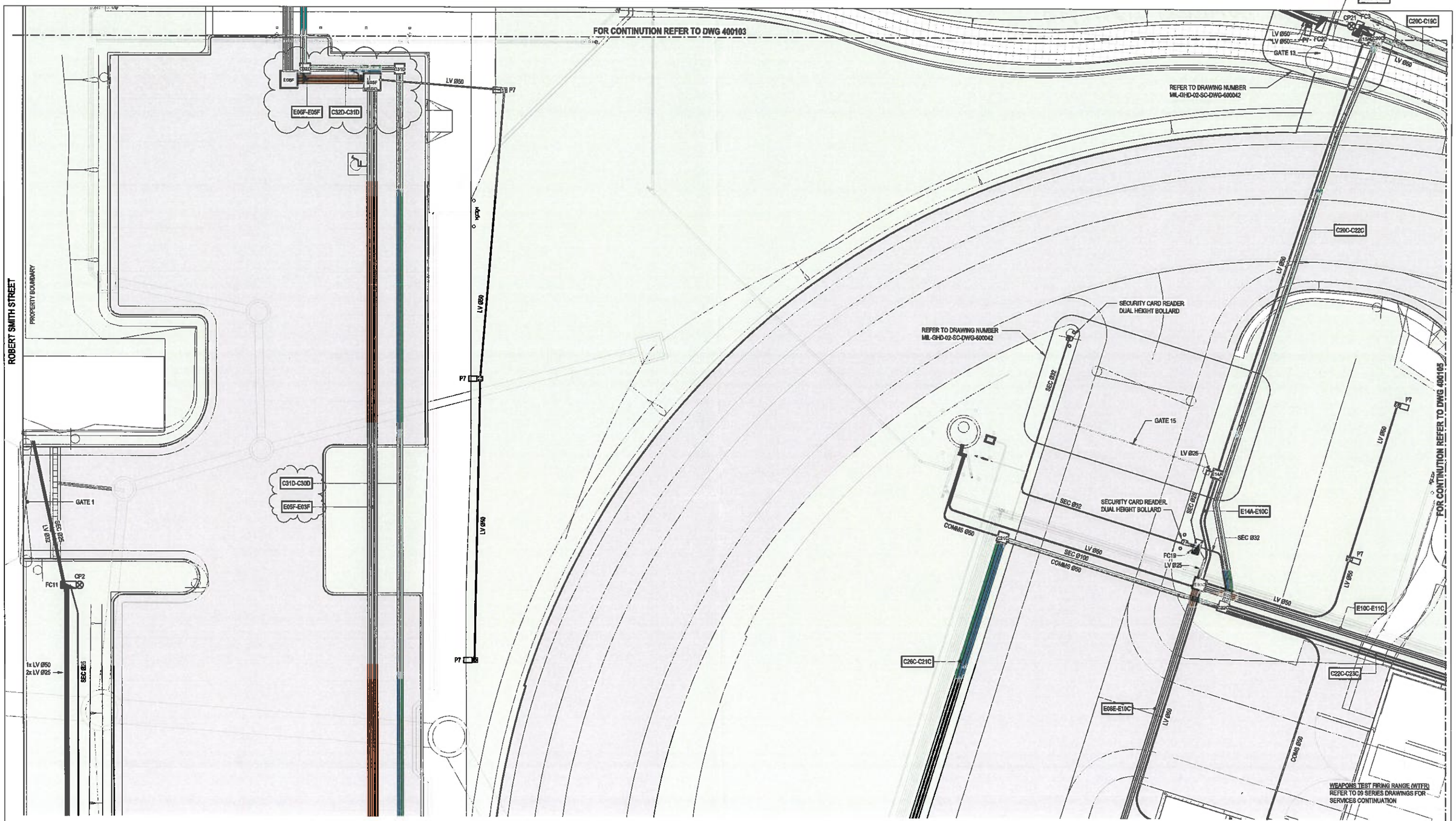
Drawing 400104 shows the underground conduit system with changes the top right-hand corner pits and the related drawings. As well as changes to the conduit related drawings in the middle left hand side of the drawing.

Drawing 400109 shows the main submain station of the project. This is where power goes from high voltage to low voltage for general use. Additional conduit and pits have been added, along with changes to the referenced drawings.

Hope this clears it up for you.

Thanks,

Tess Veldink
Contract administrator



No	Revision	Drawn	Job Manager	Project Director	Date
1	ISSUED FOR CONSTRUCTION	EA	MB*	JT*	06.03.19
0	ISSUED FOR CONSTRUCTION	EA	MB*	JT*	21.02.19

Scale Bars

0 1000 2000 3000 4000 5000 mm

SCALE 1:100 AT ORIGINAL SIZE

North Arrow

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Drafting Check	D.TURNER	Design Check	P.KNIGHT
Technical Approved	P.KNIGHT*	Project Approved	J. THORBURN*

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GHD Project No. 41-31776

Scale @ A1 1 : 100

Principal: DEPARTMENT OF STATE DEVELOPMENT, MANUFACTURING, INFRASTRUCTURE & PLANNING
Project: MILVEHCOE
Facility: SITE WIDE SERVICES
Discipline: ELECTRICAL SERVICES
Title: SITE - ELECTRICAL SERVICES PLAN - SHEET 2

Original Size A1

Drawing No: MIL-GHD-02-EL-DWG-400104 Rev: 1

Plot Date: 7/03/2019 5:08:42 PM

Cad File No: C:\Users\EArconado\Documents\Revit 2018 Local Files\MIL-GHD-01-MD-SITE_earconado.rvt

FOR CONTINUTION REFER TO DWG 400106

FOR CONTINUTION REFER TO DWG 400110

FOR CONTINUTION REFER TO DWG 400113

E01J-E02E

P7

LV Ø50

E02A

REFER TO DWG: MIL-GHD-02-EL-DWG-400900

LV Ø50

E01J-KIOSK-A

KIOSK A

C79D-C34D

LV Ø50

E02J

COMS Ø100

HV Ø150

HV Ø150

HV Ø150

COMS Ø50

LV Ø50

LV Ø100

C34D-C35J

REFER TO DWG: MIL-GHD-12-EL-DWG-400200

E01J-E30J

ENERGEX ENCLOSURE

HV Ø150

HV Ø150

INTAKE SUBSTATIONON

CP4

LV Ø50

FC4

GATE 2

E79E

LV Ø100

EP1A

LV Ø50

LV Ø50

P7

P7

No	Revision	Drawn	Job Manager	Project Director	Date
1	ISSUED FOR CONSTRUCTION	EA	MB*	JT*	06.03.19
0	ISSUED FOR CONSTRUCTION	EA	MB*	JT*	21.02.19

Scale Bars

LV Ø50

0 1000 2000 3000 4000 5000 mm

SCALE 1:100 AT ORIGINAL SIZE

North Arrow

N

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GHD Project No. 41-31776

Scale @ A1 1 : 100

Principal DEPARTMENT OF STATE DEVELOPMENT, MANUFACTURING, INFRASTRUCTURE & PLANNING

Project MILVEHCOE

Facility SITE WIDE SERVICES

Discipline ELECTRICAL SERVICES

Title SITE - ELECTRICAL SERVICES PLAN - SHEET 7

Original Size A1

Drawing No: MIL-GHD-02-EL-DWG-400109 Rev: 1

Plot Date: 7/03/2019 5:08:13 PM

Cad File No: C:\Users\EArconado\Documents\Revit 2018 Local Files\MIL-GHD-01-MD-SITE_arconado.rvt

Interpret Specifications

To: Blue Star Electrical team
Subject: Meeting - Site Electrical Service Plan for Military Base
From: gabrielle@bluestarelectrical.com.au

Hi Blue Star team,

I've just been told that we have won the Military Base project in Redbank! Well-done team! Some drawings have just been revised so I thought it's a great time to have a meeting and sit down together to interpret the specifications and budgets for the project.

Attached is a copy of the specifications – can everyone please revise and bring a copy to the meeting. (See specifications document attached in the initial email)

Proposed meeting:
Wednesday 15th April at 10am
Run time: 10am – 12pm

I will take meeting minutes and send the final copy through.

Thanks,

Tess Veldink
Contract Administrator

To: Blue Star Electrical team
Subject: Meeting - Site Electrical Service Plan for Military Base
From: gabrielle@bluestarelectrical.com.au

Hi Everyone,

Here are the final meeting minutes – please let me know if you have any issues.

CONFIDENTIAL
MEETING MINUTES
MILITARY BASE – REDBANK
PROJECT 20023

Provisional Sum and Prime Costs
Prime costs are the amount of money included in a contract sum to purchase a specified item such as light fixings, GPO's and down lights. The agreed estimated amount is in the contract sum, which Blue Star have already agreed upon and signed. However, the particular item hasn't been selected yet the estimate is made from a reasonable cost. If Watpac is to change the fittings, we will need to complete a variation with the change of the item along with difference in labour, please remember to complete these ASAP so Watpac can approve them.

Provisional Sums are the amount of money included in a contract sum to cover works and/or materials that aren't detailed when entering the contract. Typically, Watpac is to ensure

these costs are limited by taking reasonable steps in the construction process, however these costs can also be unforeseen. Meaning the provisional sum could be exceeded which is adding to our contract sum. Looking at old projects Blue Star usually allows $150k for provisional work, for this project Blue Star have budgeted $200k due to the kind of work that is involved.

Customer Variations

The project specifications set out the minimum standards and codes required for all structural components and provide details on the electrical systems description and technical requirements on the electrical supply, metering, consumer mains, submains, telecommunications, emergency lighting etc. (see specification document for more). Remember plans, contracts, permits and other trade documents go hand in hand with the project specifications. It's important that Blue Star's Project Managers/ Supervisors are on top of any updates with our customer variations and identify the changes in the project specifications.

Project Manager and Supervisors are to ensure there are no disputes with the contractor it's our responsibility to put variations in writing to the builder as early as possible through the variation portal. Changes to any works, terms, including costs must be dated and signed by both parties. Ensure to submit an extension of time form as early as possible as the extension might cause delays for the overall project and or increase scope of works. Variation payments should be made in accordance with the time stated in the variation document.

Estimation, planning and supervisory tasks

The Blue Star estimating team have provided the project team with a budget for the project so that we can work to accurate figures and make correct pricing decisions. The essential estimates that are considered in our budgets are materials, labour costs, off-site overheads and business running costs.

Blue Star estimators start by quantifying the project documentation by performing electrical takes and counts of the drawings. Once all the drawings are quantified, they then sourced material costs for all of the items/equipment. Then the labour rates are applied to each of the items – the labour rates include site workers and supervision. Both materials and labour cost will have a margin, which is then the company's profit.

An example is below:

Item	Quantities	Material Price (w/margin)	Labour (w/margin)
Light fitting	5	$100.00 each	2 hr hour to install @ $50 per hour

= $1000.00 budget with margin

This process is completed for all items for the project and totalled together for the final budget. Once the project has started the client may want to change fitting etc. this when you would complete a variation form with the additional figures of the material and labour costs including a margin figure.

Building Codes and Standards

The main building codes and standards followed by electrical companies are the NCC and AS: 3000. For this particular project there is a list in the specification document on pages 6 and 7.

Key Features in specifications – design, purpose, aesthetics and cost relationship

Ensure to lock down and understand key features in the specifications such as the design, purpose, aesthetics and cost relationships. These features are important in the early stages of construction so the building process is run smoothly.

For this particular project the design and aesthetics features will be highlighted in the project documents and discussed in project meeting with the clients and other trades. The purpose of the project is to build a new base for the military and making sure we provide the highest standards of electrical work and be actively involved in offering an electrical perspective. And please ensure that we have a good cost relationship with the set budget and make cost effective decisions.

Occasion 2

Client: Jeff & Gabrielle Veldink
Contractors: Coral Homes

Interpret drawings

To: jandgveldink@bigpond.com
Subject: New Home – 7 Cassim Place, Redland Bay
From: Tess Veldink – Coral Homes

Hi Gabrielle and Jeff,

Thank you for choosing Coral Homes to build your dream home. From our last meeting attached some of your house drawings to look over. Here's some information about the drawings to help you interpret them.

Purpose & advantages of different types of drawings

A drawing is the means of showing the shape, size and position of a building site, together with the composition of the materials used and the overall construction of the project. Specifications are a detailed document that supports drawings and plans and provides details of the materials, techniques and standards.

There are multiple categories of drawings these include, initial sketches, CAD drawings, preliminary and final drawings and plans, detailed amendment drawings, presentation drawings and service details. CAD drawings are the drawings for your house as they show the design of the house, materials and dimensions and we are able to modify and optimise the design if needed.

