



**CHIEF EXECUTIVE OFFICER ATTACHMENTS  
ORDINARY MEETING OF COUNCIL  
WEDNESDAY 18 MAY 2022**

REPORT NUMBER	REPORT TITLE AND ATTACHMENT DESCRIPTION	PAGE NUMBER(S)
CEO01 – 05/22	<p><b>Amendment to Shire of Chittering Policy 1.18 Recording and Access to Recordings of Council Meetings</b></p> <p><b>Attachments</b></p> <ol style="list-style-type: none"> <li>1. DRAFT Policy 1.18 Recording, Elected Member Voting and Access to Recordings of Council Meetings</li> </ol>	1 – 2
CEO02 – 05/22	<p><b>Housing Options Investigation Report</b></p> <p><b>Attachments</b></p> <ol style="list-style-type: none"> <li>1. Housing Options Investigation Report</li> </ol>	3 – 8
CEO03 – 05/22	<p><b>Request for Architectural Services Tender – Muchea Recreation Centre</b></p> <p><b>Attachments</b></p> <ol style="list-style-type: none"> <li>1. Council Resolution 140222</li> <li>2. Request for Tender Muchea Recreation Centre</li> <li>3. General Conditions of Contract - annexure draft 220511</li> <li>4. Specification for the Construction of Muchea Recreation Centre</li> </ol>	9 – 601
CEO04 – 05/22	<p><b>Ceasing of Muchea Recreation Centre Reference Group</b></p> <p><b>Attachments</b></p> <ol style="list-style-type: none"> <li>1. Council Resolution 140222</li> </ol>	602 – 684

## 1.18 Recording, Elected Member Voting and Access to Recordings of Council Meetings

Policy Owner:	Governance
Person Responsible:	Executive Assistant
Date of Approval:	20 November 2019
Amended:	18 May 2022
Review Frequency:	Annually
Next Review:	November 2020

### Objective

To ensure that there is a process in place to outline access to the recorded proceedings of Council including Elected Member voting on Council Resolutions. To emphasise that the reason for the recording of Council Meetings and Elected Member voting is to ensure the accuracy of Council Minutes and transparency on how elected members are voting to represent the community's interest and that any reproduction is for the sole purpose of Council business.

### Statement

#### Recording of Proceedings

1. Proceedings for meetings of the Council, Electors, and Public Question Time during Council meetings shall be recorded by the Shire on sound recording equipment, except in the case of meetings of the Council where the Council closes the meeting to the public.
2. Notwithstanding clause 1, proceedings of a meeting of the Council which is closed to the public shall be recorded where the Council resolves to do so.
3. No member of the public is to use any electronic, visual or vocal recording device or instrument to record the proceedings of the Council or a committee without approval as per Local Government (Council Meetings) Local Law 2014, c6.15.
- 3.4. A table of Elected Member Voting to be published following every Ordinary or Special Council Meeting in the Northern Valley News and on the Shire website and Facebook page.

#### Access to Recordings

- 4.5. The record of proceedings from the Agenda Forum is to be circulated to Council before the issuance of the Ordinary Council Meeting Agenda to the public.
- 5.6. The record of proceedings of Council and Electors meetings is to be loaded on to the Shire's website once the minutes have been made available.

#### Retention of Recordings

- 6.7. Recordings pertaining to the proceedings of Council Meetings shall be retained in accordance with the State Records Act 2000.

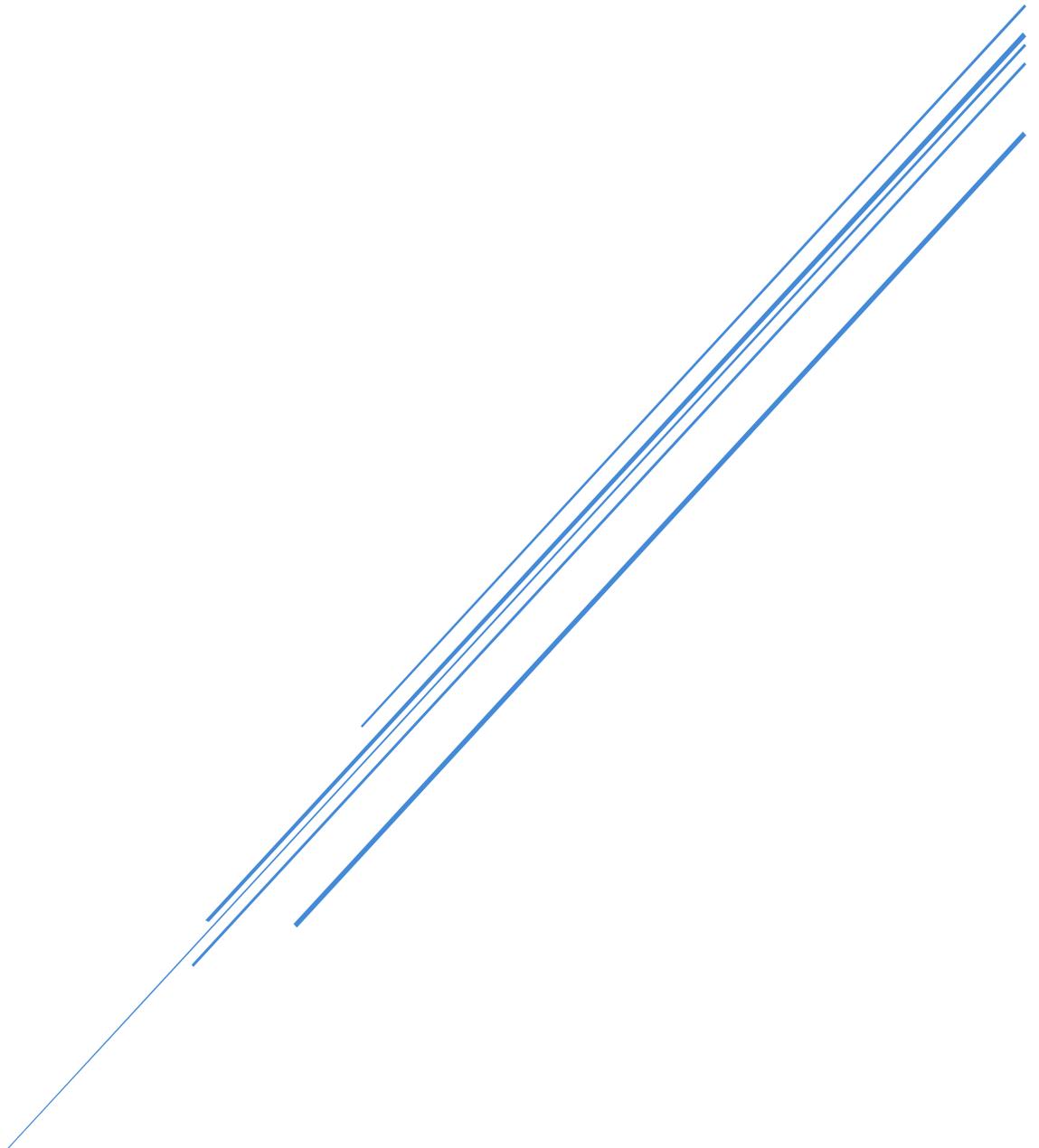
**Disclosure of Policy**

- ~~7.8.~~ An excerpt of this Policy shall be printed within the agenda of all Council, Special Council, Electors and Special Electors meetings to advise the public that the proceedings of the meeting are recorded.
- ~~8.9.~~ Signage and a verbal notice via the Presiding Member shall be provided to ensure that attendees to Council meetings are aware of the recording practice of Council.

**Responsibility of Implementation**

Office of the Chief Executive Officer

# HOUSING OPTIONS INVESTIGATION REPORT



Shire of Chittering

## Background

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The Shire of Chittering currently owns 18 houses over three lots. The houses are allocated as four (4) staff houses, six (6) community houses and eight (8) seniors houses. The four staff houses are owned wholly by the shire, while the shire owns an equity percentage of the community and seniors housing as part of the 'Joint Venture' arrangement with the Department of Communities.

For the shire, the total equity of all houses is estimated to be between \$2,549,532 and \$ 2,775,760.

## Staff Housing

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The shire owns four staff houses on one lot of land at 6194 Great Northern Highway. They are all 4 bedroom, 2 bathroom homes that are well maintained. A recent appraisal gave an indicative price of \$410,000-450,000 per house, giving a total value of \$1,640,000-1,800,000.

As the houses are on one lot, they would need to be strata-titled before being sold.



## Joint Venture Housing

The 14 Joint Venture units are located on two land parcels. One of the land parcels includes Edmonds Place, the Bindoon Fire Brigade and Chittering Incident Control Unit station, the shire depot and the Aerobic Treatment Unit for the joint-venture units located on the neighbouring lot.



The units range in size from one through to three-bedroom units. A recent appraisal gave the following indicative prices for the units:

Valuation	Low	High
1x1	\$140,000	\$140,000
2x1	\$240,000	\$260,000
3x1	\$280,000	\$300,000

The units were constructed as part of a Joint Venture Agreement with the Department of Communities. For each agreement, the Department of Communities supplied the majority of the equity for the construction, with the shire being responsible for the maintenance and operation of the units. The operation of the units must be in line with the Department of Communities Guidelines. There were three agreements made with each agreement having a different equity arrangement. The below shows an estimate of the shire's equity.

Unit Size	Number		Low Value	High Value	Equity	Low Portion	High Portion
<b>Agreement 1: Trust Deed</b>							
1 bedroom	0		\$0	\$0	25%	\$0	\$0
2 bedroom	2		\$480,000	\$520,000	25%	\$120,000	\$130,000
3 bedroom	1		\$280,000	\$300,000	25%	\$70,000	\$75,000
<b>Agreement 2: 1997 for 25 years</b>							
1 bedroom	2		\$280,000	\$280,000	33.57%	\$93,996	\$93,996
2 bedroom	2		\$480,000	\$520,000	33.57%	\$161,136	\$174,564
3 bedroom	0		\$0	\$0	33.57%	\$0	\$0
<b>Agreement 3: 2001 for 25 years</b>							
1 bedroom	0		\$0	\$0	27%	\$0	\$0
2 bedroom	6		\$1,440,000	\$1,560,000	27%	\$388,800	\$421,200
3 bedroom	1		\$280,000	\$300,000	27%	\$75,600	\$81,000
<b>Totals</b>	<b>14</b>		<b>\$ 3,240,000</b>	<b>\$ 3,480,000</b>		<b>\$ 909,532</b>	<b>\$ 975,760</b>

## New House and Land Construction

According to Development WA, the indicative cost of developing land in Western Australia is from \$100,000 to \$140,000. The shire has previously developed costings for strata titling land, necessary due to sewerage requirements, and the costs, when applied to a twelve lot development, were similar to these costs.

Figures obtained from several shires indicate that a good price for the construction of an independent living unit was around \$230,000, though these prices were before the recent building price increases.

These figures indicate that it would cost the shire around \$330,000 to \$370,000 to develop the land and construct a unit of reasonable quality. There are potentially other options available, however, these would not meet the accessibility standards of what would be expected of an Independent Living Unit. These figures also do not include the purchase of further land that may be required in the future.

## Option Assessment

When assessing the potential options, the main considerations for Council would be:

1. Does it use the capital or the earnings of the Housing Fund;
2. Does it build units to sell, build land to sell or build units to rent.

This gives six basic outcomes, however, apart from self-imposed rules, there is nothing to preclude Council from utilising a number of these options.

	<b>Build Land &amp; Units for Sale</b>	<b>Build Land Only for Sale</b>	<b>Build Land &amp; Units for Rent</b>
<b>Use Capital from Fund</b>	Option 1: Use Capital to Build Land & Units for Sale	Option 2: Use Capital to Build Land Only for Sale	Option 3: Use Capital to Build Land & Units for Rent
<b>Use Earnings from Fund</b>	Option 4: Use Earnings to Build Land & Units for Sale	Option 5: Use Earnings to Build Land Only for Sale	Option 6: Use Earnings to Build Land & Units for Rent

### Option 1: Use Capital to Build Land & Units for Sale

If the Capital was used for the Construction of Land and Units, it would allow 6-8 units to be built, utilising the average cost of building 12 lots. There would be some additional upfront costs required that may need to either be covered by other means or result in a reduced initial number of units constructed.

It would appear likely that the shire would get enough of a return if sold at market value that the costs would be covered. This would then replenish the fund which could then be used to build and sell more units.

Ideally, enough of a profit from each unit would be made to enable future purchases of land once the current land supply of the shire has ceased.

### Option 2: Use Capital to Build Land Only for Sale

If the Capital was used for the Construction of Land, it would allow 22-24 lots to be built, utilising the average cost of buildings 12 lots. If the initial development takes place on not more than two parcels of land, the average cost should be able to be achieved.

Depending on the area of the shire in which the land is built, it is not certain that if the lots are sold at market value that the development costs would be covered, or if they are then sales may be slow. If the fund is replenished, it may not be with a profit for future land purchases. An investigation conducted by someone with greater expertise would provide better information.

### Option 3: Use Capital to Build Land & Units for Rent

If the Capital was used for the Construction of Land and Units, it would allow 6-8 units to be built, basing the calculation on the average cost of building 12 lots. There would be some additional upfront costs required that may need to either be covered by other means or result in a reduced initial number of units constructed.

A previous investigation indicated that a market rent and low inflation would be required to ensure that the cost of the unit is paid back over the lifetime of the unit. If this proves to be correct, then it would be very limited in the number of units that can be built.

If the replacement expense was ignored and only the operational profit used to build further units, then with a limited initial number of units built, it would still take around a decade to save enough for an additional unit to be built, assuming around six units were initially built.

#### Option 4: Use Earnings to Build Land & Units for Sale

If the Housing Fund were to receive earnings of around 5%, it would equate to around \$138,788 per year. Due to the requirement for the upfront costs of just over \$1 million, it would take around nine years of saving to be able to produce the first unit. Each additional unit would then take around three years of earnings, though in that time the already built unit could be turned over which would increase the number of lots of land being built.

#### Option 5: Use Earnings to Build Land Only for Sale

If the Housing Fund were to receive earnings of around 5%, it would equate to around \$138,788 per year. Due to the requirement for the upfront costs of just over \$1 million, it would take around seven and a half years of saving to be able to produce the first lot of land. The first 12 lots of land would take around ten years to complete.

The advantage of using the earnings and selling the land developed is that the number of units being developed can continue to increase rather than just being turned over. In the first ten years, there would be funding for 12 lots, but over the next ten years, there would be funding for 24 lots.

#### Option 6: Use Earnings to Build Land & Units for Rent

If the Housing Fund were to receive earnings of around 5%, it would equate to around \$138,788 per year. Due to the requirement for the upfront costs of just over \$1 million, it would take around nine years of saving to be able to produce the first unit. Each additional unit would then take around three years of earnings.