Aspects of drawings

Aspects of drawings include plans, elevations, sections and views in isometric projection and perspective. A plan is often a top-down view which shows the layout or arrangement of a structure and its surroundings. Types of plans include, location plans, site plans, floor plans, detailed plans and landscape plans. The drawings given in this tender are floor plans and site plans as it shows details of the proposed structure, such as rooms, positioning of fixtures and floor coverings.

Symbols and abbreviations

The Australia Architectural Standards details the symbols that must be used in drawing – to avoid confusion here are some of the most commonly used symbols in a house plan.

MEANING OF THE SYMBOL	THE SYMBOL
BASIN	
BIDET	
BATH	
DRINKING FOUNTAIN	

MEANING OF SYMBOL	THE SYMBOLS
SINK Single bowl Locate bowl as required	
SINK Double bowl Locate bowls as required	
TUB Double	
TUB Single	

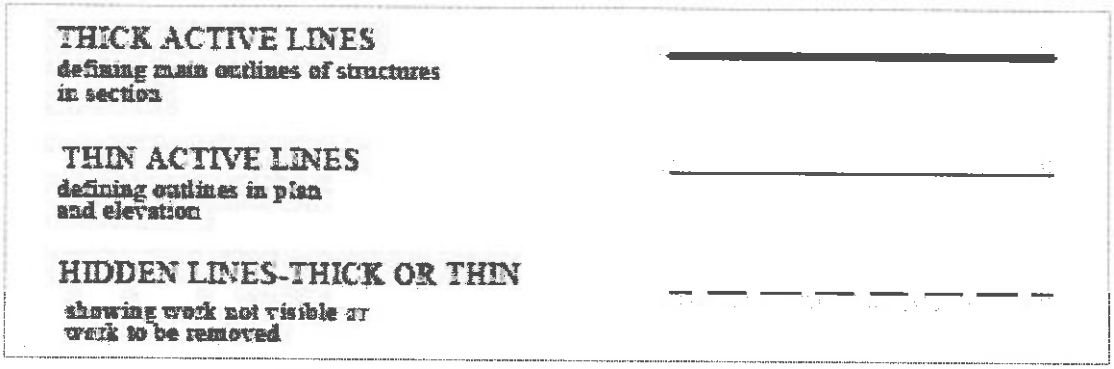
DRINKING TROUGH	
HOTPLATES	
SHOWER	
SHOWER BATH	

URINAL STALL	
VANITY BASIN	
WATER CLOSET	

There are also symbols on the house plans used for windows and doors. There are standard ways of indicating on plans the opening method for doors ie: whether they are sliding or swinging doors. For windows the opening method for windows are generally indicated on the elevation plans.

There are symbols for different materials used on a plan, for example for your house there is a lot of brickwork this will be able to be identified by using the brickwork material symbol.

There are multiple different lines on the house plans. All of the lines vary in thickness and form according to their purpose and importance. Here are the three main lines that will be present in the house plans



Drawings do show orientation and provide a scale bar in the legend on the side of the page – all drawings show the positioning of north with the floor plans at a scale of 1:100 and all the site plans at a scale of 1:200.

Abbreviations are used to help keep drawings clear and easy to read and to simplify notations on drawings. The lower floor plan has a legend on the side of the drawings to help understand the abbreviations.

Identifying building site from location drawing

A location plan is required so that you can correctly identify your building site. A location plan is necessary for the big development so that the building site location is clear. A location plan includes a lot number; plan numbers, north point and a scale.

Identifying different parts on a site plan

As mentioned previously at Coral Homes our site plans are drawn at 1:200 and gives a following information, A datum – reference height to other site levels and building location and orientation to north point.

Other key features of site plans include: details of paving and retaining walls, trees and vegetation, outline of site boundaries showing location of proposed buildings, driveways and stormwater drainage. Some of these features can be seen on the site plan.

Identifying key features of plans, elevation and sections

Plans show people interested (in this case it would be the you (the client), lending bodies and other trades) the proposed structure of the building work - how it will be constructed and how it will look when it's completed. Plans show the location of various features on the site and illustrate details, such as ceiling heights, doors, light fittings, power, services and walls. Other trades need this information to be able to quote the project and give them an idea on how it's to be built.

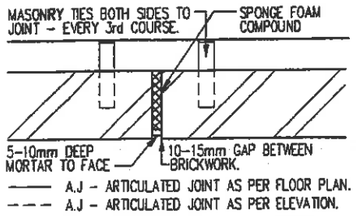
Elevation is a view you see when standing in from of that wall, most council require an elevation from each side of the project and the view is indicated by north, south, east or west. Elevation indicates finishes to external walls and size of windows, doors and balconies.

A section is a vertical view (slice) through the building. The direction of section lines or arrows is usually shown on the plan to help interpret the sectional view. Key features include – height of building, position of piers, beams and openings, construction details and distance between finished floor and existing or proposed ground levels.

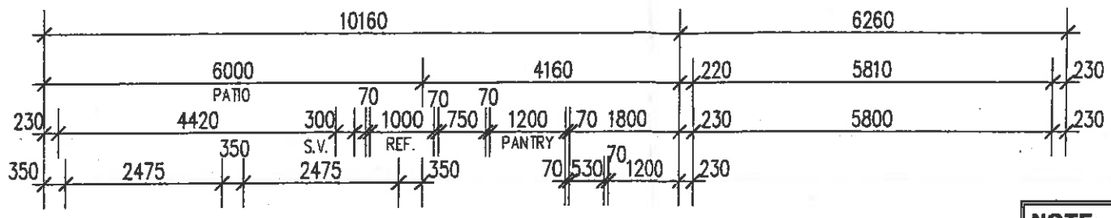
Please let us know if you have any questions regarding the above.

Many Thanks,

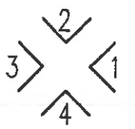
Tess Veldink
Contract Administrator



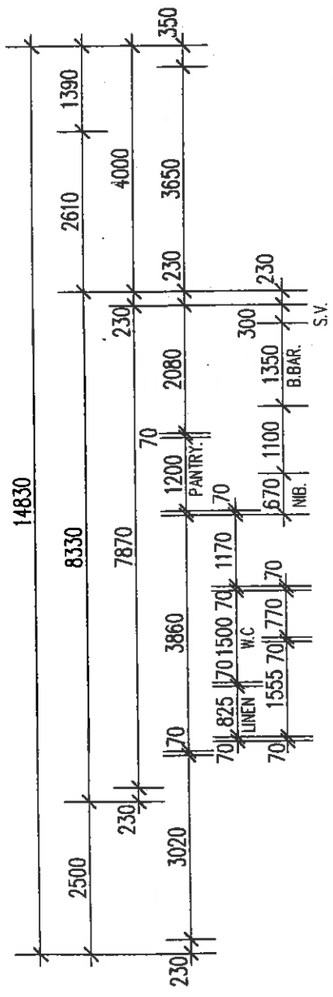
MASONARY ARTICULATION JOINT DETAIL.

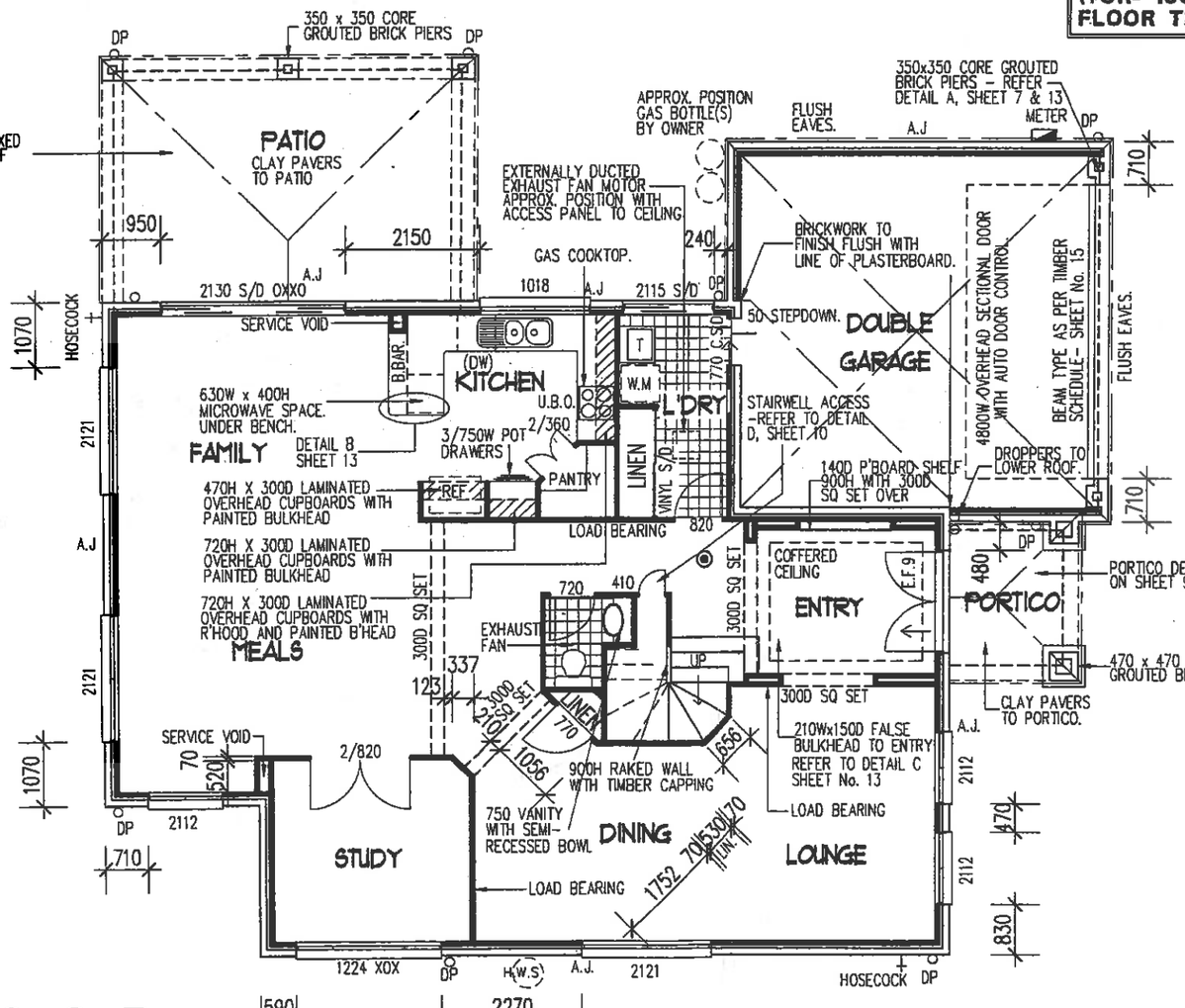


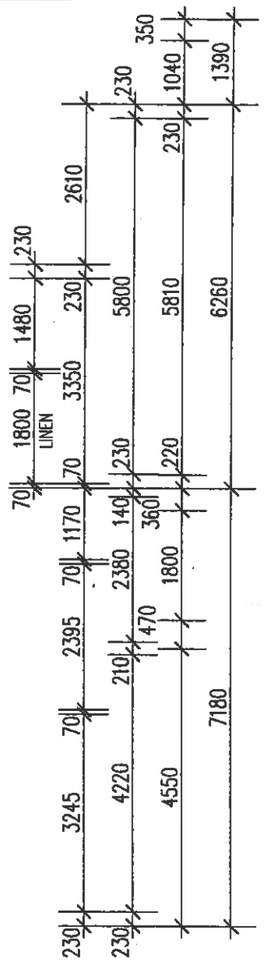
NOTE: STUDS DIRECTLY (+OR- 100mm) UNDER FLOOR TRUSS



ELEVATIONS







LEGEND

F.R.C	FIBRE REINFORCED CEMENT
REF	FRIDGE PROVISION
W.O.	WALL OVEN TOWER
D.W	DISHWASHER PROVISION
B.BAR	BREAKFAST BAR
W.M.	WASHING MACHINE PROVISION
SHR.	SHOWER
M.H.	600 x 600 MAN HOLE
D.P.	DOWNPIPE
HWD	HARDWOOD TIMBER
OBS	OBSCURE GLASS
F/G	FIXED GLASS TO ALL PANELS
D/H	DOUBLE HUNG WINDOW
BAY	BAY WINDOW
SL	GLASS SIDELIGHT PANEL
S/D	GLASS SLIDING DOOR (EXTERNAL)
XO	SLIDING PANEL/ FIXED PANEL
M/F	POWDER COATED ALUM. FLASHING
PV	PERMANENT VENT PANEL TO WINDOW
FED	FEDERATION BARS TO WINDOWS
COL	COLONIAL BARS TO WINDOWS
V.S.D	VINYL FACED SLIDING ROBE DOORS
M.S.D	MIRROR SLIDING ROBE DOORS
F.S.D.	FACE OF WALL SLIDING DOOR (PELMET)
C.S.D.	INTERNAL CAVITY SLIDING DOOR
SQ SET	300D SQUARE SET P'BOARD BULKHEAD
820	SIZE OF TIMBER DOOR (WIDTH)
21-18	SIZE OF WINDOW (2100H x 1800W)
P.C.J.	PLASTERBOARD CEILING CONTROL JOINT
◉	LOCATION OF SMOKE ALARM. (TO COMPLY WITH B.C.A CLASS 1 & 10 PART 3.7-2 & WITH A.S 3786.

NOTES

WRITTEN DIMENSIONS WILL TAKE PRECEDENCE OVER SCALE.

ALL INTERNAL DIMENSIONS STATED ARE FRAME SIZE - EXCLUDING LININGS.

ALL WINDOWS TO BE SLIDING U.N.O.

4/450mm WIDE WHITE MELAMINE SHELVES TO PANTRY.

4/530mm WIDE PAINTED PYNEBOARD SHELVES TO LINEN CUPBOARD.

R2.5 INSULATION TO ENTIRE CEILING AREA (EXCLUDING GARAGE AND PORTICO).

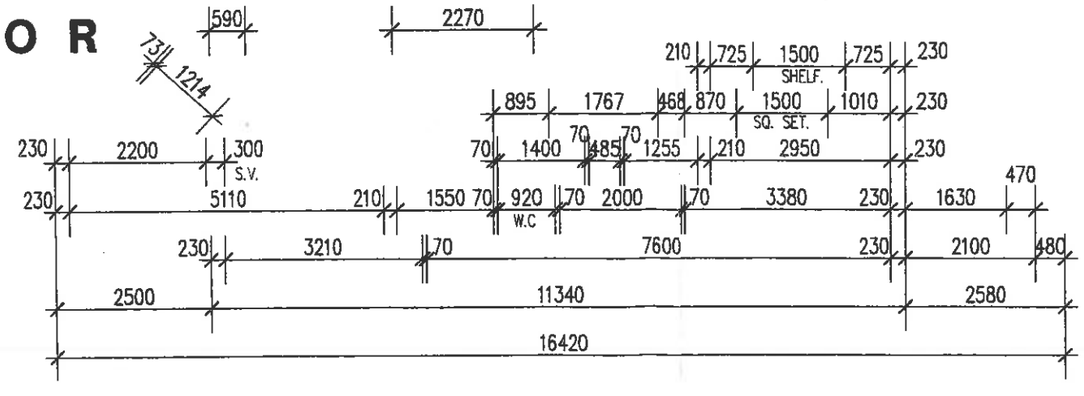
RHINOWRAP SARKING TO ALL EXTERNAL WALLS (INCLUDING GARAGE.)

PROVIDE LP BOTTLED GAS PIPEWORK AND CONNECTION TO HOT WATER UNIT.

LOWER FLOOR PLAN

AREA:-

LIVING (LOWER):-	131.84m²
LIVING (UPPER):-	131.84m²
GARAGE:-	37.55m²
PORTICO:-	5.52m²
PATIO:-	24.00m²
TOTAL AREA:-	330.75m²
PER LENGTH (LOWER):-	59.72m
PER LENGTH (UPPER):-	49.34m
ROOF AREA (LOWER):-	69.27m²
PER LENGTH:-	32.97m



ANTIGUA 307 MSP

FINAL SIGNED COPY

I/WE ACCEPT THAT THESE PLANS ARE THE FINAL WORKING DRAWINGS THAT SUPERSEDE PRELIM. PLANS & I/WE HAVE CHECKED THAT ANY ALTERATIONS OR ADDITIONS ARE SHOWN.

THESE PLANS ALSO FORM PART OF OUR CONTRACT BETWEEN THE PROPRIETOR & CORAL HOMES.

PROPRIETOR SIGNATURE PROPRIETOR SIGNATURE

BUILDERS SIGNATURE

THESE PLANS REMAIN COPYRIGHT OF THE CORAL HOMES GROUP

Coral Homes
"Built On Trust"
CORAL HOMES
42 SIGANTO DRIVE, OXENFORD
P.O BOX 497, OXENFORD. 4210.
B.S.A LIC. No. 1014053 (QLD)
B.S.C LIC. No. 62084C (NSW)

CLIENTS
J. & G. VELDINK
LOT 48 CASSIM PLACE
REDLAND BAY

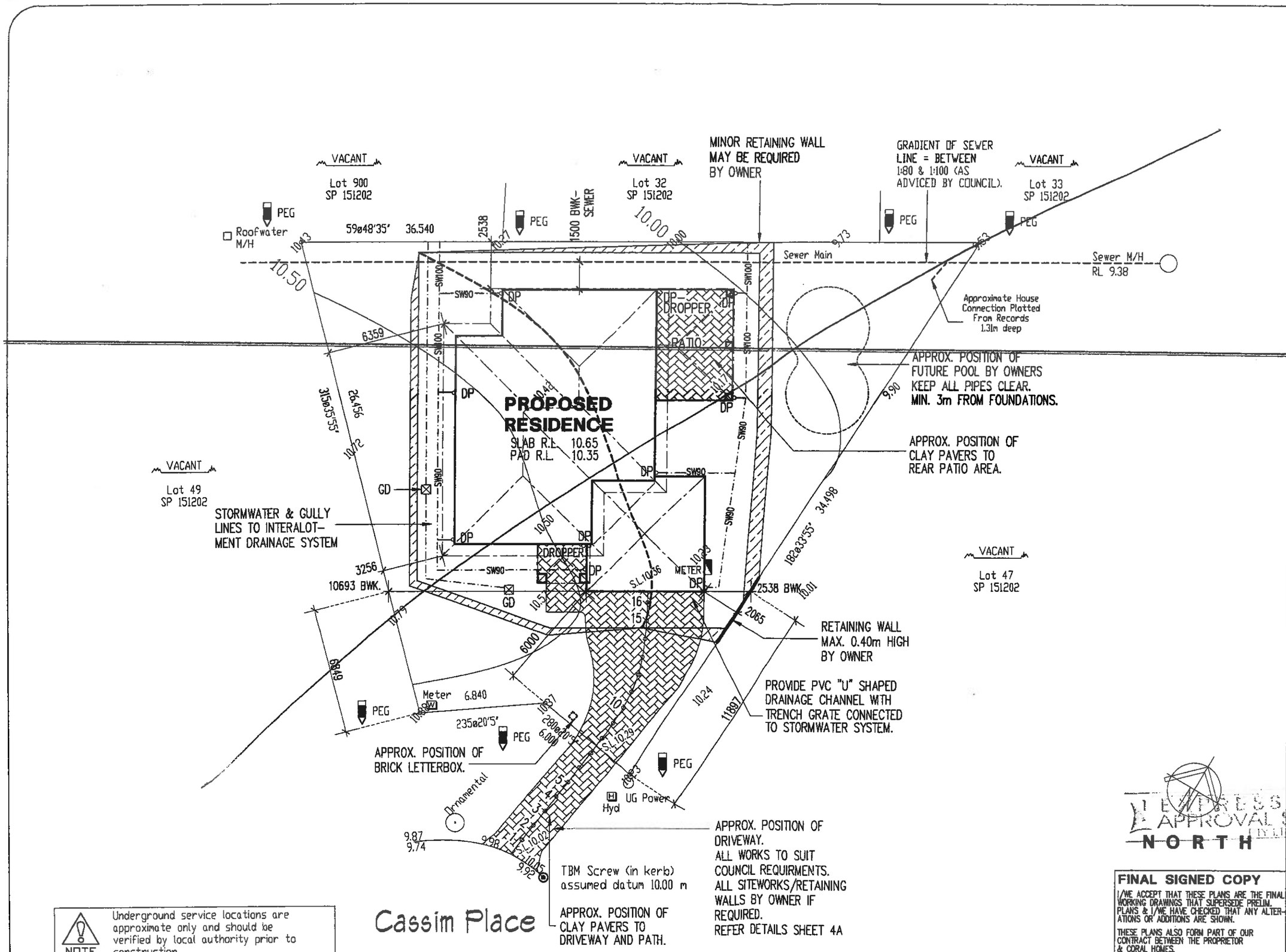
CHECKED | TENDER LETTER
26 MAY 2003

DRAWING: FLOOR PLAN LAYOUT | REFERENCE No. J7847

SCALE: 1:100 | DATE: 20/05/03 (CP)

DRAWN: SCA

SHEET 1 OF 15

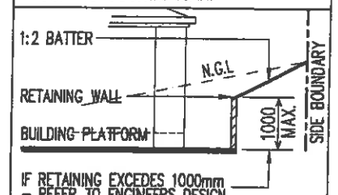


NOTE
Underground service locations are approximate only and should be verified by local authority prior to construction.

SITE PLAN

NOTES

SETBACK DISTANCES ARE FROM THE OUTSIDE OF THE FASCIA TO THE BOUNDARY.
EAVE WIDTH TO OUTSIDE OF FASCIA IS 650mm MAX.



IF RETAINING EXCEDES 1000mm – REFER TO ENGINEERS DESIGN.

RETAINING DETAIL.

SITE COST OPTION:- 31-03-03

PROPERTY DESCRIPTION

LOT 48 ON SP 151202
CASSIM PLACE

SUBURB	REDLAND BAY
LOCAL AUTH.	REDLAND S.C.
PARISH	REDLAND
COUNTY	STANLEY
UBD REF.	B 226 F20

AREAS	M²
LAND	651
SITE COVERAGE	30.6%

SITEWORKS

CUT:- 0.40
FILL:- 0.40
PAD R.L:- 10.35
SLAB R.L:- 10.65
NOTE : CRITICAL DRIVEWAY GRADIENT RESTRICTED PAD R.L. ☑NO
NOTE : PLATFORM HEIGHT CAN VARY DUE TO SITE COND.

LEGEND

DENOTES 90/100mm DIA P.V.C STORM-WATER PIPE.
D.P - DOWNPIPE LOCATION.
☒ GD DENOTES 250x 250 GULLY DRAIN CONNECTED TO SEPARATE STORM-WATER PIPE.

NOTE : ALL BUILDING WORKS ARE TO COMPLY WITH THE BUILDING CODE OF AUSTRALIA.

WRITTEN DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALE.

SURVEYOR No. - L030705

Coral Homes
"Built On Trust"
CORAL HOMES
42 SIGANTO DRIVE, OXENFORD
P.O BOX 497, OXENFORD. 4210.
B.S.A LIC. No. 1014053 (QLD)
B.S.C LIC. No. 52084C (NSW)

EXPRESS APPROVAL SERVICES (QLD) PTY LTD
NORTH

CLIENTS
J. & G. VELDINK
LOT 48 CASSIM PLACE
REDLAND BAY

FINAL SIGNED COPY

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THESE PLANS ALSO FORM PART OF OUR CONTRACT BETWEEN THE PROPRIETOR & CORAL HOMES.

PROPRIETOR SIGNATURE PROPRIETOR SIGNATURE

CHECKED	TENDER LETTER 26 MAY 2003
DRAWING: SITE PLAN LAYOUT	REFERENCE No. J7847
SCALE: 1:200	DATE: 20/05/03 (CP)
DRAWN: SCA	
SHEET 4 OF 15	

To: tessveldink@coralhomes.com.au
Subject: New Home – 7 Cassim Place, Redland Bay
From: Jeff & Gabrielle

Hi Tess,

Sorry for the late response – thank you for all that information and the lower floor plan and site plan.

Please see our notes and approval on the lower floor plan and site plan. Can you please make these changed official and send through the revised copies?

Thanks,

Jeff & Gabrielle.

To: jandgveldink@bigpond.com
Subject: New Home – 7 Cassim Place, Redland Bay
From: Tess Veldink – Coral Homes

Hi Jeff & Gabrielle,

Yes of course we can make these changes. Please see attached revision 1 of both the lower floor plan and site plans.

To avoid any errors occurring with miscommunication, all variation to standard building plans are marked with a clouded area (the clouded area is so highlighted in this scenario to help it stand out) You can also see the revision on the bottom left hand corner of the legend.