If the units were rented and the replacement costs ignored, the profit derived from renting units would assist a reduction in the time required to save up to build units, however, it would still result in only around four units being built in the first 20 years of the program.

## Other Issues

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This paper has only considered the sale of current housing to develop more housing. If Council chooses to proceed further in one of the directions, there would need to be further considerations, especially around the issue of staff housing. Currently, this is incorporated into staff packages so there would need to be an investigation of how this compensation would be replaced and if Council wants to incentivise staff to live in the area, what form the incentives would take.

**CEO04 – 02/22 Muchea Recreation Centre**

<b>Applicant</b>	Shire of Chittering
<b>File ref</b>	GRT.CSRFF.Muchea Hall
<b>Author</b>	Community Development Coordinator
<b>Authorising Officer</b>	Chief Executive Officer
<b>Disclosure of interest</b>	Neither the Author nor Authorising Officer have any Impartiality, Financial or Proximity Interests that requires disclosure
<b>Voting requirements</b>	Simple Majority
<b>Attachments</b>	<ol style="list-style-type: none"> <li>1. Muchea Recreation Centre Staging Plans</li> <li>2. Schematic Design Cost Estimate Report - Muchea Recreation Centre</li> <li>3. Funding tracker</li> <li>4. Muchea Recreation Centre Reference Group Minutes – 25 October 2021</li> <li>5. OCM Minutes unconfirmed 151221</li> </ol>

**SUBSTANTIVE MOTION / COUNCIL RESOLUTION 140222**

Moved Cr Ross, seconded Cr Campbell

That Council instruct the Chief Executive Officer to:

1. Instruct Site Architecture Studio Shine to undertake the detailed design with staging to be as per the amended Staging Plan and prepare the tender documents (e.g. scope of work, specifications and design requirements);
2. Authorise additional funding to appoint an experienced individual or company to work with Site Architecture to run the tender process;
3. Prepare an agenda item for the next Ordinary Council Meeting or at a Special Council Meeting held for the specific purpose, to enable Council to decide upon the technical and commercial bid evaluation assessment criteria and tender conformance criteria;
4. Release a severable portion tender for the Muchea Recreation Centre, where portions may include Stage 1 only; Stage 2 only; Stage 3 only; Stage 4 only; Stages 1 and 2 combined; Stages 1, 2, and 3 combined; Stages 1, 2, 3 and 4 combined;
5. On receipt of tenders, with assistance from Site Architecture Studio Shine and the appointed experienced individual or company;
  - a. undertake technical bid evaluations (TBE) including but not limited to verifying conformance against the project scope of work, specifications and other tender documentation;
  - b. undertake commercial bid evaluations (CBE) including but not limited to verifying tenderer's experience, capability (resources) to complete the work, financial solvency and conformance to the agreed criteria;
  - c. derive normalised total cost for each separable portion;
  - d. prepare a Recommendation for Award (RFA);
6. Workshop the Long Term Financial Plan with Council utilising potential loan repayments; and
7. Prepare an agenda item with the Recommendation for Award (RFA) and include it on the agenda, where practicable and in line with legislative requirements, at the next Ordinary Council Meeting.

**CARRIED UNANIMOUSLY 7 / 0**

TIME: 7.59PM

	<b>Authority / Discretion</b>	<b>Definition</b>
<input type="checkbox"/>	Advocacy	<i>When Council advocates on its own behalf or on behalf of its community to another level of government/body/agency.</i>
<input checked="" type="checkbox"/>	<b>Executive</b>	<b><i>The substantial direction setting and oversight role of Council. e.g. adopting plans and reports, accepting tenders, directing operations, setting and amending budgets.</i></b>
<input type="checkbox"/>	Legislative	<i>When Council initiates or adopts a policy position, or a local law.</i>
<input type="checkbox"/>	Quasi-Judicial	<i>When Council determines an application/matter that directly affects a person's rights and interests. The judicial character arises from the obligation to abide by the principles of natural justice. Examples of Quasi-Judicial authority include development applications, building permits, applications for other permits/licences (e.g. under Health Act, Dog Act or Local Laws) and other decisions that may be appealable to the State Administrative Tribunal.</i>
<input type="checkbox"/>	Information	<i>Includes items for information purposes only and do not require a decision of Council (to 'note' only).</i>

### Executive Summary

Council is requested to instruct the Chief Executive Officer (CEO) to put the Muchea Recreation Centre Project out to tender, with a request for severable portions to the tender to reflect the 3 stages of the project.

### Background

The Muchea Recreation Centre Reference Group resolved at the 25 October 2021 meeting that the Muchea Recreation Centre project would be placed on hold to enable Shire staff to seek direction from Council with regard to the budget of the project, in light of potential funding shortfalls and sharply increasing costs of construction across Western Australia.

It was suggested that Council would need to consider the following three options:

1. Resolve not to proceed with the project;
2. Re-design the project to reduce the scale of the project to reduce the cost to within budget or;
3. Approve a contingency amount to be drawn down on, likely to be in the order of 30% of the total project cost.

The following items were to be updated and submitted to the November Ordinary Council Meeting:

- The Project Manager to provide Council with an up to date total project budget outlining inclusions/exclusions list and cost breakdown of all other materials and services to be provided by the Shire of Chittering as part of the project, any proposed future staging and an up to date funding strategy including clubs contributions and potential staging:
  - Stage 1: Construction of the Muchea Recreation centre
  - Stage 2: Demolition of Muchea Town Hall
  - Stage 3: Upgrade of the Muchea Netball Courts
- Additionally, the Shire Project Manager was to document the contracting strategy including in-kind costs as this will be required for the tendering process.

At this meeting it was acknowledged that any delays will impact on the capacity of Site Architecture Studio to meet agreed timeframes.

Due to the time required to prepare this information, the above items were not available for the November Ordinary Council Meeting and have subsequently been tabled for the February 2021 Ordinary Council Meeting. See attachments 1 – 3.

It was requested that a session for Council be held that would cover the background of the project, progress to date, and a potential path forward. As part of the discussion that was to take place, it was requested of staff to prepare costings of the following three options:

1. Option 1: Retain the current design concept, demolish the existing hall and develop a new layout over the sight of the existing hall.
2. Option 2: Retain the existing club rooms (hall), build the proposed change rooms only, and delay construction of the new club rooms to a later date:
3. Option 3: Proceed to tender based on the designs developed in conjunction with the Muchea Recreation Centre Reference Group.

A Council Workshop for the project was held on Thursday, 2 December 2021. The intention of this session was to brief new Councillors on the background of the project and progression of the project to date and for Council to consider the financial implications of any decisions pertaining to this project.

At the 15 December 2021 Ordinary Council Meeting, Council resolved the following:

*ALTERNATIVE MOTION / COUNCIL RESOLUTION 111221*

*Moved Cr King, seconded Cr Hughes*

*That Council:*

1. *Instruct the CEO to procure professional services to provide detailed cost estimates for each of the three options listed in item 2 below, including all of the assignment exclusions and services proposed to be supplied the Shire, associated infrastructure, services and utilities;*
2. *Confirm the three options to be costed are:*
  - a) *Option 1 – Retain the Muchea Hall, build the proposed new club room over the existing netball court, build the new change room, build a new fourth netball court (in a 2 x 2 configuration) with lighting, refurbish the existing three netball courts with upgraded lighting as required, replace the existing machinery storage shed, then demolish the Muchea hall and redevelop the area;*
  - b) *Option 2 – Demolish the Muchea Hall upfront, retain the current change rooms design and develop a new layout over the site of the existing hall, refurbish the netball court surfaces and upgrade lighting, and replace the existing machinery storage shed*
  - c) *Option 3 - Retain the Muchea Hall and allow for essential refurbishment only, build the new Change Rooms only, decommission the existing change rooms, and refurbish the existing four netball court surfaces and upgrade lighting.*
3. *Instruct the CEO to provide a report on the sources of secured project funding, including the Shire's contribution, community contribution from grants, donations and in-kind sources;*
4. *Authorise the Architects professional services fee to be funded from the undrawn budget allocation for professional services; or if not sufficient, authorises additional allocation from the current budget;*
5. *Instruct the CEO to table a report at the February 2022 Ordinary Council Meeting or at a Special Council Meeting if the information is available earlier.*

*CARRIED BY ABSOLUTE MAJORITY 4 / 3*

*TIME: 7.52pm*

*For: Cr King, Cr Hughes, Cr Dewar, Cr Curtis*

*Against: Cr Ross, Cr Angus, Cr Campbell*

Following this meeting, a Council briefing session was held on 22 December 2021 with Site Architecture Studio to provide more specific direction on the Muchea Recreation Centre Project.

At this meeting Council instructed Site Architecture Studio to draw up the costings for the following staging components, based on what they have already established through hydraulic and electrical consultant reports and the QS measured structural concept.

- Stage 1: Build the new change room, replace the existing machinery storage shed and do all necessary ancillary works to enable future stages, such as ATU systems.
- Stage 2: Build the proposed new club room over the existing netball court, retaining the existing hall until the completion of build.
- Stage3: Build a new fourth netball court (in a 2 x 2 configuration) with lighting, refurbish the remaining netball courts

It is Council's intention to make a determination over whether they do the complete build, what could be staged and/or when.

Each of these stages will include a commentary on what impacts need to be considered for each stage i.e. we would need to move the existing storage shed to accommodate stage one. Stage 2 would necessitate consideration to building entry points and, there would a potential need for temporary facilities for the duration of the build if the existing hall is demolished prior the new clubrooms being completed.

Site Architecture Studio as the appointed Architect for the project, provided the above costings to Council on 27 January 2022.

A subsequent Council workshop was held on 3 February 2022 to review the costings and determine the way forward for the project.

### **Consultation/Communication Implications**

#### Local

The following Muchea Recreation Centre Reference Group Meetings have been held with minutes tabled at Council.

- 22 July 2021
- 17 August 2021
- 30 August 2021
- 13 September 2021
- 28 September 2021
- 25 October 2021

The minutes of the 25 October 2021 Reference Group Meeting have been tabled as attachment 4 to the report.

A project page is available on the Shire Website with all relevant publically available documents uploaded to this page.

#### State

Not applicable

### **Legislative Implications**

#### State

Nil

Local

Nil

**Policy Implications**State

Nil

Local

Nil

**Financial Implications**

Nil – Costs for the preparation of the tender can be met by the allocated budget.

**Strategic Implications**LocalStrategic Community Plan 2017-2027

Focus area: Our community

Objective: S1.1 An active and supportive community

Strategy: S1.1.2 Develop and enhance existing recreation and social facilities for local communities

Objective: S1.2 Strong sense of community

Strategy: S1.2.3 Activate our local centres and towns

Focus area: Our Build Environment

Objective: S3.1 Development of local hubs

Strategy: S3.1.1 Plan for new and enhanced community facilities

Objective: S3.3 Improved infrastructure and amenities

Strategy: S3.3.1 Improved asset management across all asset classes

Focus Area Strong Leadership

Objective: S5.3 Accountable Governance

Strategy: S5.3.1 Good governance which supports efficient and effective service delivery

State

Nil

**Site Inspection**

Not applicable

**Risk Assessment / Implications**

Low – The preparation and release of a tender was included in the scope of the approved project.

**Officer Comment/Details**

Nil

## OFFICER RECOMMENDATION

Moved Cr Ross, seconded Cr Campbell

That Council instruct the Chief Executive Officer to:

1. Instruct Site Architecture Studio Shine to undertake the detailed design with staging to be as per the Staging Plan in Attachment 1 and prepare the tender documents (e.g. scope of work, specifications and design requirements);
2. Authorise additional funding to appoint an experienced individual or company to work with Site Architecture to run the tender process;
3. Prepare an agenda item for the next Ordinary Council Meeting or at a Special Council Meeting held for the specific purpose, to enable Council to decide upon the technical and commercial bid evaluation assessment criteria and tender conformance criteria;
4. Release a severable portion tender for the Muchea Recreation Centre;
5. On receipt of tenders, with assistance from Site Architecture Studio Shine and the appointed experienced individual or company;
  - a. undertake technical bid evaluations (TBE) including but not limited to verifying conformance against the project scope of work, specifications and other tender documentation;
  - b. undertake commercial bid evaluations (CBE) including but not limited to verifying tenderer's experience, capability (resources) to complete the work, financial solvency and conformance to the agreed criteria;
  - c. derive normalised total cost for each separable portion;
  - d. prepare a Recommendation for Award (RFA);
6. Workshop the Long Term Financial Plan with Council utilising potential loan repayments; and
7. Prepare an agenda item with the Recommendation for Award (RFA) and include it on the agenda, where practicable and in line with legislative requirements, at the next Ordinary Council Meeting.

## AMENDMENT

Moved Cr Ross, seconded Cr Angus

That the Officer Recommendation be amended to include at the end of condition 4, "where portions may include Stage 1 only; Stage 2 only; Stage 3 only; Stages 1 and 2 combined; and Stages 1, 2 and 3 combined".

CARRIED UNANIMOUSLY 7 / 0

TIME: 7.39PM

## AMENDMENT

Moved Cr Hughes, seconded Cr Campbell

That the Staging Plan be amended to include:

1. A Stage 4 in the staging plan to include resurfacing of multi courts 2 and 3 and lighting.
2. Include Stage 4 in point 4 of the motion.