For the lower floor plan, we have four changes. The gas bottles have moved around the corner near the side of the house, kitchen drawers have been changed from 3 to 4 drawers (with two drawers becoming thinner), stove has moved over 500mm and the kitchen window has been decreased by 6mm.

The site plan includes four changes aswell, the front door pillar area has been extended, the driveway has been increased at the tail on both sides and a brick pathway has been included on the side of the house.

Please us know if you have any questions regarding these changes – please note this will increase your tendered price, we will send through the new tender document for signing over the next couple of days.

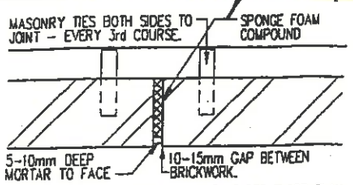
Thanks,

Tess Veldink
Contract Administrator

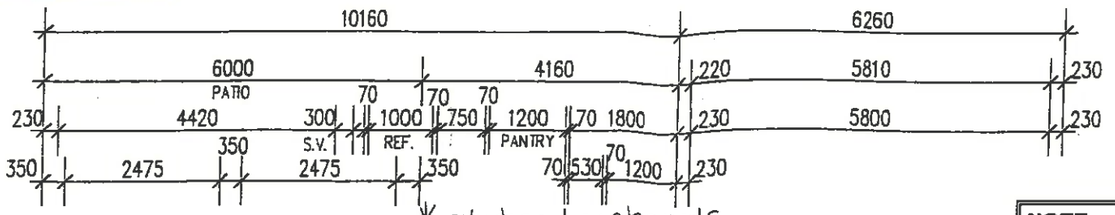
---

changes from client

BUILDERS COPY



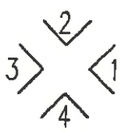
MASONARY ARTICULATION JOINT DETAIL.



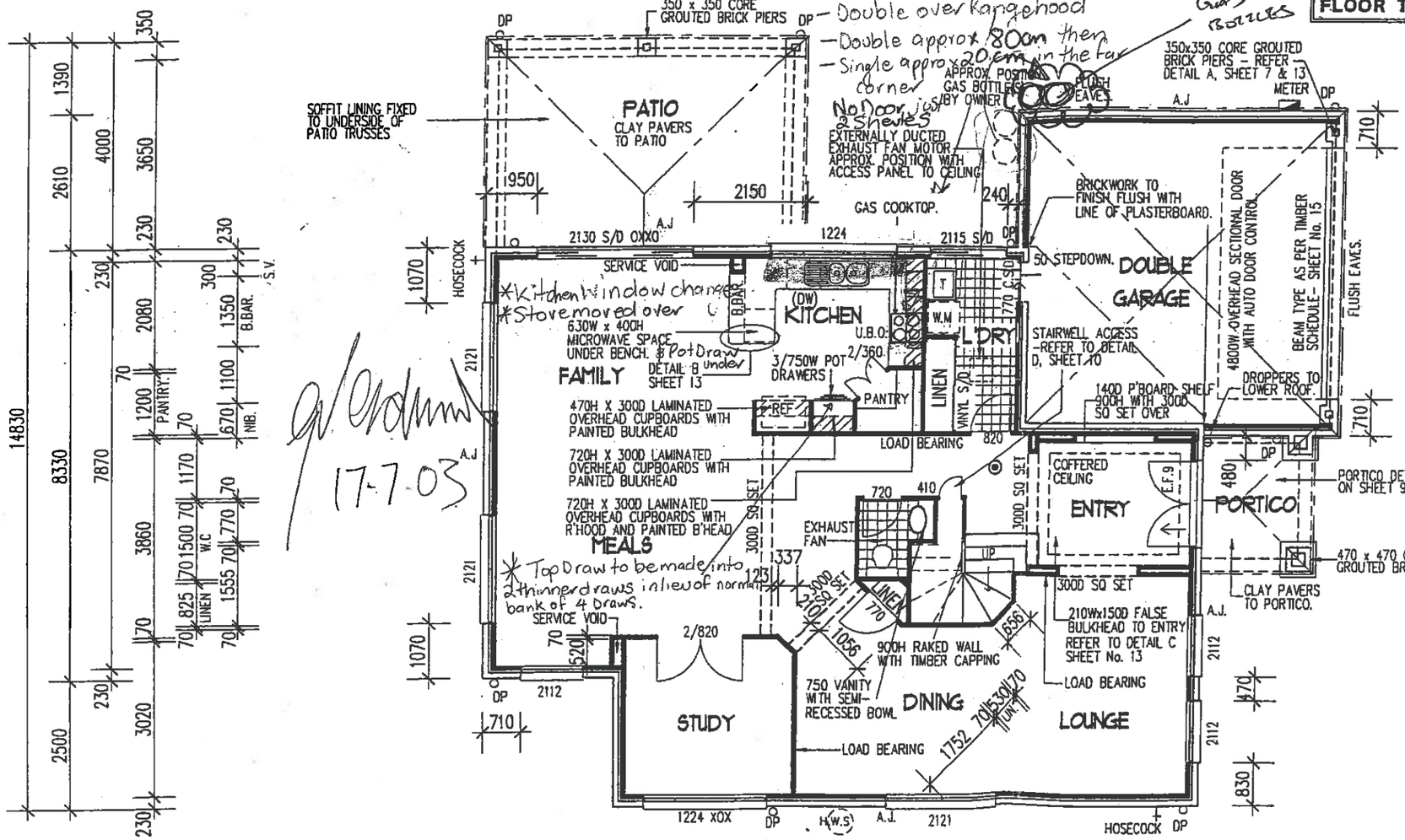
* overhead cupboards
– 50cm approx between Pantry & Stove
– Double over Rangehood
– Double approx 80cm then
– Single approx 20cm in the far corner

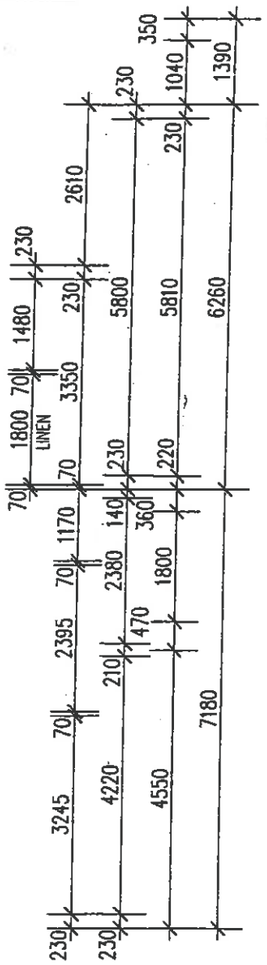
NOTE:
STUDS DIRECTLY (+OR- 100mm) UNDER FLOOR TRUSS

N2.



ELEVATIONS

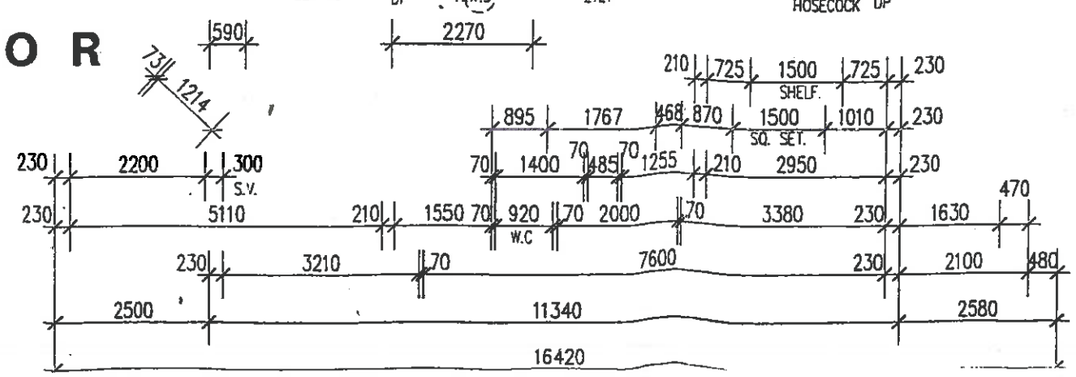




LOWER FLOOR PLAN

AREA: –

LIVING (LOWER): –	131.84m²
LIVING (UPPER): –	131.84m²
GARAGE: –	37.55m²
PORTICO: –	5.52m²
PATIO: –	24.00m²
TOTAL AREA: –	330.75m²
PER LENGTH (LOWER): –	59.72m
PER LENGTH (UPPER): –	49.34m
ROOF AREA (LOWER): –	69.27m²
PER LENGTH: –	32.97m



ANTIGUA 307 MSP

LEGEND

F.R.C	FIBRE REINFORCED CEMENT
REF	FRIDGE PROVISION
W.O.	WALL OVEN TOWER
D.W	DISHWASHER PROVISION
B.BAR	BREAKFAST BAR
W.M.	WASHING MACHINE PROVISION
SHR.	SHOWER
M.H.	600 x 600 MAN HOLE
D.P.	DOWNPIPE
HWD	HARDWOOD TIMBER
OBS	OBSCURE GLASS
F/G	FIXED GLASS TO ALL PANELS
D/H	DOUBLE HUNG WINDOW
BAY	BAY WINDOW
SL	GLASS SIDELIGHT PANEL
S/D	GLASS SLIDING DOOR (EXTERNAL)
XO	SLIDING PANEL/ FIXED PANEL
M/F	POWDER COATED ALUM. FLASHING
PV	PERMANENT VENT PANEL TO WINDOW
FED	FEDERATION BARS TO WINDOWS
COL	COLONIAL BARS TO WINDOWS
V.S.D	VINYL FACED SLIDING ROBE DOORS
M.S.D	MIRROR SLIDING ROBE DOORS
F.S.D.	FACE OF WALL SLIDING DOOR (PELMET)
C.S.D.	INTERNAL CAVITY SLIDING DOOR
SO SET	300D SQUARE SET P'BOARD BULKHEAD
820	SIZE OF TIMBER DOOR (WIDTH)
21–18	SIZE OF WINDOW (2100H x 1800W)
P.C.J.	PLASTERBOARD CEILING CONTROL JOINT
⊙	LOCATION OF SMOKE ALARM. (TO COMPLY WITH B.C.A CLASS 1 & 10 PART 3.7–2 & WITH A.S 3786.

NOTES

WRITTEN DIMENSIONS WILL TAKE PRECEDENCE OVER SCALE.
ALL INTERNAL DIMENSIONS STATED ARE FRAME SIZE – EXCLUDING LININGS.
ALL WINDOWS TO BE SLIDING U.N.O.
4/450mm WIDE WHITE MELAMINE SHELVES TO PANTRY.
4/530mm WIDE PAINTED PYNEBOARD SHELVES TO LINEN CUPBOARD.
R2.5 INSULATION TO ENTIRE CEILING AREA (EXCLUDING GARAGE AND PORTICO).
RHINOWRAP SARKING TO ALL EXTERNAL WALLS (INCLUDING GARAGE.)
PROVIDE LP BOTTLED GAS PIPEWORK AND CONNECTION TO HOT WATER UNIT.

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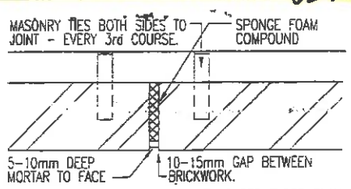
PROPRIETOR SIGNATURE PROPRIETOR SIGNATURE

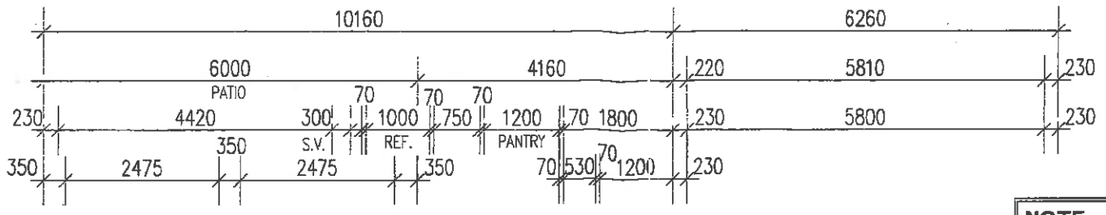
CLIENTS
J. & G. VELDINK
LOT 48 CASSIM PLACE
REDLAND BAY

CHECKED
TENDER LETTER
26 MAY 2003
DRAWING: FLOOR PLAN LAYOUT
REFERENCE No.: J7847
SCALE: 1:100
DATE: 20/05/03 (CP)
DRAWN: SCA
SHEET 1 OF 15

-> Final changes with clouded area from Coral Homes.