CARRIED UNANIMOUSLY 7 / 0

TIME: 7.56PM

## MOTION / COUNCIL RESOLUTION 120222

Moved Cr King, seconded Cr Ross

That Council suspend standing orders at 7.43pm

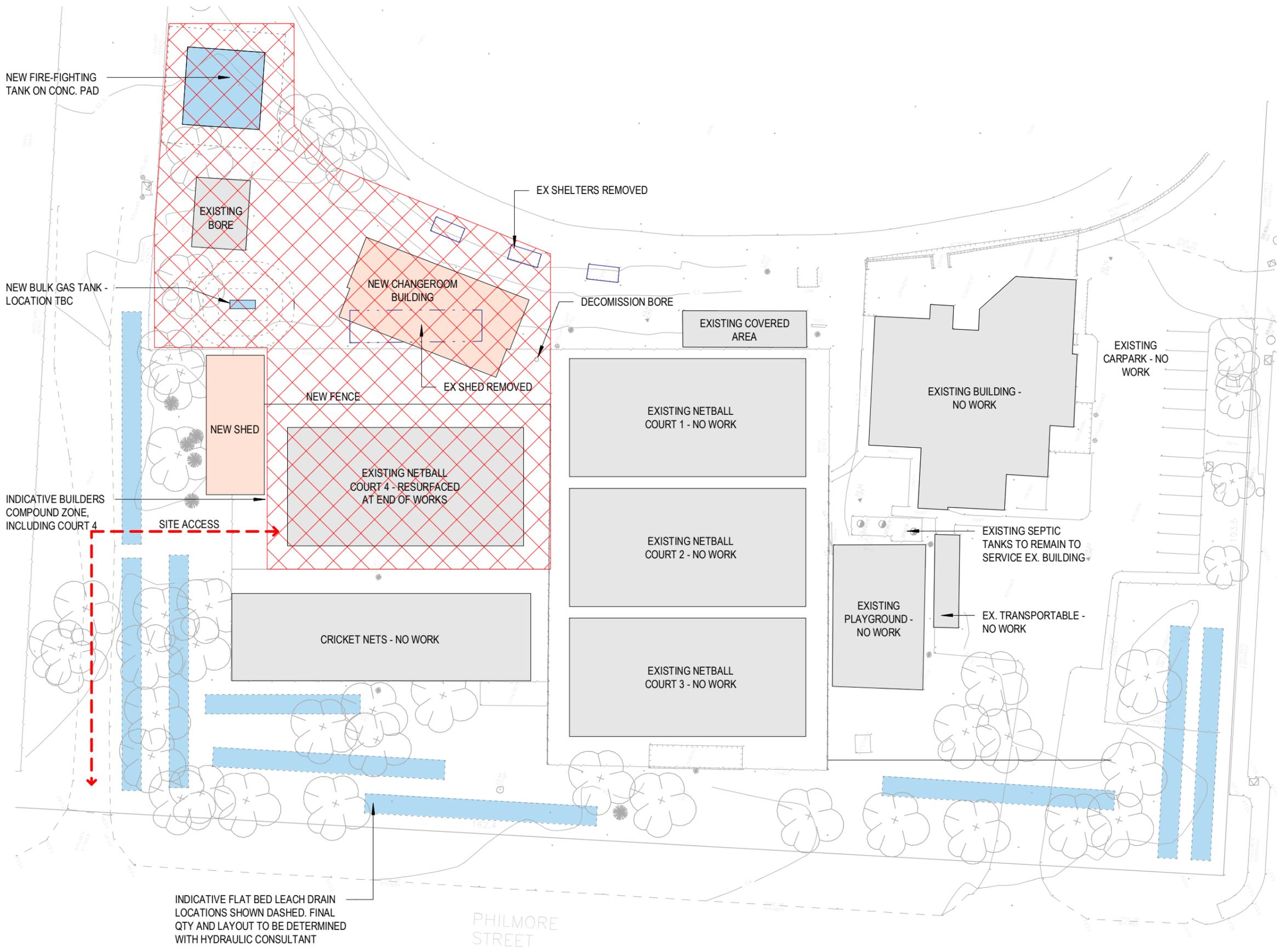
CARRIED UNANIMOUSLY 7 / 0

MOTION / COUNCIL RESOLUTION 130222

Moved Cr King, seconded Cr Ross

That Council resume standing orders at 7.54pm

CARRIED UNANIMOUSLY 7 / 0



**FORWARD WORKS BY SHIRE**

- CONSTRUCT NEW SHED
- DEMOLISH EXISTING SHED
- DEMOLISH EXISTING OVAL SHELTERS

**SITE ACCESS**

- CONTRACTORS SITE COMPOUND TO INCLUDE EX. NETBALL COURT 4
- SITE ACCESS OFF PHILMORE STREET VIA ACCESS ROAD
- EXISTING HALL, CARPARK, PLAYGROUND, 3 X NETBALL COURTS AND CRICKET NETS TO REMAIN ACCESSIBLE TO CLUBS AND PUBLIC
- EXISTING COVERED AREA TO REMAIN

**MAIN BUILDING WORKS**

- CONSTRUCT NEW CHANGEROOM BUILDING, INCLUDING AN INCREASE IN CURRENTLY PROPOSED COVERED AREAS TO FRONT AND SIDE OF BUILDING
- DEMOLISH HARDSTAND AREA ADJACENT TO COURT 4 AND CONSTRUCT NEW FENCE

**SITE SERVICES**

- INSTALL NEW FLAT BED LEACH DRAINS AND ATU SYSTEM.
- NOTE: CURRENT SYSTEM TO REMAIN TO SERVICE EXISTING BUILDING
- INSTALL WATER TANK
- INSTALL BULK GAS TANK
- ELECTRICAL UPGRADES INCLUDING PROVISION FOR FUTURE NETBALL COURT LIGHTING REPLACEMENT

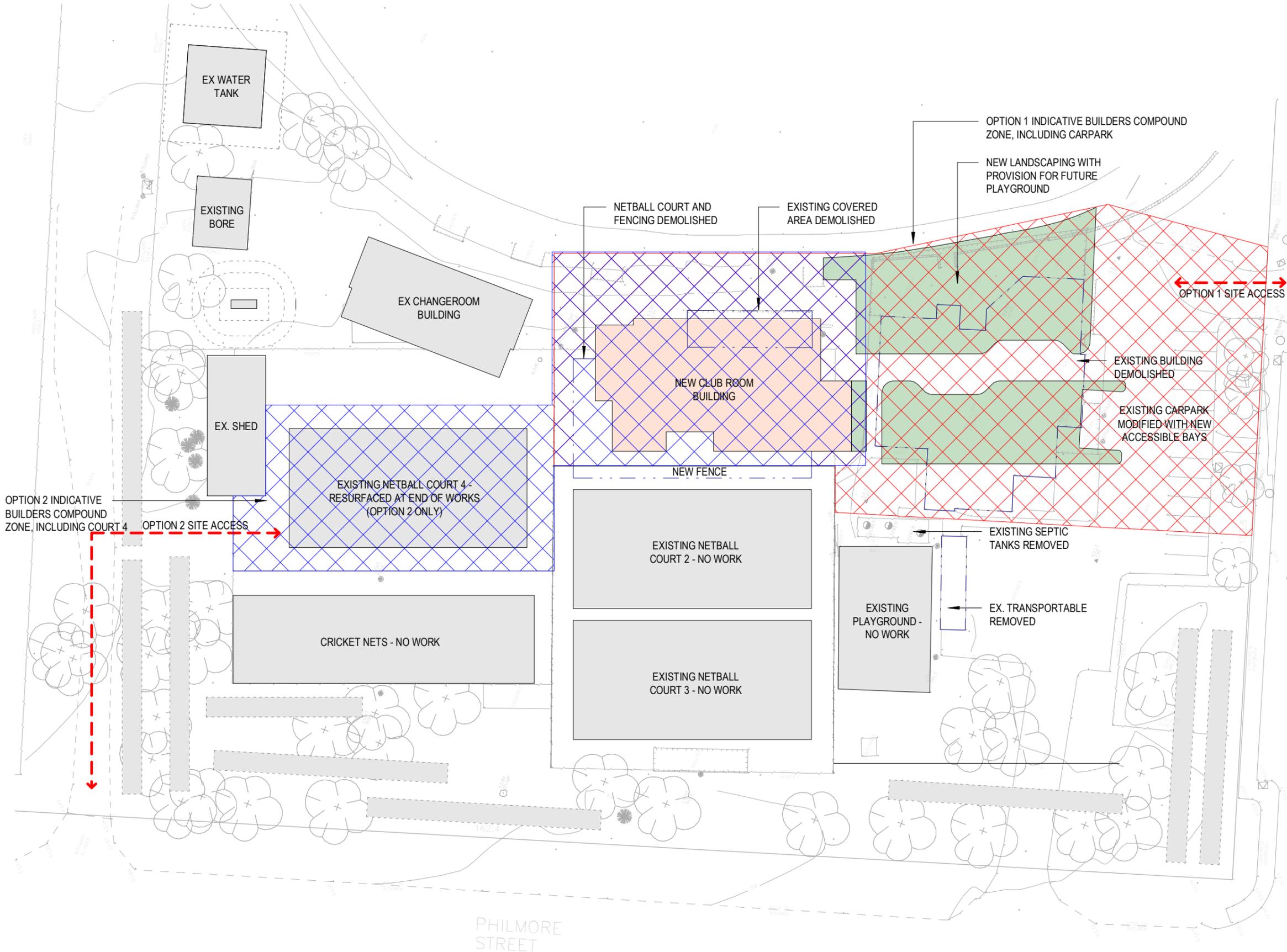
**SITE MAKE GOOD WORKS**

- RESURFACE COURT 4 AT COMPLETION OF WORKS, TO BASIC LEVEL ONLY NOT FULL NETBALL COMPETITION STANDARD
- NOTE: ALSO REFER TO OPTIONAL SCENARIO FOR STAGE 2. RE-SURFACING MAY BE HELD OFF UNTIL END OF STAGE 2

**CONSULTANT SCOPE**

- FULLY DOCUMENT 2 X TENDER PACKAGES (STAGE 1 AND STAGE 2).
- \* **ADDITIONAL CONSULTANT DOCUMENTATION FEES REQUIRED**
- CDC FOR STAGE 1 WORKS ONLY

INDICATIVE FLAT BED LEACH DRAIN LOCATIONS SHOWN DASHED. FINAL QTY AND LAYOUT TO BE DETERMINED WITH HYDRAULIC CONSULTANT



**FORWARD WORKS BY SHIRE**  
 - DEMOLISH EXISTING COVERED AREA  
 - DEMOLISH 1 X NETBALL COURT AND FENCING  
 - NEW NETBALL COURT FENCE  
 - REMOVE TRANSPORTABLE AT END OF STAGE

**SITE ACCESS**  
**OPTION 1:**  
 - SITE ACCESS OFF ARCHIBALD STREET  
 - NEW CHANGEROOM BUILDING, PLAYGROUND, 3 X NETBALL COURTS AND CRICKET NETS TO REMAIN ACCESSIBLE TO CLUBS AND PUBLIC  
 \*NOTE COURT 4 WOULD REQUIRE RESURFACING AT END OF STAGE 1 FOR THIS SCENARIO  
 - NO PUBLIC PARKING AVAILABLE ON SITE  
 - EXISTING BUILDING DEMOLISHED AT START OF WORKS

**OPTION 2:**  
 - CONTRACTORS SITE COMPOUND TO INCLUDE EX. COURT 4  
 - SITE ACCESS OFF PHILMORE STREET VIA ACCESS ROAD  
 - NEW CHANGEROOMS, CARPARK, PLAYGROUND, 2 X NETBALL COURTS AND CRICKET NETS TO REMAIN ACCESSIBLE TO CLUBS AND PUBLIC

**MAIN BUILDING WORKS**  
 - CONSTRUCT NEW CLUBROOM BUILDING AND COVERED VIEWING AREAS  
 - DEMOLISH EXISTING BUILDING. OPTION 1 @ START OF WORKS, OPTION 2 @ END OF WORKS

**SITE SERVICES**  
 - REMOVE EXISTING SEPTIC TANKS

**SITE MAKE GOOD WORKS**  
 - RESURFACE COURT 4 AT COMPLETION OF WORKS - IN OPTION 2 SCENARIO ONLY. OPTION 1 SCENARIO RESURFACING DONE AT END OF STAGE 1

**CONSULTANT SCOPE**  
 - UPDATES TO STAGE 2 DOCUMENTS FOR TENDER  
 - ADDITIONAL CDC AND CCC REQUIRED  
 \* **ADDITIONAL CONSULTANT DOCUMENTATION FEES REQUIRED**

FORWARD WORKS BY SHIRE

- CONSTRUCT NEW PLAYGROUND
- DEMOLISH EXISTING PLAYGROUND

SITE ACCESS

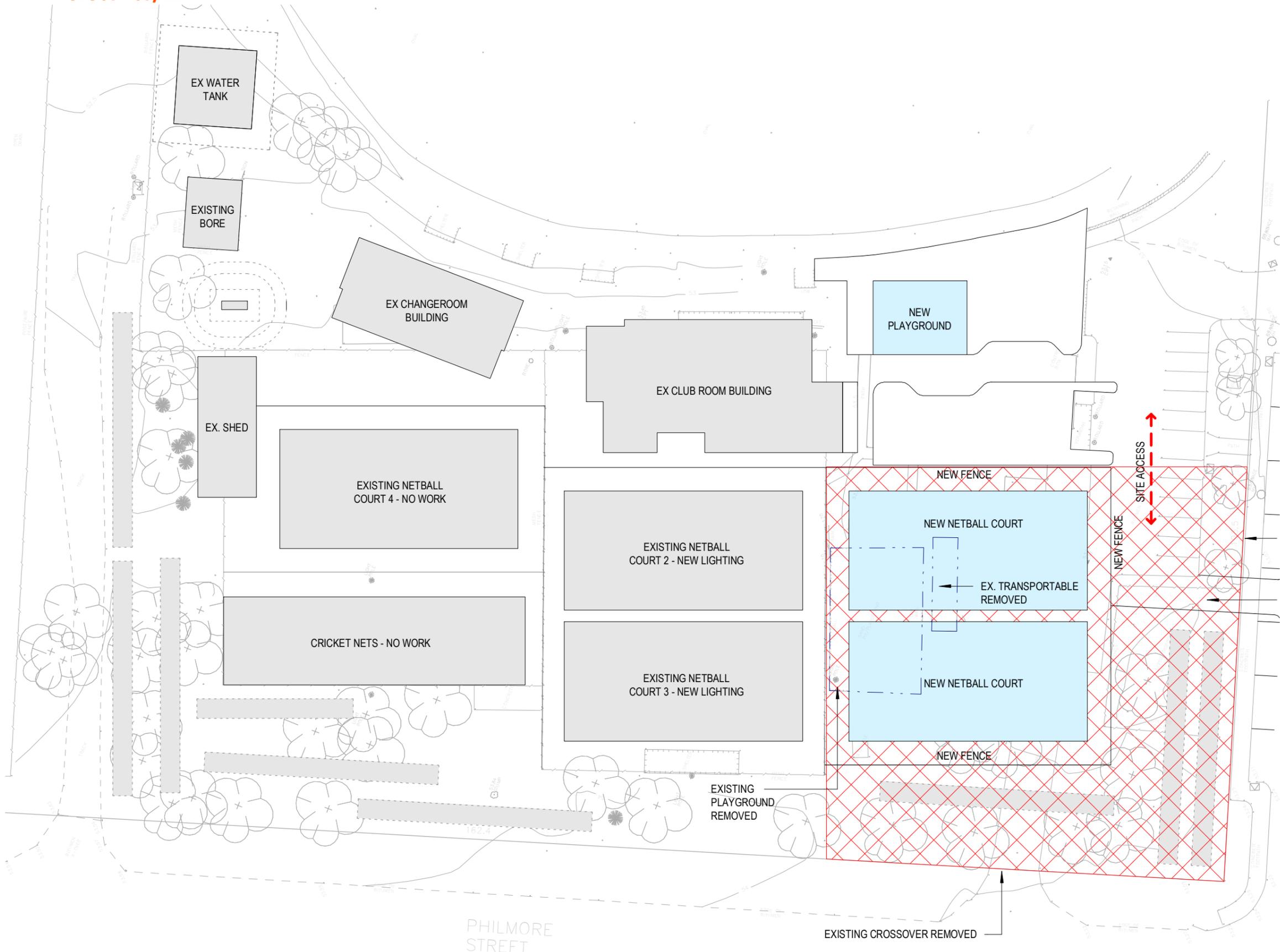
- SITE ACCESS OFF ARCHIBALD STREET
- NEW CHANGEROOM AND CLUB ROOM BUILDING, 3 X NETBALL COURTS AND CRICKET NETS TO REMAIN ACCESSIBLE TO CLUBS AND PUBLIC
- REDUCED PUBLIC PARKING AVAILABLE ON SITE

MAIN BUILDING WORKS

- CONSTRUCT 2 x NEW COURTS AND ASSOCIATED FENCING AND LIGHTING
- UPGRADE LIGHTING TO 2 x EXISTING COURTS
- MODIFY EXISTING CARPARK INCLUDING CROSSOVERS AND STREET PARKING

CONSULTANT SCOPE

- DOCUMENTATION OF NEW COURTS AND ASSOCIATED CIVIL WORKS



INDICATIVE BUILDERS  
COMPOUND ZONE

EXISTING CARPARK MODIFIED  
WITH NEW CROSSOVER AND  
MODIFIED STREET PARKING

# Schematic Design Cost Estimate Report

## Muchea Recreation Centre



PROJECT NO.:	71930.100389
AUTHORISED BY:	Sharon Yap
DOCUMENT TITLE:	Schematic Design Cost Estimate Report (rev 3)
ISSUE DATE:	27 January 2022

**ISSUE REGISTER**

Version	Issue Date	Details	Prepared by	Checked by	Authorised by
0	28 Oct 2021	Schematic Design Cost Report	Teresa Wong	Louise Butler	Sharon Yap
1	22 Dec 2021	Added 3 design options	Sharon Yap	Louise Butler	Sharon Yap
2	26 Jan 2022	Draft issue for 3 stages	Sharon Yap	Louise Butler	Sharon Yap
3	27 Jan 2022	Final issue	Sharon Yap	Louise Butler	Sharon Yap

**DISTRIBUTION**

Company	Name	Sent via
Site Architecture Studio	Stephen Hart / Naomi McCabe	Email

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## 1. EXECUTIVE SUMMARY

Altus Group (hereinafter “AG”) have been commissioned to provide a schematic design cost plan for Muchea Recreation Centre redevelopment works. The objective of this cost plan is to provide an estimated cost for the works divided into 3 stages as detailed below:

### Stage 1

Comprises the new change room, replace the existing machinery storage shed and all necessary ancillary works to enable future stages such as ATU systems.

### Stage 2

Comprises a new club room over the existing netball court, resurface court 4 and retaining the existing hall until the completion of build.

### Stage 3

Comprises a new fourth netball court (in a 2 x 2 configuration) with lighting, refurbish the remaining netball courts and modify existing carpark with new cross-over

The estimated cost for all stages is tabulated below:

No	Stage 1	Total Amount (Ex-GST)	No	Stage 2	Total Amount (Ex-GST)	No	Stage 3	Total Amount (Ex-GST)
1	Changing Room	\$773,520	1	Community Centre	\$1,351,870	1	2 new courts and refurbish 2 existing court	\$994,605
2	Breakout and Viewing Area	\$29,770	2	Breakout and Viewing Area	\$161,580	2	Modify existing carpark and new crossover	\$31,630
3	External Services	\$267,990	3	Resurface Court 4	\$52,190			
4	<b>Total Construction Cost - Stage 1</b>	<b>\$1,071,280</b>	4	<b>Total Construction Cost - Stage 2</b>	<b>\$1,513,450</b>	4	<b>Total Construction Cost - Stage 3</b>	<b>\$1,026,235</b>
5	Contingency	\$92,930	5	Contingency	\$131,290	5	Contingency	\$89,030
6	Professional Fees	\$123,018	6	Professional Fees	\$159,681	6	Professional Fees	\$25,000
7	Escalation	\$39,400	7	Escalation	\$115,050	7	Escalation	\$127,840
8	<b>TOTAL STAGE 1 - WORKS (A)</b>	<b>\$1,326,628</b>	8	<b>TOTAL STAGE 2 - WORKS (C)</b>	<b>\$1,971,661</b>	8	<b>TOTAL STAGE 3 - WORKS (E)</b>	<b>\$1,268,105</b>
	<b>Stage 1 - Below the Line</b>			<b>Stage 2 - Below the Line</b>			<b>Stage 3 - Below the Line</b>	
9	Fire Fighting and Hardstand	\$28,400	9	Demolition works	\$115,165	9	Demolish Existing Playground	\$12,850
10	New Shed	\$41,430	10	New Netball Court Fence	\$9,015	8	New Playground	\$85,830
11	Demolition works	\$33,190	11	Remove transportable	\$3,930			
			12	New Landscaping & Irrigation	\$50,196			
	<b>TOTAL STAGE 1 - BELOW LINE ITEM</b>	<b>\$103,020</b>		<b>TOTAL STAGE 2 - BELOW LINE ITEM</b>	<b>\$178,306</b>		<b>TOTAL STAGE 3 - BELOW LINE ITEM</b>	<b>\$98,680</b>
	<b>TOTAL STAGE 1 - WORKS (A) + BELOW LINE ITEM (B)</b>	<b>\$1,429,648</b>		<b>TOTAL STAGE 2 - WORKS (C) + BELOW LINE ITEM (D)</b>	<b>\$2,149,967</b>		<b>TOTAL STAGE 3 - WORKS (E) + BELOW LINE ITEM (F)</b>	<b>\$1,366,785</b>

## 2. EXCLUSIONS

- GST
- Public Art
- Commissioning, relocation costs and disbursements

### ASSUMPTIONS

- Assumed full height wall tiles to Toilets, Amenities room, Changerooms and Umpires room
- Assumed trowel concrete finish to Breakout and viewing area
- Assumed solid timber core door to external door
- Assumed 1 no. Entrance mat at Building 2
- Allowed 12% for the Builder's Preliminaries and Margin
- Allowed Design Contingency calculated based on 3.5% of Estimated Construction Cost
- Allowed Construction Contingency calculated based on 5% of Estimated Construction Cost

### 3. COST PLAN BREAKDOWN AND DETAILS

## Cost Plan Summary

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Total
	<b><u>STAGE 1 - BUILD THE NEW CHANGE ROOM, REPLACE THE EXISTING MACHINERY STORAGE SHED AND DO ALL NECESSARY ANCILLARY WORKS TO ENABLE FUTURE STAGES SUCH AS ATU SYSTEMS.</u></b>				
1	Changing Room	223	m2	3,468.70	773,520
2	Breakout and Viewing Area	177	m2	167.97	29,770
3	External Services	400	m2	669.59	267,990
	<b>Total Construction Cost - Stage 1</b>				<b>1,071,280</b>
4	Contingency				92,930
5	Professional Fees				123,018
6	Escalation				39,400
	<b>TOTAL STAGE 1 - WORKS (A)</b>				<b>1,326,628</b>
	<b>Stage 1 - Below the Line</b>				
7	Fire Fighting and Hardstand				28,400
8	New Shed				41,430
9	Demolition works				33,190
	<b>TOTAL STAGE 1 - BELOW LINE ITEM (B)</b>				<b>103,020</b>
	<b><u>TOTAL STAGE 1 - WORKS (A) + BELOW LINE ITEM (B)</u></b>				<b><u>1,429,648</u></b>
	<b><u>STAGE 2 - BUILD THE PROPOSED NEW CLUB ROOM OVER THE EXISTING NETBALL COURT, RETAINING THE EXISTING HALL UNTIL THE COMPLETION OF BUILD.</u></b>				
10	Community Centre	465	m2	2,907.25	1,351,870
11	Breakout and Viewing Area	494	m2	327.06	161,580
12	Resurface Court 4	466	m2	112.00	52,190
	<b>Total Construction Cost - Stage 2</b>				<b>1,513,450</b>
13	Contingency				131,290
14	Professional Fees				159,681
15	Escalation				115,050
	<b>TOTAL STAGE 2 - WORKS (C)</b>				<b>1,971,661</b>
	<b>Stage 2 - Below the Line</b>				
16	Demolition works				115,165
17	New Netball Court Fence				9,015
18	Remove transportable				3,930
19	New Landscaping & Irrigation				50,196
	<b>TOTAL STAGE 2 - BELOW LINE ITEM (D)</b>				<b>178,306</b>
	<b><u>TOTAL STAGE 2 - WORKS (C) + BELOW LINE ITEM (D)</u></b>				<b><u>2,149,967</u></b>

## Cost Plan Summary

**Project:** Site Architecture Studio  
**Building:** Muehea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Total
	<b><u>STAGE 3 - BUILD A NEW FOURTH NETBALL COURT (IN A 2 X 2 CONFIGURATION) WITH LIGHTING, REFURBISH THE REMAINING NETBALL COURTS</u></b>				
20	2 new courts and new court lighting , refurbish 2 existing court and lighting,and new fence	2,327	m2	427.42	994,605
21	Modify existing carpark and new crossover	216	m2	146.52	31,630
	<b>Total Construction Cost - Stage 3</b>				<b>1,026,235</b>
22	Contingency				89,030
23	Professional Fees				25,000
24	Escalation				127,840
	<b>TOTAL STAGE 3 - WORKS (E)</b>				<b>1,268,105</b>
	<b>Stage 3 - Below the Line</b>				
25	Demolish Existing Playground				12,850
26	New Playground				85,830
	<b>TOTAL STAGE 3 - BELOW LINE ITEM (F)</b>				<b>98,680</b>
	<b><u>TOTAL STAGE 3 - WORKS (E) + BELOW LINE ITEM (F)</u></b>				<b><u>1,366,785</u></b>
	<b><u>EXCLUSION</u></b>				
27	GST				
28	Public Art				
29	Commissioning, relocation costs & disbursements				

## Cost Plan Details Breakdown

**Project:** Site Architecture Studio  
**Building:** Mueha Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 Changing Room</b>							
<b>1.1 Substructure</b>							
1.1.1	Allowance for concrete slab and thickening including excavation, formwork and reinforcement	223.14	m2	140.00	31,240		31,240
<b>1</b>	<b>Substructure</b>						<b>31,240</b>
<b>1.2 Columns</b>							
1.2.1	C1 - 89x89x5SHS	0.79	t	9,000.00	7,110		7,110
1.2.2	Allowance for base plate with bolts	17	No	100.00	1,700		1,700
1.2.3	Allowance for loose fittings and connection (15%)	0.12	t	9,000.00	1,067		1,067
1.2.4	Allowance for steel treatment	0.91	t	1,000.00	909		909
<b>2</b>	<b>Columns</b>						<b>10,785</b>
<b>1.3 Roof</b>							
1.3.1	Roof framing						
1.3.2	B2 - 150x150x6SHS	0.59	t	9,000.00	5,310		5,310
1.3.3	BR1 - 101x3.2CHS	0.23	t	9,000.00	2,070		2,070
1.3.4	Outrigger 150x100x4RHS	0.11	t	9,000.00	990		990
1.3.5	R1 - 200UB25	0.52	t	9,000.00	4,680		4,680
1.3.6	R2 - 150PFC	0.64	t	9,000.00	5,760		5,760
1.3.7	WB1 - 89x89x5SHS	0.38	t	9,000.00	3,420		3,420
1.3.8	WH1 - 89x89x5SHS	0.52	t	9,000.00	4,680		4,680
1.3.9	WH2 - 150x100x4RHS	0.62	t	9,000.00	5,580		5,580
1.3.10	Allow 15% for loose fitting and connection	0.54	t	9,000.00	4,874		4,874
1.3.11	Allow for surface treatment	3.61	t	1,000.00	3,610		3,610
1.3.12	Allow for bridging and purlins	529	m	25.00	13,231		13,231
1.3.13	Roof covering						
1.3.14	Metal roof covering (assumed Corrugated sheet)	314	m2	60.00	18,840		18,840
1.3.15	Allowance for insulation	314	m2	15.00	4,710		4,710
1.3.16	Miscellaneous						
1.3.17	Roof flashing and drainage	314	m2	40.00	12,560		12,560
<b>3</b>	<b>Roof</b>						<b>90,315</b>
<b>1.4 External Wall</b>							
1.4.1	Allow for lightweight wall including metal cladding and framing	143.69	m2	450.00	64,661		64,661
1.4.2	Allow for lightweight wall including pre-finish FC board and framing	111.33	m2	260.00	28,946		28,946
<b>4</b>	<b>External Wall</b>						<b>93,606</b>

## Cost Plan Details Breakdown

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 Changing Room (Continued)</b>							
<b>1.5 External Door</b>							
1.5.1	Single solid timber door including frame, hardware and painting	8	No	1,700.00	13,600		13,600
1.5.2	Double metal door including frame and hardware	2	No	2,000.00	4,000		4,000
1.5.3	Allow for door signage	10	No	150.00	1,500		1,500
<b>5</b>	<b>External Door</b>						<b>19,100</b>
<b>1.6 Window</b>							
1.6.1	Allowance for window	7	m2	650.00	4,550		4,550
<b>6</b>	<b>Window</b>						<b>4,550</b>
<b>1.7 Internal Screen and Borrow Light</b>							
1.7.1	Toilet cubicle / shower partition including door and hardware	16	No	1,500.00	24,000		24,000
1.7.2	Toilet cubicle door including hardware	4	No	500.00	2,000		2,000
<b>7</b>	<b>Internal Screen and Borrow Light</b>						<b>26,000</b>
<b>1.8 Internal Wall</b>							
1.8.1	Moisture resistance plasterboard both sides on steel stud framing including insulation	133	m2	180.00	23,953		23,953
1.8.2	Plasterboard both sides on steel stud framing including insulation	21	m2	145.00	3,025		3,025
1.8.3	1 layer plasterboard and 1 layer moisture resistance plasterboard each side on steel stud framing including insulation	182	m2	170.00	30,857		30,857
1.8.4	Moisture resistance plasterboard bulkhead (above 3.5m height)	16	m2	185.00	2,917		2,917
<b>8</b>	<b>Internal Wall</b>						<b>60,751</b>
<b>1.9 Internal Door</b>							
1.9.1	Single solid door including frame, hardware and paint finish	5	No	1,525.00	7,625		7,625
<b>9</b>	<b>Internal Door</b>						<b>7,625</b>
<b>1.10 Wall Finishes</b>							
1.10.1	Allow selected wall tiles including waterproofing	202.01	m2	135.00	27,271		27,271
1.10.2	Allowance for splashback to First Aid room	1	Sum	600.00	600		600
1.10.3	Painting to wall	460.36	m2	20.00	9,207		9,207
<b>10</b>	<b>Wall Finishes</b>						<b>37,079</b>
<b>1.11 Floor Finishes</b>							
1.11.1	Allow fully vitrified ceramic floor tile, R12 slip resistance rating	62.99	m2	135.00	8,504		8,504