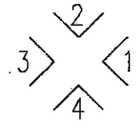


MASONARY ARTICULATION JOINT DETAIL.

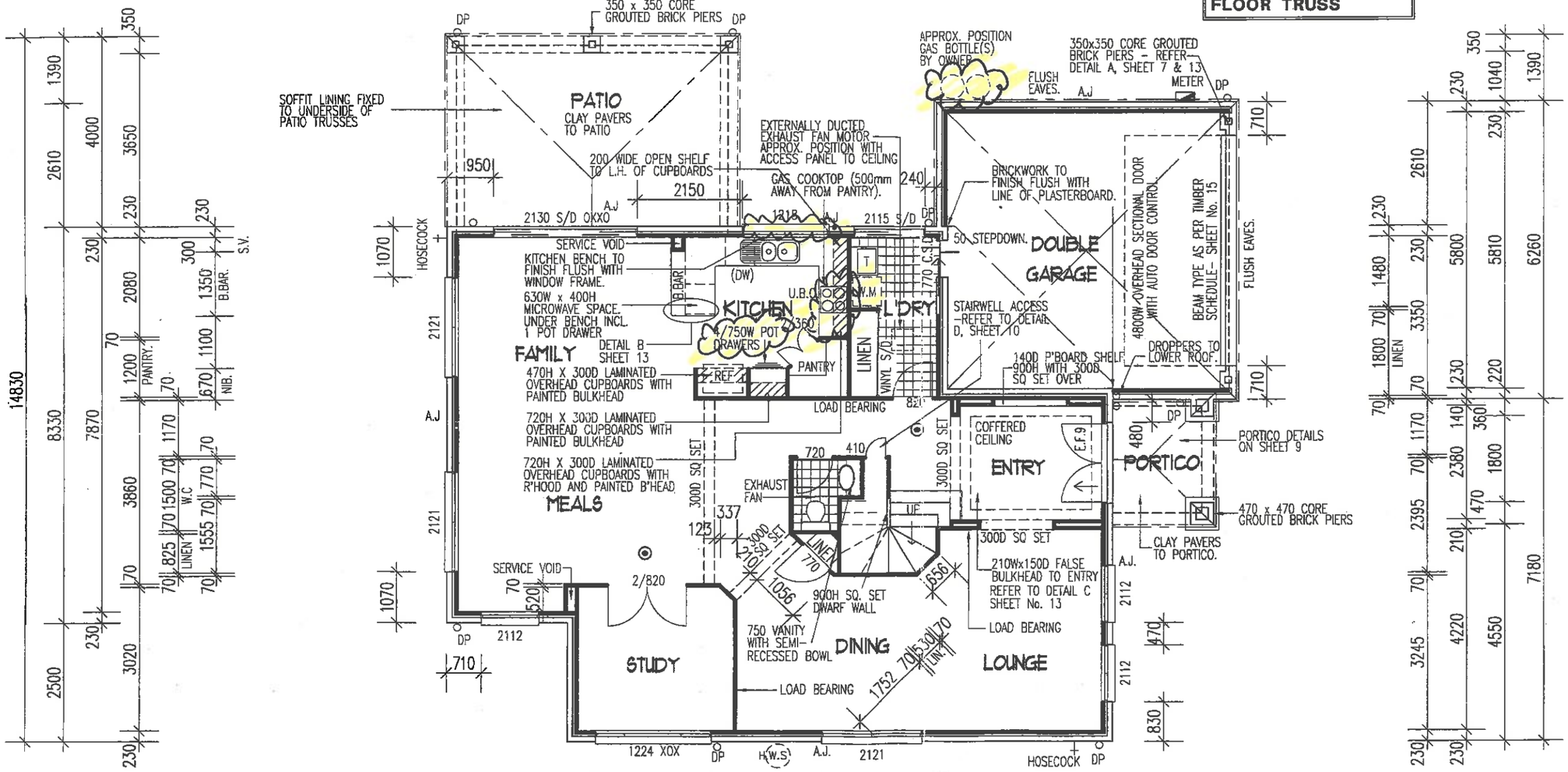


NOTE:
STUDS DIRECTLY (+OR- 100mm) UNDER FLOOR TRUSS

N2.



ELEVATIONS



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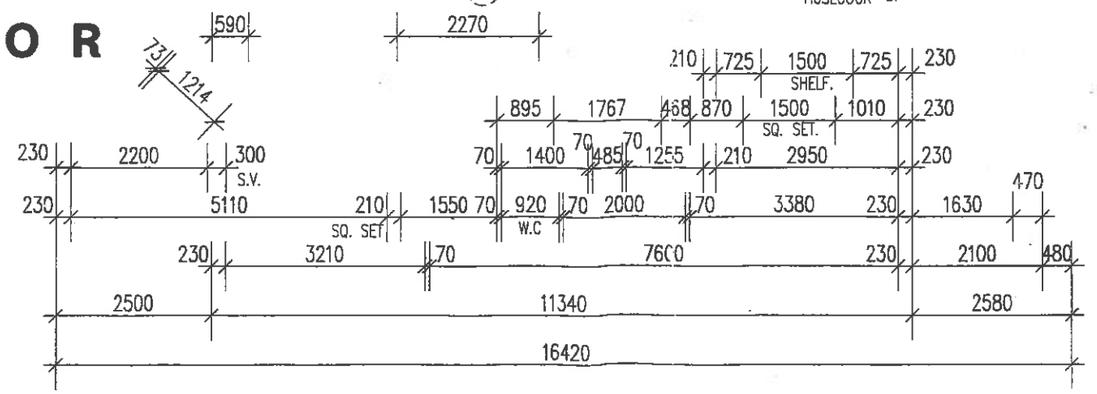
CLASSIC



ANTIGUA 307 MSP

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PROVIDE LP BOTTLED GAS PIPEWORK AND CONNECTION TO HOT WATER UNIT.
OWNER TO SUPPLY AND INSTALL KITCHEN SPLASHBACK TILES.

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PROPRIETOR SIGNATURE PROPRIETOR SIGNATURE

BUILDERS SIGNATURE

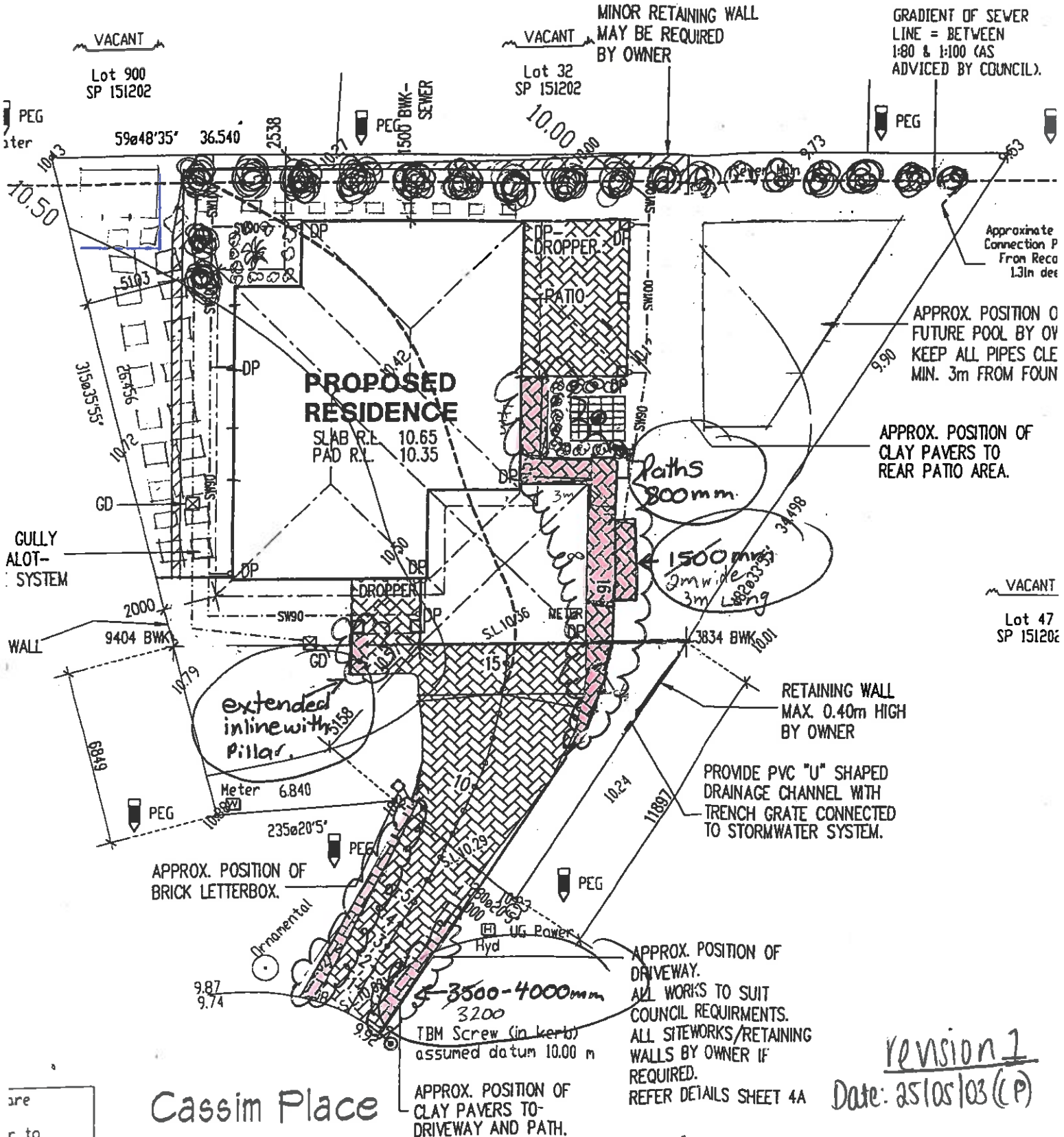
THESE PLANS REMAIN COPYRIGHT OF THE CORAL HOMES GROUP

CLIENTS
J. & G. VELDINK
LOT 48 CASSIM PLACE
REDLAND BAY

CHECKED TENDER LETTER

DRAWING: FLOOR PLAN LAYOUT
REFERENCE No.: J7847
SCALE: 1:100 DATE: 20/05/03 (CP)
DRAWN: SCA 22/07/03 (V.2)
12/08/03 (FPR)
SHEET 1 OF 15

changes from client and final clouded area from coral homes



Cassim Place

revision 1
Date: 25/05/03 (CP)

L A N

1/9/2003

Interpret Specifications

To: Coral Homes
Subject: New Home – 7 Cassim Place, Redland Bay
From: tessveldink@coralhomes.com.au

Hi team,

The new home at 7 Cassim Place is nearly ready to start construction. The client has come back with changes to the drawings and I've just received the revision tender document signed.

I thought it's a great time to have a meeting and sit down together to try and interpret the specifications for the project.

Attached is a copy of the signed revised new home tender and signed modification for the house – can everyone please revise and bring a copy to the meeting.

Proposed meeting:
Wednesday 15th April at 10am
Run time: 10am – 12pm

I will take meeting minutes and send the final copy through.

Thanks,

Tess Veldink
Contract Administrator

To: Coral Homes
Subject: New Home – 7 Cassim Place, Redland Bay
From: tessveldink@coralhomes.com.au

Hi Everyone,

Here are the final meeting minutes – please let me know if you have any issues.

CONFIDENTIAL
MEETING MINUTES
NEW HOME – 7 CASSIM PLACE
PROJECT 20023

Provisional Sum and Prime Costs
Prime costs are the amount of money included in a contract sum to purchase a specified item such as tiles, flooring and bathroom fittings. The agreed estimated amount is in the contract sum, which the clients (The Veldink's) have already agreed upon and signed. However, the particular item hasn't been selected yet, the estimate is made from a reasonable cost. If the client is to change the fittings, we will need to complete a variation with the change of the material along with difference in labour. Please remember to complete these ASAP, so the client can approve this.

Provisional Sums are the amount of money included in a contract sum to cover works and/or materials that aren't detailed when entering the contract. Typically, its Coral Homes duty to ensure these costs are limited by taking reasonable steps in the construction process, however these costs can also be unforeseen. Meaning the provisional sum could be exceeded which is adding to our contract sum. Looking at old projects Coral Homes usually allows $50k for provisional work this is the amount in the contract.

Customer Variations

The project specifications outlined in the tender and modification documents set out the minimum standards and codes required for all structural components and also include additional costs details on all the building aspects.

Remember plans, contracts, permits and other trade documents go hand in hand with the project specifications. It's important that Coral Homes Project Managers/ Supervisors are on top of any updates with our customer variations and identify the changes that need to be made in the specifications.