## Cost Plan Details Breakdown

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 Changing Room (Continued)</b>							
<b>1.11 Floor Finishes (Continued)</b>							
1.11.2	Fully ceramic skirting tile, 150mm high	218	m	50.00	10,921		10,921
1.11.3	Allowance for waterproofing	63	m2	INCL	0		0
1.11.4	Linear drain	8	m	250.00	2,043		2,043
1.11.5	Sealed concrete flooring	152	m2	40.00	6,070		6,070
1.11.6	Allow for Vinyl flooring to First Aid including moisture resistant	9	m2	120.00	1,080		1,080
1.11.7	Allowance for coved skirting	9	m2	35.00	315		315
<b>11</b>	<b>Floor Finishes</b>						<b>28,931</b>
<b>1.12 Ceiling Finishes</b>							
1.12.1	Flushed plasterboard suspended ceiling including paint	49.39	m2	95.00	4,692		4,692
1.12.2	Moisture resistant plasterboard suspended ceiling including paint	173.75	m2	105.00	18,244		18,244
1.12.3	Soffit lining paint finish	52	m2	120.00	6,276		6,276
1.12.4	Allowance for shadowline angle trim	266	m	5.00	1,331		1,331
1.12.5	Allowance for access panel	1	Sum	1,200.00	1,200		1,200
<b>12</b>	<b>Ceiling Finishes</b>						<b>31,743</b>
<b>1.13 Sanitaryware and fitments</b>							
1.13.1	<u>Built in joinery</u>						
1.13.2	Timber slat seat including clothes rail hook	53.95	m	300.00	16,185		16,185
1.13.3	No allowance for locker						Excluded
1.13.4	Allow built in vanity bench with cabinet at First Aid	2.70	m	750.00	2,025		2,025
1.13.5	<u>Changeroom/Umpire/Amenities</u>						
1.13.6	Toilet roll holder	10	No	100.00	1,000		1,000
1.13.7	Soap dispenser	10	No	150.00	1,500		1,500
1.13.8	Paper towel dispenser	10	No	200.00	2,000		2,000
1.13.9	Mirror	10	No	350.00	3,500		3,500
1.13.10	Grabrail set	6	No	500.00	3,000		3,000
1.13.11	Coat hook	32	No	30.00	960		960
1.13.12	Shelf	2	No	350.00	700		700
1.13.13	<u>First Aid</u>						
1.13.14	Soap dispenser	1	No	150.00	150		150
1.13.15	Paper Towel dispenser	1	No	200.00	200		200
1.13.16	Mirror	1	No	350.00	350		350
1.13.17	Coat hook	2	No	30.00	60		60

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**1 Changing Room****(Continued)****1.13 Sanitaryware and fitments****(Continued)**

1.13.18	<u>Sanitary fixtures</u>						
1.13.19	Water cistern	10	No		0		Incl in Hydraulic services
1.13.20	Shower rose	10	No		0		Incl in Hydraulic services
1.13.21	Wall basin	10	No		0		Incl in Hydraulic services
1.13.22	First aid basin	1	No		0		Incl in Hydraulic services
1.13.23	Cleaner trough	1	No		0		Incl in Hydraulic services
1.13.24	<u>Miscellaneous</u>						
1.13.25	Allowance for fire extinguisher and blanket	1	Sum	500.00	500		500
<b>13</b>	<b><u>Sanitaryware and fitments</u></b>						<b><u>32,130</u></b>

**1.14 Hydraulics Services**

1.14.1	<u>Allowance for hydraulics services (based on Hydraulic consultant's est. dated 20/10/21)</u>						
1.14.2	- Fixtures and tapware	1	Sum	32,597.50	32,598		32,598
1.14.3	- Property sewer, wastes and vents	1	Sum	7,605.00	7,605		7,605
1.14.4	- Cold water services	1	Sum	4,095.00	4,095		4,095
1.14.5	- Hotwater services and units	1	Sum	15,600.00	15,600		15,600
1.14.6	- LP Gas services	1	Sum	6,337.50	6,338		6,338
1.14.7	- Grease trap	1	Sum	9,750.00	9,750		9,750
1.14.8	- Mechanical drainage	1	Sum	1,950.00	1,950		1,950
1.14.9	Allowance for builder's work	1	Sum	3,900.00	3,900		3,900
<b>14</b>	<b><u>Hydraulics Services</u></b>						<b><u>81,835</u></b>

**1.15 Electrical Services**

1.15.1	Based on Electrical estimate dated 15/10/21	1	Sum	76,400.58	76,401		76,401
<b>15</b>	<b><u>Electrical Services</u></b>						<b><u>76,401</u></b>

**1.16 Mechanical Services**

1.16.1	Based on Mech estimate dated 15/10/21	1	Sum	58,519.59	58,520		58,520
<b>16</b>	<b><u>Mechanical Services</u></b>						<b><u>58,520</u></b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**1 Changing Room**

*(Continued)*

**1.17 Builder's Prelim & Margin**

1.17.1	Builder's Prelim & Margin	12.0	%	690,620.00	82,900		82,900
<b>17</b>	<b>Builder's Prelim &amp; Margin</b>						<b>82,900</b>
<b>1</b>	<b>Changing Room</b>						<b>773,510</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**2 Breakout and Viewing Area**

**2.1 Breakout & Viewing Covered Area**

2.1.1	Allowance for concrete slab including excavation, formwork and reinforcement	177.23	m2	140.00	24,812		24,812
2.1.2	Allow for trowel concrete finish	177.23	m2	10.00	1,772		1,772
	<b><u>Builder's Prelim &amp; Margin</u></b>						
2.1.3	Prelim & Margin	12	%	26,584.50	3,190		3,190
<b>1</b>	<b><u>Breakout &amp; Viewing Covered Area</u></b>						<b><u>29,775</u></b>
<b>2</b>	<b>Breakout and Viewing Area</b>						<b>29,775</b>

Cost Plan Details Breakdown

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Mueha Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**3 External Services**

**3.1 External Services**

3.1.1	<u>Water Treatment Works</u>						
3.1.2	Aquarius 18KL ATU and flatbed leach drains	1	Sum	132,800.00	132,800		132,800
3.1.3	RO, filtration and storage tank with chlorine dosing	1	Sum	56,480.00	56,480		56,480
3.1.4	<u>Electrical</u>						
3.1.5	Building main switchboard for the new clubroom	1	Sum	15,000.00	15,000		15,000
3.1.6	Building main switchboard for the new changeroom	1	Sum	5,000.00	5,000		5,000
3.1.7	Submain cabling for the new buildings	1	Sum	10,000.00	10,000		10,000
3.1.8	Underground trenching and conduits	1	Sum	15,000.00	15,000		15,000
3.1.9	Relocation of the Telstra lead in, including underground trenching and conduits	1	Sum	5,000.00	5,000		5,000
3.1.10	Netball Lighting				Excl		0
3.1.11	SMSB works				Excl		0
	<b><u>Builder's Prelim &amp; Margin</u></b>						
3.1.12	Prelim & Margin	12	%	239,280.00	28,710		28,710
<b>1</b>	<b><u>External Services</u></b>						<b>267,990</b>
<b>3</b>	<b>External Services</b>						<b>267,990</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**4 Contingency**

**4.1 Design Contingency**

4.1.1	Design Contingency	3.5	%	1,071,280.00	37,490		37,490
<b>1</b>	<b>Design Contingency</b>						<b>37,490</b>

**4.2 Construction Contingency**

4.2.1	Construction Contingency	5	%	1,108,770.00	55,440		55,440
<b>2</b>	<b>Construction Contingency</b>						<b>55,440</b>
<b>4</b>	<b>Contingency</b>						<b>92,930</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**5 Professional Fees**

**5.1 Professional Fee**

5.1.1	Professional Fee	1	Sum	109,520.00	109,520		109,520
5.1.2	Additional Fee for stage 1 as per Site Email dated 26/01/2022	1	Sum	13,498.00	13,498		13,498
<b>1</b>	<b><u>Professional Fee</u></b>						<b><u>123,018</u></b>
<b>5</b>	<b>Professional Fees</b>						<b>123,018</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Mucnea Recreation Centre	

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**6 Escalation**

**6.1 Escalation**

6.1.1	<u>Escalation</u>				0		0
6.1.2	Current Index Jan 2022	204					
6.1.3	Index in June 2022	211					
6.1.4	Escalation	3.7	%	1,071,280.00	39,400		39,400
<b>1</b>	<b><u>Escalation</u></b>						<b><u>39,400</u></b>
<b>6</b>	<b>Escalation</b>						<b>39,400</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**7 New Shed**

**7.1 New Machinery Shed**

7.1.1	New machinery shed	90	m2	303.88	27,350		27,350
7.1.2	Builder's prelim & margin	12	%	27,349.50	3,280		3,280
<b>1</b>	<b><u>New Machinery Shed</u></b>						<b>30,630</b>
<b>7</b>	<b>New Shed</b>						<b>41,430</b>

## Cost Plan Details Breakdown

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**8 Community Centre****8.1 Substructure**

8.1.1	Allowance for concrete slab and thickening including excavation, formwork and reinforcement	465	m2	140.00	65,031		65,031
<b>1</b>	<b>Substructure</b>						<b>65,031</b>

**8.2 Columns**

<b>Steel Columns</b>							
8.2.1	C1 - 89 x 89 x 5.0 SHA	1.02	t	9,000.00	9,180		9,180
8.2.2	C2 - 150 x 150 x 5.0 SHS	0.32	t	9,000.00	2,880		2,880
8.2.3	C3 - 150 x 100 x 6.0 RHS	0.48	t	9,000.00	4,320		4,320
8.2.4	Baseplate	33	No	100.00	3,300		3,300
8.2.5	Allowance for loose and attached connection	0.27	t	9,000.00	2,457		2,457
8.2.6	Allowance for surface treatment	2.09	t	1,000.00	2,093		2,093
<b>2</b>	<b>Columns</b>						<b>24,230</b>

**8.3 Roof**

<b>Roof Steel Structure</b>							
8.3.1	B1 - 89x89x5.0 SHS	0.18	t	9,000.00	1,620		1,620
8.3.2	B2 - 150x150x5.0 SHS	N/A	t	9,000.00	0		0
8.3.3	B3 - 150x100x6.0 RHS	0.78	t	9,000.00	7,020		7,020
8.3.4	R1 - 200UB25	N/A	t	9,000.00	0		0
8.3.5	R2 - 150 PFC	1.43	t	9,000.00	12,870		12,870
8.3.6	BR1 - 101x3.2 CHS	0.51	t	9,000.00	4,590		4,590
8.3.7	BR2 - 139x3.5 CHS	0.68	t	9,000.00	6,120		6,120
8.3.8	BR3 - 75x75x8 EA	0.14	t	9,000.00	1,260		1,260
8.3.9	WB1 - 89x89x5.0 SHS	N/A	t	9,000.00	0		0
8.3.10	WH1 - 89x89x5.0 SHS	0.71	t	9,000.00	6,390		6,390
8.3.11	<b>Truss</b>						
8.3.12	T1 - 150x100x4.0 Horizontal Top	0.34	t	11,000.00	3,740		3,740
8.3.13	T1 - 100x100x4.0 Horizontal Bottom	0.27	t	11,000.00	2,970		2,970
8.3.14	T1 - 75x50x4.0 RHS Diagonal and Vertical	0.60	t	11,000.00	6,600		6,600
8.3.15	T2 - 100x100x4.0 Horizontal Top	0.24	t	11,000.00	2,640		2,640
8.3.16	T2- 200 PFC	0.48	t	11,000.00	5,280		5,280
8.3.17	T2 - 75x50x4.0 RHS Diagonal and Vertical	0.50	t	11,000.00	5,500		5,500
8.3.18	FR1 - 100x100x4.0 Horizontal Top	0.38	t	11,000.00	4,180		4,180
8.3.19	FR1 - 100x100x4.0 Horizontal Bottom	0.38	t	11,000.00	4,180		4,180

## Cost Plan Details Breakdown

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>8 Community Centre (Continued)</b>							
<b>8.3 Roof (Continued)</b>							
8.3.20	FR1 - 75x50x4.0 RHS Diagonal and Vertical	0.85	t	11,000.00	9,350		9,350
8.3.21	<u>Miscellaneous</u>						
8.3.22	Loose and attached connection	1.27	t	9,000.00	11,435		11,435
8.3.23	Surface treatment	9.74	t	1,000.00	9,741		9,741
8.3.24	<u>Purlin</u>						
8.3.25	B2-Purlin 200x100x4.0 RHS	96	m	90.00	8,640		8,640
8.3.26	B2-Purlin 20019_1000CC	263	m	18.00	4,734		4,734
8.3.27	B2-Purlin Z15019_1000cc	279	m	15.00	4,185		4,185
8.3.28	Allow roof steel structure for link roof	71	m2	150.00	10,650		10,650
8.3.29	<u>Roof Covering</u>						
8.3.30	Metal roof covering (assumed Corrugated sheet)	735	m2	55.00	40,425		40,425
8.3.31	Allowance for insulation	735	m2	15.00	11,025		11,025
8.3.32	Roof flashing and drainage	735	m2	40.00	29,400		29,400
<b>3</b>	<b>Roof</b>						<b>214,544</b>
<b>8.4 External Wall</b>							
8.4.1	Allow for lightweight wall including metal cladding and framing	257.77	m2	450.00	115,997		115,997
8.4.2	Allow for fixed glazed wall	104.69	m2	650.00	68,049		68,049
8.4.3	Allow for lightweight wall including pre-finish FC board and framing	54.78	m2	260.00	14,243		14,243
<b>4</b>	<b>External Wall</b>						<b>198,288</b>
<b>8.5 External Door</b>							
8.5.1	Single solid timber door including frame, hardware and painting	3	No	1,700.00	5,100		5,100
8.5.2	Double metal door including frame and hardware	1	No	2,000.00	2,000		2,000
8.5.3	Extra over double door including frame and hardware	5	No	1,476.00	7,380		7,380
8.5.4	Allow for door signage	2	No	150.00	300		300
<b>5</b>	<b>External Door</b>						<b>14,780</b>
<b>8.6 Window</b>							
8.6.1	Allowance for window	6	m2	650.00	3,900		3,900
<b>6</b>	<b>Window</b>						<b>3,900</b>
<b>8.7 Internal Screen and Borrow Light</b>							
8.7.1	Toilet partition including door and hardware	3	No	1,500.00	4,500		4,500

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>8 Community Centre (Continued)</b>							
<b>8.7 Internal Screen and Borrow Light (Continued)</b>							
8.7.2	Allow for operable wall	62	m2	1,200.00	74,664		74,664
<b>7</b>	<b>Internal Screen and Borrow Light</b>						<b>79,164</b>
<b>8.8 Internal Wall</b>							
8.8.1	Moisture resistance plasterboard both sides on steel stud framing including insulation	10.89	m2	180.00	1,960		1,960
8.8.2	Plasterboard both sides on steel stud framing including insulation	144.09	m2	145.00	20,893		20,893
8.8.3	1 layer plasterboard and 1 layer moisture resistance plasterboard each side on steel stud framing including insulation	113.04	m2	170.00	19,217		19,217
8.8.4	Allowance for bulkhead (above 3.5m)	35.84	m2	85.00	3,046		3,046
<b>8</b>	<b>Internal Wall</b>						<b>45,116</b>
<b>8.9 Internal Door</b>							
8.9.1	Single solid door including frame, hardware and paint finish	10	No	1,525.00	15,250		15,250
8.9.2	Allow for door signage	10	No	150.00	1,500		1,500
8.9.3	Allow roller shutter at Kitchen (assumed 2200x900mmH)	2	No	2,100.00	4,200		4,200
8.9.4	Allow roller shutter at Bar (assumed 2760x1500mmH)	3	No	2,500.00	7,500		7,500
8.9.5	Allow roller door at Judo and Furn store	2	No	3,000.00	6,000		6,000
<b>9</b>	<b>Internal Door</b>						<b>34,450</b>
<b>8.10 Wall Finishes</b>							
8.10.1	Allow selected wall tiles including waterproofing	110	m2	140.00	15,340		15,340
8.10.2	Allowance for splashback to Kitchen	1	Sum	2,800.00	2,800		2,800
8.10.3	Painting to wall	586	m2	15.00	8,784		8,784
<b>10</b>	<b>Wall Finishes</b>						<b>26,923</b>
<b>8.11 Floor Finishes</b>							
8.11.1	<u>Tile floor finish</u>						
8.11.2	Allow fully vitrified ceramic floor tile, R12 slip resistance rating	34	m2	135.00	4,554		4,554
8.11.3	Fully ceramic skirting tile, 150mm high	68	m	50.00	3,424		3,424
8.11.4	Allow for waterproofing	34	m2	INCL	0		0
8.11.5	<u>Vinyl floor finish</u>						
8.11.6	Allowance for Vinyl flooring	58	m2	80.00	4,627		4,627
8.11.7	Allowance for coved skirting	20	m2	35.00	707		707
8.11.8	Allow for moisture barrier underneath vinyl	58	m2	40.00	2,314		2,314

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**8 Community Centre****(Continued)****8.11 Floor Finishes****(Continued)**

8.11.9	<u>Carpet floor finish</u>						
8.11.10	Allowance for carpet flooring	320	m2	55.00	17,617		17,617
8.11.11	Allowance for skirting	72	m	35.00	2,534		2,534
8.11.12	<u>Concrete floor</u>						
8.11.13	Sealed concrete flooring	36	m2	25.00	904		904
8.11.14	<u>Entrance Mats</u>						
8.11.15	Allow entrance mats at corridor	1	No	1,500.00	1,500		1,500
<b>11</b>	<b>Floor Finishes</b>						<b>38,180</b>

**8.12 Ceiling Finishes**

8.12.1	Perforated acoustic ceiling at Hall	251	m2	125.00	31,375		31,375
8.12.2	Flushed plasterboard suspended ceiling including paint	168	m2	100.00	16,774		16,774
8.12.3	Moisture resistant plasterboard suspended ceiling including paint	29	m2	110.00	3,229		3,229
8.12.4	Soffit lining paint finish	194	m2	120.00	23,263		23,263
8.12.5	Allowance for shadowline angle trim	287	m	5.00	1,437		1,437
8.12.6	Allowance for access panel	1	Sum	1,500.00	1,500		1,500
<b>12</b>	<b>Ceiling Finishes</b>						<b>77,578</b>

**8.13 Fitments**

8.13.1	<u>Built in joinery</u>						
8.13.2	Kitchenette bench with cabinet below	3	m	850.00	2,873		2,873
8.13.3	No allowance for Kitchen U shape bench with cabinet below						Excluded
8.13.4	No allowance for bar counter						Excluded
8.13.5	<u>Toilet</u>						
8.13.6	Toilet roll holder	6	No	100.00	600		600
8.13.7	Soap dispenser	5	No	150.00	750		750
8.13.8	Paper towel dispenser	5	No	200.00	1,000		1,000
8.13.9	Mirror	5	No	350.00	1,750		1,750
8.13.10	Grabrail set	1	No	500.00	500		500
8.13.11	Grab bar	2	No	150.00	300		300
8.13.12	Coat hook	6	No	30.00	180		180
8.13.13	Curtain track and curtain	1	No	700.00	700		700
8.13.14	Cistern backrest	1	No				Incl in Hydraulic services

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**8 Community Centre****(Continued)****8.13 Fitments****(Continued)**

8.13.15	Folding shower seat	1	No				Incl in Hydraulic services
8.13.16	<u>Sanitary fixtures</u>						
8.13.17	Water cistern	6	No				Incl in Hydraulic services
8.13.18	Shower rose	1	No				Incl in Hydraulic services
8.13.19	Wall basin	5	No				Incl in Hydraulic services
8.13.20	Kitchen sink	2	No				Incl in Hydraulic services
8.13.21	Kitchen hand basin	1	No				Incl in Hydraulic services
8.13.22	Urinal	2	No				Incl in Hydraulic services
<b>13</b>	<b><u>Fitments</u></b>						<b><u>8,653</u></b>

**8.14 Kitchen and Bar Cool Room**

8.14.1	<u>Cool room - Kitchen (PROVISIONAL)</u>						
8.14.2	Cool room to kitchen including shelving	1	Sum	15,000.00	15,000		15,000
8.14.3	Cool room to bar and stainless steel shelving	1	Sum	35,000.00	35,000		35,000
<b>14</b>	<b><u>Kitchen and Bar Cool Room</u></b>						<b><u>50,000</u></b>

**8.15 Fire Services**

8.15.1	Not required						
<b>15</b>	<b><u>Fire Services</u></b>						<b><u>0</u></b>

**8.16 Hydraulics Services**

8.16.1	Allowance for hydraulics services (based on Hydraulic consultant's est. dated 20/10/21)						
8.16.2	- Fixtures and tapware	1	Sum	17,552.50	17,553		17,553
8.16.3	- Property sewer, wastes and vents	1	Sum	4,095.00	4,095		4,095
8.16.4	- Cold water services	1	Sum	2,205.00	2,205		2,205
8.16.5	- Hotwater services and units	1	Sum	8,400.00	8,400		8,400
8.16.6	- LP Gas services	1	Sum	3,412.50	3,413		3,413
8.16.7	- Grease trap	1	Sum	5,250.00	5,250		5,250

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**8 Community Centre (Continued)**

**8.16 Hydraulics Services (Continued)**

8.16.8	- Mechanical drainage	1	Sum	1,050.00	1,050		1,050
8.16.9	Allowance for builder's work	1	Sum	4,200.00	4,200		4,200
<b>16</b>	<b>Hydraulics Services</b>						<b>46,165</b>

**8.17 Electrical Services**

8.17.1	Based on Electrical estimate dated 15/10/21	1	Sum	158,599.42	158,599		158,599
<b>17</b>	<b>Electrical Services</b>						<b>158,599</b>

**8.18 Mechanical Services**

8.18.1	Based on Mech estimate dated 15/10/21	1	Sum	121,480.41	121,480		121,480
<b>18</b>	<b>Mechanical Services</b>						<b>121,480</b>

**8.19 Builder's Prelim & Margin**

8.19.1	Builder's Prelim & Margin	12.0	%	1,207,070.00	144,800		144,800
<b>19</b>	<b>Builder's Prelim &amp; Margin</b>						<b>144,800</b>
<b>8</b>	<b>Community Centre</b>						<b>1,351,883</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muehea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**9 Breakout and Viewing Area**

**9.1 Spectator limestone retaining wall tier seating**

9.1.1	Terraced seating	74.90	m2	675.00	50,558		50,558
9.1.2	Staircase at terraced seating	2	Nos	3,375.00	6,750		6,750
9.1.3	Allow step at grass bank	1	Sum	2,000.00	2,000		2,000
<b>1</b>	<b>Spectator limestone retaining wall tier seating</b>						<b>59,308</b>

**9.2 Breakout and viewing area**

9.2.1	Allowance for concrete slab including excavation, formwork and reinforcement	494	m2	140.00	69,226		69,226
9.2.2	Allow for trowel concrete finish	494	m2	10.00	4,945		4,945
<b>2</b>	<b>Breakout and viewing area</b>						<b>74,171</b>

**9.3 Retaining wall and grass bank**

9.3.1	Retaining wall grass bank	86	m2	325.00	28,100		28,100
<b>3</b>	<b>Retaining wall and grass bank</b>						<b>28,100</b>
<b>9</b>	<b>Breakout and Viewing Area</b>						<b>161,578</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**10 Resurface Court 4**

**10.1 Resurface existing court & Upgrade Existing Light**

10.1.1	Resurface existing court including grind off top layer completely, new asphalt pavement to top layer, new top coating and new line marking	466	m2	100.00	46,600		46,600
10.1.2	Builder's prelim & margin	12	%	46,600.00	5,590		5,590
<b>1</b>	<b>Resurface existing court &amp; Upgrade Existing Light</b>						<b>52,190</b>
<b>10</b>	<b>Resurface Court 4</b>						<b>52,190</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**11 Contingency**

**11.1 Design Contingency**

11.1.1	Design Contingency	3.5	%	1,513,450.00	52,970		52,970
<b>1</b>	<b>Design Contingency</b>						<b>52,970</b>

**11.2 Construction Contingency**

11.2.1	Construction Contingency	5	%	1,566,420.00	78,320		78,320
<b>2</b>	<b>Construction Contingency</b>						<b>78,320</b>
<b>11</b>	<b>Contingency</b>						<b>131,290</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**12 Professional Fees**

**12.1 Professional Fee**

12.1.1	Professional Fee	1	Sum	109,121.00	109,121		109,121
12.1.2	Additional Fee for stage 2 as per Site Email dated 26/01/2022	1	Sum	50,560.00	50,560		50,560
<b>1</b>	<b><u>Professional Fee</u></b>						<b><u>159,681</u></b>
<b>12</b>	<b>Professional Fees</b>						<b>159,681</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**13 Escalation**

**13.1 Escalation**

13.1.1	<u>Escalation</u>				0		0
13.1.2	Current Index Jan 2022	204					
13.1.3	Index in Jan 2023	219					
13.1.4	Escalation	7.6	%	1,513,450.00	115,050		115,050
<b>1</b>	<b><u>Escalation</u></b>						<b><u>115,050</u></b>
<b>13</b>	<b>Escalation</b>						<b>115,050</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**14 New Netball Court Fence**

**14.1 New Chain link Fencing**

14.1.1	New Chain link fencing including post, footing and PVC coated Chain link fence (assumed 2100mm high)	37	m	155.00	5,735		5,735
14.1.2	Builder's prelim & margin	12	%	5,735.11	690		690
<b>1</b>	<b><u>New Chain link Fencing</u></b>						<b>6,425</b>
<b>14</b>	<b>New Netball Court Fence</b>						<b>9,015</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**15 Remove transportable**

**15.1 Remove transportable**

15.1.1	Remove transportable	1	Sum	2,500.00	2,500		2,500
15.1.2	Builder's prelim & margin	12	%	2,500.00	300		300
<b>1</b>	<b>Remove transportable</b>						<b>2,800</b>
<b>15</b>	<b>Remove transportable</b>						<b>3,930</b>

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>16</b>	<b>2 new courts and new court lighting , refurbish 2 existing court and lighting,and new fence</b>						
<b>16.1</b>	<b>Resurface existing court &amp; Upgrade Existing Light</b>						
16.1.1	Resurface existing court including lightly grind off top layer, new top coating, new line marking	931	m2	15.00	13,965		13,965
16.1.2	Upgrade existing court lighting (assumed total 2 lights tower per court)	4	No	90,000.00	360,000		360,000
16.1.3	Builder's prelim & margin	12	%	373,965.00	44,880		44,880
<b>1</b>	<b><u>Resurface existing court &amp; Upgrade Existing Light</u></b>						<b><u>418,845</u></b>
<b>16.2</b>	<b>New Netball Court &amp; Court lighting</b>						
16.2.1	New netball court including sub-base, asphalt pavement, acrylic top coat, line marking	930	m2	150.00	139,500		139,500
16.2.2	New net ball court lighting (assumed 2 light pole per court and 100 lux luminaire)	4	No	90,000.00	360,000		360,000
16.2.3	Builder's prelim & margin	12	%	499,500.00	59,940		59,940
<b>2</b>	<b><u>New Netball Court &amp; Court lighting</u></b>						<b><u>559,440</u></b>
<b>16.3</b>	<b>New Chain link Fencing</b>						
16.3.1	New Chain link fencing including post, footing and PVC coated Chain link fence (assumed 2100mm high)	94	m	155.00	14,570		14,570
16.3.2	Builder's prelim & margin	12	%	14,570.28	1,750		1,750
<b>3</b>	<b><u>New Chain link Fencing</u></b>						<b><u>16,320</u></b>
<b>16</b>	<b>2 new courts and new court lighting , refurbish 2 existing court and lighting,and new fence</b>						<b>994,605</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**17 Modify existing carpark and new crossover**

**17.1 Modify car parking**

17.1.1	Modify bitumen car park including asphalt pavement, kerbing, car wheel stopper, line marking	216	m2	100.00	21,600		21,600
17.1.2	New cross over	11	m2	150.00	1,640		1,640
17.1.3	Upgrade carpark lighting	1	Sum	5,000.00	5,000		5,000
17.1.4	Builder's prelim & margin	12	%	28,239.50	3,390		3,390
<b>1</b>	<b>Modify car parking</b>						<b>31,630</b>
<b>17</b>	<b>Modify existing carpark and new crossover</b>						<b>31,630</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**18 Contingency**

**18.1 Design Contingency**

18.1.1	Design Contingency	3.5	%	1,026,234.78	35,920		35,920
<b>1</b>	<b>Design Contingency</b>						<b>35,920</b>

**18.2 Construction Contingency**

18.2.1	Construction Contingency	5	%	1,062,154.78	53,110		53,110
<b>2</b>	<b>Construction Contingency</b>						<b>53,110</b>
<b>18</b>	<b>Contingency</b>						<b>89,030</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**19 Professional Fees**

**19.1 Professional Fee**

19.1.1	Additional Fee for stage 3 as per Site Email dated 26/01/2022	1	Sum	25,000.00	25,000		25,000
<b>1</b>	<b>Professional Fee</b>						<b>25,000</b>
<b>19</b>	<b>Professional Fees</b>						<b>25,000</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**20 Escalation**