Project Manager and Supervisors are to ensure there are no disputes with the client or other trades. It's our responsibility to put variations in writing to the client as early as possible through email and to check our variation portal for variation from the other trades. Changes to any works, terms, including costs must be dated and signed by both parties. Ensure to submit an extension of time form as early as possible as the extension might cause delays for the overall project and or increase scope of works. Variation payments should be made in accordance with the time stated in the variation document.

Estimation, planning and supervisory tasks

The Coral Homes estimating team have provided the project team with a budget for the project. This is so that we can work to accurate figures and make correct pricing decisions. The essential estimates that are considered in our budgets are materials, labour costs, off-site overheads and business running costs.

Coral Homes estimators start by quantifying the project documentation by performing takes and counts of the drawings. Once all the drawings are quantified, they then sourced material costs for all of the items/equipment. Then the labour rates are applied to each of the items – the labour rates include site workers and supervision. Both materials and labour costs will have a margin, which is then Coral Home's profit.

An example is below:

Item	Quantities	Material Price (w/margin)	Labour (w/margin)
Tiles	1 pallet	$1000 per pallet	2 hr hour to install @ $60 per hour

= $1120.00 to install the kitchen and lounge tiles

This process is completed for all items for the project and totalled together for the final budget for the client (including a margin figure).

We then give all the required trades an opportunity to quote the project. Once we have all the submissions, we then choose the best companies for the project based on, final quote amount, references, past projects work and companies' status. The final figure to build the house is then presented to the client.

Building Codes and Standards

Please ensure the construction of this house is following the National Construction codes (volume one – class 2 - 9 building), the Australian Standards and the HIA building agreement as stated in the new home tender document.

Key Features in specifications – design, purpose, aesthetics and cost relationship

Ensure to lock down and understand key features in the specifications such as the design, purpose, aesthetics and cost relationships. These features are important in the early stages of construction so the building process is run smoothly. These features are in the new tender document and the modification document approved by the client

For this particular project the design and aesthetics features will be highlighted in the project documents and discussed in project meeting with the clients and other trades. The purpose of the project is to build a new home for our client with the highest of standards while making cost effective decisions in budget.

Coral Homes
"Built On Trust"

New Home Tender for:	**Jeffrey Veldink and Gabrielle Veldink**
Job No:	**J7847**
Reference No:	**TL7847.3**
Dated:	**26-May-03**

BLE:AGI:DBO

NEW HOME TENDER

PREPARED FOR:

OWNER: Jeffrey Veldink and Gabrielle Veldink
at
SITE ADDRESS: Lot 48 Cassim Place, Redland Bay

LOCAL AUTHORITY: Redland Shire Council

House Design: **Modified Antigua 307**

Basic House Price (Modified Standard Plan dated 20-Mar-03) based on the Coral Homes Designer range of inclusions. **$146,177.00**

Provide Coral Homes "Value Pack" range of Classic inclusions. **$1,980.00**

Please Note: All prices quoted are inclusive of GST.

SITE WORKS

The following **FIXED PRICE** Site Costs have been prepared to suit Coral Homes site plan dated 31-Mar-03. They are in addition to the Basic House Price.

HOUSE PAD (CUT/FILL AREA)

Provide equal excavation and filling works to produce a level house pad (cut/fill area) to **RL 10.35** with a maximum crossfall over the house area of **0.79m**.
Size of the house pad (cut/fill area) as indicated on the site plan (approximately 2000mm larger than the concrete floor slab dimensions).
Price for excavation and filling works - ***includes*** - rock excavation as required.
Please Note: Rock excavation mentioned above relates to house pad excavation and filling works only.
Please Note: House pad level (RL) is approximate only and may vary subject to site conditions.
Please Note: Excess excavated material to be spread over the site by the Builder. Should the quantity of excess excavated material exceed the amount required for spreading over site, the remainder of material will be stockpiled on site for disposal by Owner (this material may be used on garden beds etc.). **$924.00**

RETAINING WALLS

Owner to provide retaining walls as required.

Please refer to the notes **"Owner Constructed Retaining Walls (Cut Side)"** and **"Owner Constructed Retaining Walls (Fill Side)"** (at the rear of this Tender). **BY OWNER**

SITE CLASSIFICATION

Provide Monolithic style concrete slab and screw-in piering system to engineer's design recommendations for a type **"M"** site classification. **$3,524.00**

Client Initials _____ Client Initials _____

POWER SERVICE

Provide single-phase underground power service connection including trenching from power box to meter box positioned on external wall.
Position of Meter Box: Front right hand side of garage (as viewed from the road).
Position of Power Box: Front right hand side of boundary (as viewed from the road). **INCLUDED**

SEWERAGE SERVICE

As home is to be built near a sewer line, Coral Homes have allowed for additional piering costs to below the "Zone of Influence" in accordance with standard building practice. If the Local Authority requires any additional items due to the sewer location, then these costs will be charged to the Owner by way of variation to contract. **$452.00**

STORMWATER SERVICE

Provide connection of stormwater service to inter-allotment drainage.
Please refer to the note **"Stormwater Dispersal"** (at the rear of this Tender). **INCLUDED**

WATER SUPPLY

Provide connection of water service to reticulated main. **INCLUDED**

WIND SPEED CLASSIFICATION

Provide **N2** (W33N) wind rating as indicated on engineer's site investigation.
Please refer to the note **"Wind Speed Classification"** (at the rear of this Tender) in relation to wind speed included in this Tender. **INCLUDED**

DESIGN MODIFICATIONS

The Following Design Modifications have been made to the Modified Antigua 307 house design:

Provide a Classic Façade. **INCLUDED**

STRUCTURAL MODIFICATIONS

Provide a 6000mm x 4000mm patio under main roof to right hand side elevation of family room, including three (3) brick piers and painted fibre cement ceiling fixed to underside of trusses and painted Hardiflex panels above external openings.
Please Note: Price does NOT include concrete slab. **INCLUDED**

Delete eaves to the rear elevation of house and provide painted fibre cement infill panels above all window and door openings (if applicable). **$0.00**

EXTERNAL MODIFICATIONS

Provide off-white mortar to brickwork in lieu of standard natural mortar. **$764.00**

Provide bricks selected from Coral Homes "B" range of bricks in lieu of standard range. Bricks to be chosen from colours available at time of colour selection. **$1,610.00**

Provide Hume "Vaucluse Premier XVP10" hinged external double doors to front entry in lieu of standard double doors (includes paint finish doors, one (1) set of Builder's standard external door furniture and two (2) weather seals). **$314.00**

Client Initials _____ Client Initials _____

Delete existing external hinged door to rear of garage.	**CR -$184.00**
Provide a 21-21 window to rear elevation of family room in lieu of brickwork.	**$136.00**
Reposition existing 21-30 sliding door to family room to centre of external wall.	**$0.00**
Provide a 10-18 window to kitchen in lieu of existing 10-06 window.	**$28.00**
Delete existing 12-15 window to study and provide brickwork wall.	**CR -$116.00**
Provide a 09-24 window to bedroom 1 in lieu of existing 06-24 window.	**CR -$33.00**
Provide a 15-09 window to ensuite in lieu of existing 10-09 window.	**CR -$2.00**

INSULATION

Supply and install R2.5 cellulose fibre insulation (100mm thick) to entire ceiling of house (excluding garage and portico).	**$1,150.00**
Supply and install Rhinowrap building grade sarking to all external walls including garage.	**$890.00**

INTERNAL MODIFICATIONS

Provide five (5) banks of three (3) 450mm wide open painted pyneboard shelves – two (2) to walk-in robe and one (1) each to bedrooms 2, 3 and 4 built-in robes. Bank of shelves to walk-in robe to be positioned adjacent mirror faced sliding doors, bank of shelves to bedroom 2 built-in robe to be positioned adjacent TV room and bank of shelves to bedrooms 3 and 4 built-in robes to be positioned adjacent internal hinged doors.	**$575.00**
Provide for internal hinged door to bedrooms 1 and 4 to be hinged on the left hand side in lieu of standard.	**$0.00**
Provide *Chateau / Pacific / Oakfield / Vienna* internal doors in lieu of existing flush panel internal doors. Feature doors to be positioned throughout house (thirteen (13) doors in total).	**$624.00**
Square off first three (3) stair treads only to staircase in lieu of standard.	**$0.00**

WET AREA MODIFICATIONS

Supply and install a 1300mm (nominal) 'Stylus Mirage' corner bath to bathroom in lieu of standard.	**INCLUDED**
Interchange position of ensuite shower enclosure and ensuite WC. **Please Note:** Reposition existing WC adjacent internal wall / shower enclosure. **Please Note:** Exhaust fan to remain in WC.	**$0.00**
Increase length of ensuite shower enclosure by 310mm by decreasing length of WC to ensuite by 310mm to suit. **Please Note:** Increase width of shower enclosure by 20mm to align with full height painted plasterboard wall to WC.	**$122.00**
Provide a 1200mm long x 300mm wide single bowl laminated vanity unit with white Caroma Concorde semi-recessed basin, post formed laminated top, three (3) doors and one (1) bank of drawers to the bathroom in lieu of existing vanity unit. Mirror to be full length of vanity top.	**$565.00**

Client Initials Client Initials

Provide a 1500mm long x 300mm wide double bowl laminated vanity unit with white Caroma Concorde semi-recessed basin, post formed laminated top, three (3) doors and two (2) banks of drawers to the ensuite in lieu of existing vanity unit. Mirror to be full length of vanity top. **$979.00**

Provide two (2) "Posh Solus" chrome single towel rails to ensuite in lieu of standard, one (1) "Posh Solus" chrome double towel rail to bathroom in lieu of standard and three (3) "Posh Solus" chrome toilet roll holders – one (1) to each WC and powder room in lieu of standard. **$124.00**

Provide a 750mm long x 300mm wide single bowl laminated vanity unit with white Caroma Concorde semi-recessed basin, post formed laminated top, one (1) door and one (1) bank of drawers to the powder room in lieu of existing vanity unit. Mirror to be full length of vanity top. **$412.00**

Provide Clark 8011T (45 litre) stainless steel laundry tub in lieu of standard laundry tub. Price includes additional splashback tiling as required **$60.00**

KITCHEN MODIFICATIONS

Reconfigure kitchen as follows:

- Provide additional 750mm of "A" style kitchen bench (600mm wide laminated cabinets against existing full height plasterboard backing wall) to kitchen in lieu of existing wall oven tower and reposition wall oven under cooktop
- Provide 2080mm of 720mm high x 300mm deep laminated overhead cupboards plus painted bulkhead to kitchen in lieu of existing plasterboard rangehood housing. Price includes additional splashback tiling as required
- Provide additional 750mm of 720mm high x 300mm deep laminated overhead cupboards plus painted bulkhead to kitchen. Overhead cupboards to be positioned between pantry and fridge space. Price includes additional splashback tiling as required
- Provide 1000mm of 470mm high x 300mm deep laminated overhead cupboards to fridge space plus painted bulkhead above
- Provide three (3) 750mm wide pot drawers to kitchen in lieu of laminate cabinets. Pot drawers to be positioned between pantry and fridge space
  Please Note: Pot drawers to be of equal height
- Provide a 630mm wide x 400mm high microwave space including one (1) pot drawer below to end of "C" style kitchen bench (600mm wide laminated cabinets with 900mm wide laminated "breakfast bar" bench top and laminate back panel) adjacent passageway
- Provide 450mm wide white melamine shelves to kitchen pantry in lieu of 300mm wide painted pyneboard shelves
- Reposition pantry to adjacent hallway / laundry
- Reposition fridge space adjacent family room. **$2,190.00**

Provide two (2) 2040mm x 360mm laminated doors to the pantry in lieu of existing 720mm wide flush panel hinged door. **$290.00**

APPLIANCES

Provide Blanco BRSS602RSS front recirculating slide-out rangehood in lieu of standard. **$98.00**

Provide Blanco GMRS4400W/X gas cooktop including single power point in lieu of standard electric cooktop. **$60.00**

Provide LP bottled gas pipework and connection to the cooktop.
Please Note: Gas bottles and security deposit is to be organised and paid for by the Owner and the location of gas bottles will be as per the gas company's regulations. **$550.00**

Client Initials Client Initials

ELECTRICAL MODIFICATIONS

Provide an automatic garage door opener with two (2) handsets to garage door. **$592.00**

Supply and install 2 light model fan / light / heater combination units to bathroom and ensuite in lieu of existing light points. **$522.00**

Provide ceiling fan to positions as nominated by Owner (seven (7) ceiling fans in total). **$1,204.00**

Total number of light points = 23

Total number of single power points = 6
(includes 1 for dishwasher space, 1 for fridge space,
1 for microwave space, 1 for rangehood,
1 for gas cooktop and 1 for automatic garage door opener)

Total number of double power points = 17

Total number of TV points = 2

Total number of smoke detectors = 3

Total number of exhaust fans = 3

Total number of 2-way switches = 1

Total number of 2 light model fan / light / heater combination units = 2

Please Note

- Exact location of all electrical fixtures will be finalised with the electrical contractor during your on-site meeting.
- Light points include bayonet fitting only. Installation of Owner's light fittings is additional cost.
- TV antenna not included unless otherwise noted.