**20.1 Escalation**

20.1.1	<u>Escalation</u>				0		0
20.1.2	Current Index Jan 2022	204					
20.1.3	Index in Jan 2024	229					
20.1.4	Escalation	12.5	%	1,026,234.78	127,840		127,840
<b>1</b>	<b><u>Escalation</u></b>						<b>127,840</b>
<b>20</b>	<b>Escalation</b>						<b>127,840</b>
							<b>4,606,253</b>

Source of funds	confirmed funding amount	pending funding	%	Funding type	scheduled date of gift to Shire	responsible stakeholder	purpose of funding method in grant	reporting requirements	responsible officer/club	acquired requirements	Grant acknowledgment requirements
Shire of Chitting			0.0%	Cash (loan)	secured	Shire hold ultimate responsibility for final project costs					
MIRIG - CRC, MNC, CDC, Muchea Cricket	\$48,830		1.8%	Cash (in sponsorship)		held in MUCKEA SPORTING FUND ACCOUNT as at 25/10/20 includes funding contributions from Barnidge Bank (48,830)	See CSRF Grant requirements	as per CSRF grant	Project Manager / CDC	as per CSRF grant	
MIRIG - CRC, MNC, CDC, Muchea Cricket		\$22,954	1.8%	volunteer labour		held in MUCKEA SPORTING FUND ACCOUNT as at 25/10/20 includes funding contributions from Australian Financial Services (20,000), Barnidge Bank (referral program (2,950))	See CSRF Grant requirements	log of hours and activities required for CSRF grant acquired	Project Manager / CDC	as per CSRF grant	
Federal Government - Stronger Communities Fund	\$12,000		0.6%	cash		held in MUCKEA SPORTING FUND ACCOUNT as at 25/10/20 includes funding contributions from Australian Financial Services (20,000), Barnidge Bank (referral program (2,950))					
State Government - CSRF Forward Planning Grant	\$300,000		6.1%	cash	2022/23: \$75,000 2023/24: \$225,000	Funds held by Shire as applicant	Construction of a pavilion at Muchea Oval	Monthly progress reports	Project Manager / CDC	15 June 2023 see apply for 25% payment on signing of major works contract. 25% claim at completion of project. 50% claim once 50% of expenditure reached	signage acknowledging the State's Contribution must be erected during construction - any other signage erected promoting the project or informing the public must include the State's logo (available from the CDC, website) and acknowledge the contribution by the State. Signage should be sent to CDC for approval prior to erection. The State may choose to provide signage for erection upon project completion. If so, this should be displayed in a prominent place for at least three years from erection. Should the organization choose to erect their own signage or plaque, it must display the State's logo and be approved by CDC prior to erection. The Minister for Sport and Recreation and a representative from CDC must be invited to any official opening or media opportunities regarding the Project. Verbal acknowledgements in public announcements and public written materials.
State Government - Darren West Election Contest	\$150,000		7.0%	cash		held in MUCKEA SPORTING FUND ACCOUNT	commitment outlined in CSRF grant. Forfeited on successful building tender invite to utilise other contractors/ suppliers	detailed records required as part of CSRF grant acquired	Project Manager / CDC	Muckea sporting club	as per CSRF grant
Local Business donated materials		\$48,830		materials							
ATL - AFF grant	\$100,000		2.0%	cash	at completion	Shire to final project costs	construction of new clubrooms and (dependencies to enhance football participation and provide the local community with quality sporting and recreation infrastructure. In particular, the project will ensure adequate facilities are provided to meet the growth of female participation.	acquired at completion of project	Shire - CDC	Completion of an online sign-off form via SecurityForms that includes an invoice made out to AFL Application Number 86-AFFP_21005 to be included on invoice verification that the project has been completed as per	The AFL are appropriately acknowledged in any formal publicity or events regarding the project. That the State/Territory body is involved in the development of the details design and sign off the final plans (include the involvement in Affnet Control Group)
WACA grant	\$30,000		0.6%	cash		funds held by Chitting Junior Cricket Club	Pavilion and gender-neutral player change rooms and supporting amenities.	Quarterly reports evidence of funding contributions to project proposed components of the Project must meet requirements within the Guidelines, any changes will require the applicant to gain approval from the WACA	CDC - Leahlan Chitman	100% funding provided upfront 50% and on completion of project	No public announcements, promotion or advertisement about the grant or the project without prior involvement with the WACA and Cricket Australia.
Muckea Sporting Club						Muckea Sporting Club					
<b>Total Project Budget</b>	<b>\$4,946,400</b>										
<b>Total Income</b>	<b>\$480,530</b>										
<b>Shire shortfall</b>	<b>\$4,465,870</b>										

N.B. additional funding included in Shire loan for \$120,000 lighting towers  
total budget \$ 1,998,251



project description	source	type	open	funding limits	considerations	grant guidelines	Sport & recreation	
							Plan	implications to other strategic projects
<b>netball court refurbishment</b>	DLSO - CSRF	Small grant	July and Feb rounds	maximum \$100,000 for projects up to \$300,000	low likelihood of funding - maintenance and resurfacing considered responsibility of facility owner	fund new or upgraded facilities which will maintain or increase physical activity, or result in a more rational use of facilities.	23/2024	
	DLSO - Club Night Lights program	floodlighting infrastructure	June	The maximum grant offered for standard grant applications is one third of the total estimated project cost (excluding GST) up to a maximum grant of \$1 million.	will not be considered for recurrent maintenance. A life cycle cost analysis must be provided for projects with a total cost over \$500,000.	fund new or upgraded facilities which will maintain or increase physical activity and participation through the provision of floodlighting.		
<b>netball court redevelopment</b>		Small grant or Annual Grant	July and Feb rounds June	maximum \$100,000 for projects up to \$300,000 Minimum grant of \$100,001 Maximum grant of \$166,666 for projects between \$300,000- \$500,000	targets projects involving a detailed level of planning		23/2024	
	DLSO - CSRF	floodlighting infrastructure	June	The maximum grant offered for standard grant applications is one third of the total estimated project cost (excluding GST) up to a maximum grant of \$1 million.	will not be considered for recurrent maintenance. A life cycle cost analysis must be provided for projects with a total cost over \$500,000.	fund new or upgraded facilities which will maintain or increase physical activity and participation through the provision of floodlighting.		
<b>Clubrooms / function centre</b>	Lotterywest	Inclusive thriving community	year round	no upper limit and seek co-contributions up to 100% of eligible project costs except for local governing bodies where grant funding will be up to 50% of eligible projects costs. Your grant request must be between \$2500 and \$20,000.		must have a clear community benefit within a Community Investment Framework	21/2022	Lower Chiltering Community Centre Djaj Djaj Ridge Bindoon Mountain Bike Park
	Stronger Communities	small capital projects	Nov - January	Funding allocations for the LRCI Program are determined by formula and take into account road length and population.		Federal funding offered by local MP through competitive round.		Lower Chiltering Community Centre Bindoon Mountain Bike Park
	Local Roads and Community Infrastructure		January			LRCI Program Phase 3, with projects under the Program to be delivered by 30 June 2023.		

**MUCHEA RECREATION CENTRE REFERENCE (MRC) GROUP****MINUTES**

Monday, 25 October 2021

Muchea Fire Station

Chittering Street, Muchea

**1. DECLARATION OF OPENING OF MEETING - Cr Ross**

Meeting open: 6:05pm

We wish to acknowledge the traditional custodians of the land we are meeting on, the Yued people. We would like to pay respect to the Elders of the Nyoongar nation, past and present, who have walked and cared for the land, we acknowledge and respect their continuing culture, and the contributions made to this region.

Welcome to Cr Aaron King, newly appointed Shire President.

**2. RECORD OF ATTENDANCE / APOLOGIES****2.1 MEMBERSHIP**

Membership of the Reference Group shall consist of:

- o The elected representative appointed to the Muchea Hall User Group (MHUG)
- o Project Manager;
- o 4 representatives of the existing Muchea Hall User Group – 1 (Cricket) 1 (Football) 1 (Netball) 1 (Judo);
- o 3 independent Community representatives and;
- o Other intermittent stakeholders as determined and invited by the Project Manager.

**2.2 Attendance**

Reference Group Members:

Shire: Cr Ross (Chairperson), Nathan Gough (Project Manager), Lisa Kay (minute taker)

Community representatives: Simon Cox, Brian Chipchase,

MHUG representatives: Liz Pugsley (Netball), Will Grimshaw (Football), Lachlan Chilman, (Cricket)

Architect: Steven Hart, Naomi McCabe (Site Architecture Studio)

Invited stakeholder: Cr Aaron King

Also in attendance Cr Kylie Hughes, on behalf of netball club

**2.3 Apologies**

Louise Yates (6pm commencement time does not suit her)

**3. DISCLOSURE OF INTEREST**

It is noted that the club representatives of Chittering Junior Football, Chittering Junior Cricket, Muchea Senior Cricket, Muchea Netball Club, and Muchea Judo Club have an inherent interest in this project as existing users of this facility.

#### 4. PREVIOUS MINUTES

Simon advised that he did not receive previous minutes.

Consensus by all present that these are a true record.

#### 5. ARCHITECT

Recap from last meeting.

Arranged for quantity surveyor to draft cost estimate on simple drawings and design. To date the QS has been largely done on a m<sup>2</sup> estimate. Since the last meeting have been working on a more detailed design to prove up spaces and the size of the building as well as defining the structure. The work undertaken since the last meeting has enabled structural and hydraulic input to work through a cost estimate with the quantity surveyor. Geo tech survey to date is indicating the soil conditions are pretty good with a reduction in the ground system costs previously accounted for, as it should not require 600mm sand fill under slabs, and no special footing/ structural design.

ATU and waste water watering area.

Two key allowances that needed consideration were the water and subsequent cost of filtration system. Results from the water quality testing indicate a less expensive filtration system is required than allowed for in the previous estimate.

Other service systems

Instantaneous gas system would be the advice of the Architect. Bushfire water systems are still to be followed up with Site Architecture Studio seeking advice on these.

Cost Estimate

Refer to attached 1

1. To keep costs down architects have excluded any new landscaping (turf and irrigation) but have allowed for paving between the carpark and the building
2. Fit out of the bar (benches, glass washers etc.) has been excluded
3. Contingencies have been included (4% design and 5% construction) which equate to more than the Shire's original \$100,000 allowance however given the current market we recommended that sufficient is allowed to cover unexpected costs
4. Escalation has been excluded
5. Refer to the estimate for other exclusions

Had input from mechanical consultations to do heat load calculations. Aircon system has been considered through a ducted refrigerated system.

Portico areas have been incorporated at entrance and directly above canteen. Covered areas could be extended at later stages. Concerns expressed by Netball representatives that there is limited covered area for viewing netball. It is the considered opinion of the Architect that there is quite a good connection for viewing of netball courts and with the redevelopment of the courts this will enable 3 metres around all of them, which they do not currently have.

Cr Hughes raised maintenance of existing western court – Cr Ross outlined that this is a maintenance issue for the Shire to address, rather than an architect issue for discussion as part of this meeting.

Discussion over the provision for counter lever roof to the terraced spectator areas. At present the proposed pavilion area is about 3m. This could extend over the terraced areas, however if the intention is to not have columns then the cantilever cannot extend much more than it is currently proposed. Architects to discuss with the structural engineer, however it is noted that any extension is not currently accounted for in the budget. Proposed cantilever is not lined. Structure will be well formed and aesthetically pleasing. Proposal for translucent roof sheeting to draw more natural light into the pavilion area would need to be durable to accommodate some natural light and wear and tear from stray balls. Cr King suggested that a simple post structure might be a compromise for a larger pavilion area. MRC may need to consider what can be compromised on to meet budget.

Cr King asked all user representatives if their user requirements have been met. Also expressed a desire to have the user requirements clearly defined as these would normally be signed off at the commencement of the project. Discussion outlined that the process to date has involved extensive conversations and input from the current users and community representatives to ensure that the facility meets user requirements. Architects Steve and Naomi also pointed out that at the commencement of their involvement in this project, they were presented with concept plans that had been developed by the users of which were endorsed by Council. These concept plans informed the initial stages of the project.

Cr King expressed that there is no question that Council fully supports the project but is concerned that we consider what is essential and what could be considered gold plating aspects that could be better utilised elsewhere. Also need to ensure that we consider all users of the facility.

Architect Steven outlined that they have utilised the design brief provided by Clubs and have considered this in line with architectural experience and proposed changes to enhance the usability of the facility. This led to a loosely prepared Masterplan that improved user ability and connectivity. Steve expressed that ALF and Cricket held a strong drive for users to view activities on the oval. Netball also held a strong vision for connectivity to the courts and viewing areas. This sentiment was shared by all reference group members. User group requirements have been addressed and played a role in the design solutions that have been presented to date. It is important from all stakeholders' perspective that the clubs and users have ownership of the project that is produced. Steven outlined that he does not believe there has been competing ideas by Shire or users. What did become evident through investigations was the requirement for an additional 2 change rooms to enable the provision of unisex games. The original brief only contained 2 change rooms.

Reference Group members expressed that they have been really happy with the process so far and resulting in a multi-purpose approach to the facility.

Cr Hughes expressed that the current positioning of the facility does not meet any of the Netball club's needs. With only 3 courts and one of these requiring maintenance to bring up to capacity, netball will be heavily impacted, especially with another club utilising the facility and requiring competition standards. General discussion highlighted that the redevelopment of the Netball courts is not part of the building development budget (\$2.7m) however, it is agreed by the reference group that the courts are fundamental to the overall redevelopment of the facility. The Shire should consider the netball court refurbishment/redevelopment as a staged approach to the overall site redevelopment.

Cr King – Council has only certain amount of capital to cover all projects. Have to spend money wisely. If these costs don't come back in budget will need to find some compromise. Due to the shortage of resources and materials and related escalation, there is considerable risk that the total project cost will exceed budget. If building costs go up, will need to compromise.

**Outcome: Cr King expressed that we won't know true costs until we go out to tender and should we exceed budget it is his opinion that we have 3 options:**

- 1. Resolve not to proceed with the project**
- 2. Re-design the project to reduce the scale of the project to reduce the cost to within budget. This will cause considerable delay.**
- 3. Approve an additional contingency amount - suggest 30% of total budget.**

Site Architecture Studio are confident that the QS is based on rates that are anticipated at time of tender. Even with an experienced Quantity surveyor who has achieved good results in the past, it is a difficult science and there are risks in design development and documentation. With this in mind they have always envisaged another 2 estimates before we go to tender to test for further issues prior to going to tender.

Cr King – expressed that in order to prevent delays it would be wise to agree on a level of contingency before we go to tender. Believe that Council should consider the contingency as part of risk mitigation as a result of market contentions. Council need to have discussions as to how they will handle the risks.

It has always been the intention of the Architect and the Reference group that we keep to budget and where we have considered ways to massage the project down to work within the budget. However we are not in control of external factors i.e. steel fab, trades etc. Council may need to stretch to accommodate the contingency. View that it would be undesirable to scale back as this has already been done. Council would need to consider whether they are willing to commit further Shire funds as contingency for the project.