CONCRETE PUMP

Provide concrete pump. **INCLUDED**

COUNCIL FEES

Provide additional Council fees including water application fees if applicable to suit Redlands Shire Council. **$420.00**

Please Note: Council fees exclude any fees associated with vehicle crossover application. **NOTE**

Please Note: Council fees exclude any fees associated with driveway construction bond. **NOTE**

ADDITIONAL ON SITE MANAGEMENT REQUIREMENTS

Provide additional on site management requirements which could include but are not limited to the following: equipment hire and / or labour for the placement of building materials, on-site waste management control, Environmental Protection Authority, Workplace, Health and Safety requirements, edge protection or temporary downpipes as deemed necessary and as costed for the site specific requirements. **INCLUDED**

Client Initials Client Initials

ADDITIONAL ITEMS RECOMMENDED BY CORAL HOMES

The following items are not required by the Local Council but are considered good construction practice and are recommended by Coral Homes to reduce ongoing maintenance costs and prolong the life of the home.

Provide two (2) 250mm x 250mm yard gully drains (located as per site plan) to disperse surface water drainage.
Please Note: Gully drains are to be connected to a separate stormwater line to avoid overflow of downpipes during heavy rain, which can cause damage to your home. **$663.00**

SUB TOTAL:	$167,664.00

FINISHING ITEMS

Supply and lay Carpetcall range "B" carpet on Bridgestone Airstep Black Comfort underlay to bedrooms 1, 2, 3 and 4, all robes, upper level hallways, staircase, linen cupboard and TV room. **$3,177.00**

Provide floor tiling (selected from the Builder's range) to entry, lower level hallways, lounge / dining room, meals area, kitchen, family room and study.
Please Note: Plain straight laying pattern only. **$7,231.00**

Provide sliding security screen doors to existing sliding doors to family room and laundry (three (3) sliding doors in total). **$738.00**

Provide flyscreens to existing windows with opening sashes/panels only (twenty one (21) opening sashes/panels in total). **$630.00**

Provide keyed vent locks to twenty one (21) windows in lieu of standard one (1) locking position. **$189.00**

Provide a Gainsborough 850 double cylinder deadlock to garage external door in addition to standard external door furniture (one (1) deadlock in total). **$72.00**

Provide a Gainsborough 850 double cylinder deadlock to double entry doors in addition to standard external door furniture (one (1) deadlock in total). **$88.00**

Provide patio bolts to sliding doors (three (3) doors in total). **$45.00**

EXTERNAL WORKS

Provide 95m² of "Builder's range" PGH clay paver to driveway, path, porch and patio including physical barrier. Pavers to be laid on a "Fibrecrete" reinforced concrete slab. Pavers to be laid on a 90 degree / 45 degree standard Herringbone pattern with a contrasting edge paver. Exact location and shape of external paving to be nominated by Owner when proceeding to contract.
Please Note: Should actual amount of external paving required exceed allowed amount the Owner shall be charged for the additional works via a variation to the contract. **$6,650.00**

Provide PVC 'U' shaped drainage channel with trench and grate to the driveway / garage junction including connection to stormwater drainage. **$362.00**

Provide 350mm x 350mm x 884mm high face brickwork letter box including metal mail insert. Price excludes house numbers. Price includes off white mortar and flush joints to brickwork.
Please Note: Price includes off white mortar and flush joints to brickwork. **$325.00**

Client Initials Client Initials

MISCELLANEOUS

Provide "Value Pack". Including the following:

- Firmapanel sectional overhead garage door
- Built-in wall oven tower with microwave space
- Rangehood in decorative housing
- Three (3) coat interior paint system
- Stainless steel appliances (if selected)
- Sediment control.

INCLUDED

FIXED PRICE TENDER TOTAL:	**$187,171.00**

SPECIFICATION

When proceeding to contract this New Home Tender Letter is to be read in conjunction with Coral Homes Specification SP7847. Any items detailed in this New Home Tender Letter TL7847.3 which alter the items included in the Specification take precedence over the Specification item in all aspects.

SITE WORKS NOTES

ON SITE CONDITIONS

The site costs included in this document are based upon the on site conditions as indicated in the contour survey and soil report. Upon commencement of construction, should the on site conditions have altered from those indicated in the contour survey and soil report the Builder shall reassess the site costs and any increase or decrease in costs shall be borne by the Owner.

VEGETATION

No allowance has been made to remove grass and/or vegetation exceeding 300mm in height, which may be present on site. Upon commencement of construction should clearing of grass and/or vegetation be required all costs associated will be at Owner's expense.

FLOOD LEVEL REQUIREMENTS

No allowance has been made should Local Council require the level of the building platform/floor slab to be raised to meet any minimum floor level requirements. If required, then all associated costs including imported fill, machine hire, survey to determine AHD levels, engineer's slab design fees, Local Council fees, drafting fees and administration fees will be incurred by the Owner.

Most Councils restrict the issuing of information to Builders on minimum floor levels for houses in flood affected areas until a building application has been approved. This greatly affects Coral Homes' ability to foresee any extra costs involved in raising building platform/floor levels to meet Local Council's minimum requirements prior to submission of a building approval, therefore Coral Homes ***CANNOT*** include such costs to raise the minimum floor levels in our fixed price site costs.

SURFACE WATER DRAINAGE

Should Local Council or Coral Homes' engineer require surface water drainage system/s in addition to works already included in the New Home Tender, then all costs including drafting fees, Local Council fees and administration fees will be incurred by the Owner.

All future landscaping work by the Owner is to provide effective drainage in order to prevent water ponding against or near the structure. The ground surrounding the structure should slope away with a minimum fall of 50mm over the first metre. In reactive clay sites, garden beds adjacent to the structure should be avoided.

Client Initials _____ Client Initials _____

EXISTING KERB

Coral Homes takes no responsibility for any damage including cracking that may occur to the existing kerb by any Owner instigated construction. Heavy equipment is used in the building industry and even with extra care, damage to existing improvements can occur. All associated repair costs will be incurred by the Owner if applicable.

WIND SPEED CLASSIFICATION

This tender has been based on construction that is structurally adequate to suit the wind speed classification as advised by Coral Homes' nominated engineer and as stated in the section "Wind Speed Classification" of this tender. Should Local Council determine that a greater wind speed classification is required, all additional costs to upgrade the construction will be incurred by the Owner including drafting fees, Local Council fees and administration fees.

Please Note: Local Councils reserve the right to insist on construction to suit a greater wind speed classification even though Coral Homes' nominated engineer has assessed the site and deemed a lesser wind speed classification.

OWNER CONSTRUCTED RETAINING WALLS (CUT SIDE)

Because retaining walls are required due to site conditions and should any more be requested by Local Council, then all costs to construct the retaining walls will be incurred by the Owner.

The Owner shall be responsible for preparation, submission and receipt of Local Council approval including inspections and all associated fees. Evidence of Council approval must be provided to Coral Homes prior to commencement of construction.

The Owner shall be responsible for all engineering works including design, inspection and certification as required. Council will require this information to provide approval.

The Owner shall be responsible for any Health and Safety issues raised as a result of the construction of retaining walls.

All retaining walls must be constructed **immediately after site excavation**. Delays in the construction of the house caused by Owner constructed retaining walls not being completed and approved by Local Council in a fair and reasonable time frame shall be cause for an extension of time. Owner's nominated contractor must perform works as per instructions and time frames advised by Coral Homes site supervisor.

It is the Owner's responsibility to ensure that the retaining walls are in such a position as to not interfere with Coral Homes house construction. Should the house have to be repositioned due to incorrect retaining wall placement by the Owner, all extra costs incurred will be at the Owner's expense.

OWNER CONSTRUCTED RETAINING WALLS (FILL SIDE)

Because retaining walls are required due to site conditions and should any more be requested by Local Council, then all costs to construct the retaining walls will be incurred by the Owner.

The Owner shall be responsible for preparation, submission and receipt of local Council approval including inspections and all associated fees. Evidence of Council approval must be provided to Coral Homes prior to commencement of construction.

The Owner shall be responsible for all Engineering works including design, inspection and certification as required. Council will require this information to provide approval. A copy of certification must be provided to Builder prior to site works. The Owner's Engineer is to provide details of when "loading against wall" can commence.

The Owner shall be responsible for any Health and Safety issues raised as a result of the construction of retaining walls.

Client Initials _____ Client Initials _____

All retaining walls must be constructed **immediately prior to site works**. Delays in the construction of the house caused by Owner constructed retaining walls not being completed and approved by Local Council in a fair and reasonable time frame shall be cause for an extension of time. Owner's nominated contractor must perform works as per instructions and time frames advised by Coral Homes Site Supervisor.

It is the Owner's responsibility to ensure that the retaining walls are in such a position as to not interfere with Coral Homes house construction. Should the house have to be repositioned due to incorrect retaining wall placement by the Owner, all extra costs incurred will be at the Owner's expense.

TREE REMOVAL BY OWNER

Should tree removal be necessary:

- No allowance has been made to lop, fell or remove trees from the building site. All trees within the building zone (as indicated on site plan) must be removed from site by the Owner prior to the commencement of construction. All costs to remove trees from site are at the Owner's expense.
- Sawing off trees at ground level is NOT a satisfactory manner of removing trees. The entire root system of the trees must be fully removed.
- No allowance has been made for any additional fill which may be required to provide a level house pad where existing trees and roots have been removed. If any additional fill is required, all costs associated with importing and compacting fill will be incurred by the Owner.

BOUNDARY RELAXATION

No allowance has been made for a boundary relaxation if required by Local Council to receive a building approval. Should a boundary relaxation be required the Owner shall be responsible for all associated costs including fees to redraw plans, redesign slab details, resubmit amended plans to Local Council and administration fees.

Coral Homes takes no responsibility for any repercussions caused if Local Council reject the boundary relaxation. Should Local Council reject the boundary relaxation application, then all associated costs will be borne by the Owner.

If Local Council requests an Identification Survey be carried out by a Registered Survey indicating all boundary clearances, then all associated costs will be borne by the Owner.

STORMWATER DISPERSAL

This tender has been based on the stormwater lines running to soakage pit / s or inter-allotment drainage service.

Upon submission of building approval application should Local Council dictate that the stormwater lines must be dispersed to the street kerb and channel then all costs including additional site works, drafting fees and Local Council fees shall be charged to the Owner by way of a variation to the contract.

SITE WORKS NOTES ACCEPTANCE:
We confirm we have read, understand and accept all notes under the heading Site Works Notes

_____ _____
Client's Initials Client's Initials

DESIGN MODIFICATION NOTES

AVAILABLE COLOURS AND FINISHES

All design modification items requiring a colour or finish to be selected shall be selected from the Builder's range of standard colours (at time of colour selection) or supplied as per the colour or finish specified in the item. Selections outside the Builder's standard range may incur additional charges.

CONCRETE SLABS TO PORCH/PATIO/PORTICO/ VERANDAH AREAS

Concrete slabs to porch/patio/portico/verandah areas are NOT included unless otherwise stated.

_____ _____
Client Initials Client Initials

IN-LINE TEMPERING VALVE

Coral Homes supply an in-line tempering valve to the hot water system to regulate temperature of the hot water supply to the entire home. It is possible to have a separate un-tempered hot water supply to the kitchen sink and laundry fixtures. Should this be required, please request a variation from your Sales Consultant.

DESIGN MODIFICATION NOTES ACCEPTANCE:
We confirm we have read, understand and accept all notes under the heading Design Modification Notes

Client's Initials Client's Initials

GENERAL NOTES

SPECIAL NOTE REGARDING RED IMPORTED FIRE ANTS (RIFA)

The Department of Primary Industries (DPI) may nominate your designated property as falling within their currently defined RIFA treatment zone.

Should your property fall within a DPI's nominated treatment zone, Coral Homes is required, under the Plant Protection Regulation Act of 1990, to enter into a management protocol with the DPI.

This protocol places an obligation on Coral Homes to have your property inspected by DPI officers prior to commencing any work.

As the Owner of a block of land within the DPI's treatment zone you need to be aware of your obligations should RIFA be found at any stage on your property. These obligations include but are not limited to:

1. Should any infestation be found on your property prior to or during the construction program, the cost of identification, treatment, eradication and final certification of clearance of the site will be the sole responsibility of the Land Owner.
2. Should a RIFA infestation occur, the Builder reserves the right to seek an extension of time to the building contract (entered into with the Owner) in accordance with any timing delays that the infestation and its subsequent treatment may bring about.
3. Any further queries on your responsibilities, obligations, etc, in regard to RIFA should be directed to the DPI on 13 25 23.

BUILDING COVENANT

It is the Owner's responsibility to ensure that the proposed dwelling complies with the agreement (covenant) signed between the Owner and the vendor (developer). Coral Homes takes NO responsibility if the house design DOES NOT meet covenant and all costs to redesign the house including drafting fees, engineer's slab design fees, Local Council fees and administration fees will be incurred by the Owner. Evidence of covenant approval must be provided to Coral Homes prior to commencement of construction.

SITE IDENTIFICATION

Should the lending authority require a site identification survey, all associated costs will be incurred by the Owner.

ENERGY EFFICIENCY

Certain Local Councils are currently in the process of introducing energy efficiency policies in relation to new building approvals. Differing introduction timetables and individual Council requirements means Coral Homes is unable to assess the impact of each Council's energy efficiency requirements until a building application has been lodged and assessed, therefore no allowance has been made should Local Council require the home to meet energy efficiency requirements. If required, all costs associated with meeting the energy efficiency requirements will be incurred by the Owner.

Client Initials Client Initials

The use of a light colour roof tile and brick will be a condition of any 3.5 star rating issued by the Council or Private Certifier. Should the Owner choose a dark colour roof tile and / or brick, it may result in a reassessment of the energy rating and an increase in the insulation requirements with a subsequent increase in cost to the Owner.

OWNER SUPPLIED ITEMS AND LABOUR

All items being supplied by the Owner must be new and compatible with Coral Homes house construction and include all items, accessories and instructions required for correct installation of the item. Owner **must** supply Coral Homes with full technical information and specifications of items (model number is not sufficient). Any extra costs to fit incompatible items will be charged to the Owner. These items must be delivered to the building site and installed in accordance with instructions from Coral Homes Building Supervisor. Owner must seek approval from the Building Supervisor prior to starting any works. Please be aware that Owner supplied items are not covered under the Builder's all risk insurance or the Builder's guarantee. **These items must be insured by the Owner and any loss or damage is the Owner's responsibility.**

All items supplied by the Owner must be supplied to site in the correct quantities in accordance with the plans and/or Specifications. All quantities for Owner supplied items / materials must be calculated by the Owner. Coral Homes takes no responsibility for over or under-supplied materials by the Owner.

It is the Owner's responsibility to ensure their workers and visitors going to the building site comply with the Workplace Health and Safety Acts applicable in that State or Territory. All labour supplied by the Owner must be co-ordinated through the Building Supervisor.

All contractors (pool builders, retaining wall builders, etc) engaged by the Owner to undertake work on the site during Coral Homes' construction must produce the following documentation to the Coral Homes' Building Supervisor **BEFORE** commencing work:

- Licencing Details
- Safety Induction cards / certificates for all workers on site
- WorkCover Policy Numbers
- Public Liability Insurance Policy Numbers

New regulations for excavations now require a physical barricade to be erected around swimming pools whilst under construction. This barricade must be 1.8 metres high and be a solid structure to prevent any person falling into any partially completed swimming pool. It is the Owner's responsibility to ensure their swimming pool contractor complies with this regulation.

Full details of Owner supplied items must be provided to Coral Homes prior to commencement of construction.

DECORATOR ITEMS NOT INCLUDED – DISPLAY HOME ITEMS "AS DISPLAYED"

Unless included in this Tender Letter the Owner agrees that the following display home items are not included in the price: furniture, light fittings, window furnishings, decorations, security alarm systems, carpet and ceramic tiles except to wet areas, external landscaping, turf, sprinkler systems, fencing, letterbox, clothesline, external concreting or paving (footpaths, driveway, porch, patios and verandahs), raked ceilings (unless this home is a Stradbroke 8 design and the Owner has not deleted it), off-white mortar and other coloured mortars to brickwork, flush or ironed joints to brickwork, air conditioning units, porticos, non-standard facades, pergolas, any main roof pitch greater than 20 degrees, lightly bagged, heavily bagged or textured finishes to brickwork, and non-standard bricks and roof tiles, and any other items nominated as non-standard in each Coral Homes display home.

PRIVATE CERTIFICATION

If proceeding to contract your plans may be submitted to a Private Certifier for approval. For further information please discuss with your Sales Consultant.

Client Initials _____ Client Initials _____

MAINTENANCE PERIOD

Coral Homes offer a 6-month maintenance period from the practical completion date of your home in accordance with the provisions of the HIA Building Agreement.

FIXED PRICE PERIOD:

This is an entirely **FIXED PRICE** Tender which remains current until 9-Jun-03. If the Tender is not accepted and contract signed prior to 9-Jun-03 all prices are subject to review.

Upon signing contract documents prior to the 9-Jun-03 the following actions must take place prior to 21-Jul-03 otherwise the Builder reserves the right to terminate the Building Contract:

- Building Approval is received by Coral Homes
- Plumbing Approval is received by Coral Homes
- Your financial institute (lending authority) has issued an "Authority to Commence Construction" to Coral Homes **OR** You have opened a joint NAB cash account and deposited cleared funds equal to the final progress amount (whichever is applicable)
- You have provided evidence of your capacity to pay the full contract amount
- Your colour selection and all associated variations are received by Coral Homes
- Any other variations including amended plans are received by Coral Homes.

Please Note: Whilst the Builder will endeavour to prepare all paperwork within reasonable timeframes the Builder also takes no responsibility for an inability to prepare such paperwork within the times stated for any reason whatsoever including but not restricted to overwhelming workloads, computer or other technical breakdowns, etc.

GENERAL NOTES ACCEPTANCE:
We confirm we have read, understand and accept all notes under the heading General Notes

Client's Initials _____ Client's Initials _____

THE CORAL HOMES GROUP
Licensed QBSA 50792/1014053 QLD * 62084C NSW

Please indicate acceptance of the Tender and request to prepare contract documents based on this Tender by signing below.

Client's Signature _____

Dated: 26 / 05 / 2003.

Client's Signature _____

26 / 05 / 2003.

Client Initials _____ Client Initials _____

Coral Homes
"Built On Trust"

JOB NUMBER -

ADDITIONAL BATH

	TILE NAME	CODE	SIZE	QTY	$/M2	EXTRA TO STD
FLOOR (INCL SHOWER)						
FLOOR LAYING INSTR						
WALLS (INLC SKIRTING)						
WALL LAYING INSTR						
SOAP HOLDER						
SHOWER HOB TILE TO BE AS PER FLOOR / WALL TILE (please circle selection)						
FRIEZE TILE						
FRIEZE LOCATION						
DÉCOR TILE						
DÉCOR LOCATION						

ADDITIONAL W.C.

	TILE NAME	CODE	SIZE	QTY	$/M2	EXTRA TO STD
FLOOR	MARFIL BONE	FFPB1005	300 x 300	1.65	$31.75	$11.14
FLOOR LAYING INSTR						
SKIRTING + Splashback	POSITANO NOCE 1 Full TILE HIGH	WFCE1095	250 x 330	.9	$33.15	$7.35
SKIRTING LAYING INSTR						
OTHER -						
OTHER LAYING INSTR						

MAIN AREA FLOOR

LOCATION	TILE NAME	CODE	SIZE	QTY	$/M2	EXTRA TO STD
ENTRY, Lounge, Dining Family, Meals, Study	POSITANO BEIGE	FFCE1022	450 x 450	104.26	$32.25	$755.89
		FFCE1024	450 x 450	2.41	$32.25	$17.47
LAYING INSTR Entry	POSITANO BEIGE 1/2 Tile Border, then 1/2 Tile POSITANO NOCE Border. Full Tiles of POSITANO BEIGE inside this Border					
LAYING INSTR						
				TOTAL	EXTRAS	$1157.60
LAYING INSTR						

Signed By Owner(s): [signature]

Date: 1/8/03

30/7/03

Coral Homes
"Built On Trust"

CORAL HOMES CERAMIC TILE SELECTION

FAX 3286 2293

CLIENT - Jeff + GABRIELLE VELDINK HOME PH - 3821 0940 WORK PH - 0411517257 JOB # -

JOB ADDRESS - Lot 48 Cassim Place

TILE SUPPLIER - Amber BRANCH LOCATION - 3355 PACIFIC HIGHWAY SPRINGWOOD

REPRESENTATIVES NAME - STEVE FLINT REPRESENTATIVES CONTACT NUMBER - 3209 1522

MAIN BATHROOM	TILE NAME	CODE	SIZE	QTY	$/M2	EXTRA TO STD
FLOOR (INCL SHOWER)	MARFIL BONE	FFPB1005	300 x 300	4.4	$31.75	$ 29.70
FLOOR LAYING INSTR						
WALLS ~~INSET~~ SKIRTING	CEC POSITANO NOCE - 1 Tile High	WFCE 1095	250 x 330	2.4	$33.15	$ 21.00
WALL ~~LAYING INSTR~~	CEC POSITANO BEIGE	WFCE 1109	250 x 330	9.8	$33.15	$ 79.87
SOAP HOLDER	Alking IVORY	CA B4		1	$33.25	$ 15.25
SHOWER HOB TILE TO BE AS PER (FLOOR) / WALL TILE (please circle selection)						
FRIEZE TILE						
Wall Laying Instr	Tile Height to be 1320 all round except Shower where tiles are to 2.4m					
DÉCOR TILE						
DÉCOR LOCATION						

ENSUITE	TILE NAME	CODE	SIZE	QTY	$/M2	EXTRA TO STD
FLOOR (INCL SHOWER)	MARFIL BONE	FFPB 1005	300 x 300	6.3	$31.75	$42.53
FLOOR LAYING INSTR						
WALLS SKIRTING	CEC POSITANO NOCE - 1 TILE High	WFCE 1095	250 x 330	2.48	$33.15	$20.21
WALL	CEC POSITANO BEIGE	WFCE 1109	250 x 330	6.8	$33.15	$ 55.42
SOAP HOLDER	IVORY SV16	SV16		1	$37.00	$ 19.00
SHOWER HOB TILE TO BE AS PER (FLOOR) / WALL TILE (please circle selection)						
FRIEZE TILE						
Wall Laying Instr.	1 Tile high skirting : Tiles to 2.4m in shower.					
FOOT REST	FOOT REST IVORY (in shower)	FR B4		1	$20.90	$20.90
DÉCOR LOCATION						

W.C	TILE NAME	CODE	SIZE	QTY	$/M2	EXTRA TO STD
FLOOR	MARFIL BONE	FFPB 1005	300 x 300	1.35	$31.75	$9.11
FLOOR LAYING INSTR						
SKIRTING	CEC POSITANO NOCE	WFCE1095	250 x 333	.6	$33.15	$4.89
SKIRTING LAYING INSTR	1 x Full Tile High					
OTHER -						
OTHER LAYING INSTR						

Signed By Owner(s): [signature] Date : 1/8/03

30 Jul 03 05:11p Amber Springwood 07 32095210 p.2

Coral Homes

"Built On Trust"

KITCHEN	TILE NAME	CODE	SIZE	QTY	$/M2	EXTRA TO STD
SPLASHBACK						
LAYING INSTR						
FRIEZE TILE						
FRIEZE LOCATION						
DÉCOR TILE						
DÉCOR LOCATION						

LAUNDRY	TILE NAME	CODE	SIZE	QTY	$/M2	EXTRA TO STD
FLOOR	MARFIL BONE	FFPB 1005	300 x 300	4.92	$31.75	$33.21
FLOOR LAYING INSTR						
WALLS (INCL SKIRTING)	POSITANO NOCE 1 TILE HIGH	WFCE 1095	250 x 330	1.38	$33.15	$14.67
WALL LAYING INSTR						
FRIEZE TILE						
FRIEZE LOCATION						
DÉCOR TILE						
DÉCOR LOCATION						

CERAMIC TILE SELECTION NOTES -

Signed By Owner(s): [signature]

Date : 1/8/03

30 Jul 03 05:11p Amber Springwood