Cr King would like to see full project budget - exclusion and inclusion and what is in Architect budget and what Shire responsibility is. Being very mindful that any published costs are the total costs and include any excluded on costs borne by the Shire.

Cr Hughes asked whether the original brief has gone beyond what was originally proposed. Site Architecture Studio and Shire Officers outlined that other than the inclusion of the 2 change rooms, which as previously discussed, were identified as a critical need that was overlooked in the original brief, the design brief has not changed.

Draft elevations and plans

Refer to attachment 2

Steven outlined that there have been no changes to floor plans as determined at previous meetings. Have focussed on the external form of the building. The proposed form aims to sit quite well in landscape and reflect architecture in the area, keeping costs in mind.

The external cladding was discussed in relation to the building not looking like a hay shed. Type of cladding proposed is higher profile than normally used in sheds along with the composition of compressed fibre sheeting and glass, means it won't look like a shed. Proposed differentiation of the cladding used, and colour, to depict the different portions of the building with a view to creating architectural interest to the change room entry areas. Fibre rock is proposed for the internal areas of the change rooms to ensure longevity related to the inherent wear and tear in these areas. This is a common product which has been utilised in schools and other recreation centres. If this product is not available, would utilise a product that has similar capabilities to maintain hard wearing.

The entire structure is proposed as a steel frame building with cladding on the outside. Full height tiling in all wet areas. Floors in change rooms concrete. Wet areas will be tiled and carpet in multipurpose area. – may need to work through this to incorporate a vinyl flooring to accommodate Judo.

**Outcome:**

**Require more discussion to understand the provisioning of the flooring to accommodate these needs. Seek solutions that provide a flexible space that is suitable to everyone. Potential for timber vinyl planks.**

## Next steps

Stephen – the full consultant group will consider the design development through a sharper lens and develop further detail to the plans. At end of this stage will do another QS cost report including more specific input from consultants with regard to services.

They will also commence the contract documentation phase producing construction detail including finishes of building, writing specs etc. This will enable a pre-tender estimate. Expect QS to be pretty accurate and Site Architecture Studio have an expectation that this will be a little conservative. In their experience they haven't been the cheapest tender at market. In the original project brief and established timeframes it was expected to go to tender in December. We are behind program as we have been working to get it right. Aside from the Christmas period and, with no further delays, would expect to go to tender in February.

**Outcome: The project will be on hold to enable Shire staff to seek direction from Council with regard to the budget. The following items will be updated and submitted to the November Ordinary Council Meeting:**

- **Nathan to provide Council with an up to date total project budget outlining inclusions/ exclusions, list and cost breakdown of all other materials and services to be provided by SOC as part of the project, any proposed future staging and an up to date funding strategy including clubs contributions.**
  - **Stage 1: Construction of the Muchea Recreation centre**
  - **Stage 2: Demolition of Muchea Town Hall**
  - **Stage 3; Upgrade of the Muchea Netball Courts**
- **It is acknowledged that any delays will impact on the capacity of Site Architecture Studio to meet agreed timeframes.**
- **Nathan to document the contracting strategy including in-kind costs as this will be required for the tendering process.**

## 6. NATHAN PROJECT UPDATE

### Netball courts

As discussed previously the rather than turn this into a secondary project that impacts this budget, consider the netball courts as an incidental cost arising from this project and be put to Council as a future funded Stage 3 aspect of the project. This stage would propose 4 court redevelopment and upgrades.

### Liquor Licence

Liquor licensing will be considered in line with the governance model for the facility. Brian has met with Liquor Licencing and they appear to be comfortable with the entire interior being licenced (which would be needed for functions), with restricted areas being used when club room is in use.

## 7. NEXT MEETING

Next meeting to be advised, but will be after the November OCM.

## 8. CLOSURE: 7:57pm

## Cost Plan Summary

Project: Site Architecture Studio

Details: 211020\_Schematic Design Cost plan

Building: Muehea Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Total
1	BUILDING 1 - CHANGING ROOM	223	m2	3,258.99	726,754
2	BUILDING 2 - COMMUNITY CENTRE	465	m2	2,596.26	1,207,260
3	LANDSCAPE TURFING	716	m2	0.00	0
4	BREAKOUT & VIEWING AREA	681	m2	270.33	184,045
5	EXTERNAL SERVICES	2,206	m2	108.45	239,280
	<b>TOTAL ESTIMATED CONSTRUCTION COST</b>	<b>2,206</b>	<b>m2</b>	<b>1,068.43</b>	<b>2,357,339</b>
6	DESIGN CONTINGNECY	2,206	m2	42.74	94,300
7	CONSTRUCTION CONTINGENCY	2,206	m2	53.44	117,900
8	PROFESSIONAL FEES	2,206	m2	90.65	200,000
9	ESCALATION (EXCLUDED)	2,206	m2	0.00	0
	<b>TOTAL ESTIMATED PROJECT COST</b>	<b>2,206</b>	<b>m2</b>	<b>1,255.26</b>	<b>2,769,539</b>
	<b><u>EXCLUSION</u></b>				
10	Carpark				
11	Shed				
12	Court				
13	Playground				
14	Covered breakout - Fully Covered				
15	Forecourt / Netball viewing - 50% Covered				
16	Netball viewing - 50% Covered				
17	Social room breakout - 50% Covered				
18	Public Art				
19	Contingency				
20	Escalation				
21	Professional Fees				
22	Commissioning, relocation costs & disbursements				
23	Latent Conditions				
24	Turf and landscape				

Project: Site Architecture Studio

Details: 211020\_Schematic Design Cost plan

Building: Mueha Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 BUILDING 1 - CHANGING ROOM</b>							
<b>1.1 Substructure</b>							
1.1.1	Allowance for concrete slab and thickening including excavation, formwork and reinforcement	223.14	m2	150.00	33,471		33,471
<b>1</b>	<b>Substructure</b>						<b>33,471</b>
<b>1.2 Columns</b>							
1.2.1	C1 - 89x89x5SHS	0.79	t	10,000.00	7,900		7,900
1.2.2	Allowance for base plate with bolts	17	No	150.00	2,550		2,550
1.2.3	Allowance for loose fittings and connection (15%)	0.12	t	10,000.00	1,185		1,185
1.2.4	Allowance for steel treatment	0.91	t	1,000.00	909		909
<b>2</b>	<b>Columns</b>						<b>12,544</b>
<b>1.3 Roof</b>							
1.3.1	Roof framing						
1.3.2	B2 - 150x150x6SHS	0.59	t	10,000.00	5,900		5,900
1.3.3	BR1 - 101x3.2CHS	0.23	t	10,000.00	2,300		2,300
1.3.4	Outrigger 150x100x4RHS	0.11	t	10,000.00	1,100		1,100
1.3.5	R1 - 200UB25	0.52	t	10,000.00	5,200		5,200
1.3.6	R2 - 150PFC	0.64	t	10,000.00	6,400		6,400
1.3.7	WB1 - 89x89x5SHS	0.38	t	10,000.00	3,800		3,800
1.3.8	WH1 - 89x89x5SHS	0.52	t	10,000.00	5,200		5,200
1.3.9	WH2 - 150x100x4RHS	0.62	t	10,000.00	6,200		6,200
1.3.10	Allow 15% for loose fitting and connection	0.54	t	10,000.00	5,415		5,415
1.3.11	Allow for surface treatment	3.61	t	1,000.00	3,610		3,610
1.3.12	Allow for bridging and purlins	529	m	30.00	15,877		15,877
1.3.13	Roof covering						
1.3.14	Metal roof covering (assumed Corrugated sheet)	314	m2	65.00	20,410		20,410
1.3.15	Allowance for insulation	314	m2	15.00	4,710		4,710
1.3.16	Miscellaneous						
1.3.17	Roof flashing and drainage	314	m2	50.00	15,700		15,700
<b>3</b>	<b>Roof</b>						<b>101,822</b>
<b>1.4 External Wall</b>							
1.4.1	Allow for lightweight wall including metal cladding and framing	143.69	m2	480.00	68,971		68,971
1.4.2	Allow for lightweight wall including pre-finish FC board and framing	111.33	m2	270.00	30,059		30,059
<b>4</b>	<b>External Wall</b>						<b>99,030</b>

Project: Site Architecture Studio

Details: 211020\_Schematic Design Cost plan

Building: Mueha Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 BUILDING 1 - CHANGING ROOM (Continued)</b>							
<b>1.5 External Door</b>							
1.5.1	Single solid timber door including frame, hardware and painting	8	No	1,700.00	13,600		13,600
1.5.2	Double metal door including frame and hardware	2	No	2,000.00	4,000		4,000
1.5.3	Allow for door signage	10	No	150.00	1,500		1,500
<b>5</b>	<b>External Door</b>						<b>19,100</b>
<b>1.6 Window</b>							
1.6.1	Allowance for window	7	m2	650.00	4,550		4,550
<b>6</b>	<b>Window</b>						<b>4,550</b>
<b>1.7 Internal Screen and Borrow Light</b>							
1.7.1	Toilet cubicle / shower partition including door and hardware	16	No	1,750.00	28,000		28,000
1.7.2	Toilet cubicle door including hardware	4	No	800.00	3,200		3,200
<b>7</b>	<b>Internal Screen and Borrow Light</b>						<b>31,200</b>
<b>1.8 Internal Wall</b>							
1.8.1	Moisture resistance plasterboard both sides on steel stud framing including insulation	133.07	m2	195.50	26,015		26,015
1.8.2	Plasterboard both sides on steel stud framing including insulation	20.86	m2	170.50	3,557		3,557
1.8.3	1 layer plasterboard and 1 layer moisture resistance plasterboard each side on steel stud framing including insulation	181.51	m2	185.50	33,670		33,670
1.8.4	Moisture resistance plasterboard bulkhead (above 3.5m height)	15.77	m2	211.00	3,327		3,327
<b>8</b>	<b>Internal Wall</b>						<b>66,569</b>
<b>1.9 Internal Door</b>							
1.9.1	Single solid door including frame, hardware and paint finish	5	No	1,525.00	7,625		7,625
<b>9</b>	<b>Internal Door</b>						<b>7,625</b>
<b>1.10 Wall Finishes</b>							
1.10.1	Allow selected wall tiles including waterproofing	202.01	m2	140.00	28,281		28,281
1.10.2	Allowance for splashback to First Aid room	1	Sum	600.00	600		600
1.10.3	Painting to wall	460.36	m2	20.00	9,207		9,207
<b>10</b>	<b>Wall Finishes</b>						<b>38,089</b>
<b>1.11 Floor Finishes</b>							
1.11.1	Allow fully vitrified ceramic floor tile, R12 slip resistance rating	62.99	m2	140.00	8,819		8,819

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Building: Muchea Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 BUILDING 1 - CHANGING ROOM (Continued)</b>							
<b>1.11 Floor Finishes (Continued)</b>							
1.11.2	Fully ceramic skirting tile, 150mm high	218.41	m	20.00	4,368		4,368
1.11.3	Allowance for waterproofing	63	m2	40.00	2,520		2,520
1.11.4	Linear drain	8.17	m	250.00	2,043		2,043
1.11.5	Sealed concrete flooring	151.74	m2	40.00	6,070		6,070
1.11.6	Allow for Vinyl flooring to First Aid	9	m2	80.00	720		720
1.11.7	Allowance for coved skirting	9.00	m2	35.00	315		315
<b>11</b>	<b>Floor Finishes</b>						<b>24,854</b>
<b>1.12 Ceiling Finishes</b>							
1.12.1	Flushed plasterboard suspended ceiling including paint	49.39	m2	100.00	4,939		4,939
1.12.2	Moisture resistant plasterboard suspended ceiling including paint	173.75	m2	110.00	19,113		19,113
1.12.3	Soffit lining paint finish	52.30	m2	75.00	3,923		3,923
1.12.4	Allowance for shadowline angle trim	266.25	m	10.00	2,663		2,663
1.12.5	Allowance for access panel	1	Sum	1,500.00	1,500		1,500
<b>12</b>	<b>Ceiling Finishes</b>						<b>32,137</b>
<b>1.13 Sanitaryware and fitments</b>							
1.13.1	<u>Built in joinery</u>						
1.13.2	Timber slat seat including clothes rail hook	53.95	m	300.00	16,185		16,185
1.13.3	No allowance for locker						Excluded
1.13.4	Allow built in vanity bench with cabinet at First Aid	2.70	m	750.00	2,025		2,025
1.13.5	<u>Changeroom/Umpire/Amenities</u>						
1.13.6	Toilet roll holder	10	No	125.00	1,250		1,250
1.13.7	Soap dispenser	10	No	180.00	1,800		1,800
1.13.8	Paper towel dispenser	10	No	200.00	2,000		2,000
1.13.9	Mirror	10	No	350.00	3,500		3,500
1.13.10	Grabrail set	6	No	650.00	3,900		3,900
1.13.11	Coat hook	32	No	40.00	1,280		1,280
1.13.12	Shelf	2	No	650.00	1,300		1,300
1.13.13	<u>First Aid</u>						
1.13.14	Soap dispenser	1	No	180.00	180		180
1.13.15	Paper Towel dispenser	1	No	200.00	200		200
1.13.16	Mirror	1	No	350.00	350		350
1.13.17	Coat hook	2	No	40.00	80		80
1.13.18	<u>Sanitary fixtures</u>						

Project: Site Architecture Studio

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Building: Mueha Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 BUILDING 1 - CHANGING ROOM (Continued)</b>							
<b>1.13 Sanitaryware and fitments (Continued)</b>							
1.13.19	Water cistern	10	No		0		Incl in Hydraulic services
1.13.20	Shower rose	10	No		0		Incl in Hydraulic services
1.13.21	Wall basin	10	No		0		Incl in Hydraulic services
1.13.22	First aid basin	1	No		0		Incl in Hydraulic services
1.13.23	Cleaner trough	1	No		0		Incl in Hydraulic services
1.13.24	<u>Miscellaneous</u>						
1.13.25	Allowance for fire extinguisher and blanket	1	Sum	1,000.00	1,000		1,000
<b>13</b>	<b><u>Sanitaryware and fitments</u></b>						<b>35,050</b>
<b>1.14 Hydraulics Services</b>							
1.14.1	Allowance for hydraulics services (based on Hydraulic consultant's est. dated 20/10/21)						
1.14.2	- Fixtures and tapware	1	Sum	32,597.50	32,598		32,598
1.14.3	Property sewer, wastes and vents	1	Sum	7,605.00	7,605		7,605
1.14.4	- Cold water services	1	Sum	4,095.00	4,095		4,095
1.14.5	- Hotwater services and units	1	Sum	15,600.00	15,600		15,600
1.14.6	- LP Gas services	1	Sum	6,337.50	6,338		6,338
1.14.7	- Grease trap	1	Sum	9,750.00	9,750		9,750
1.14.8	- Mechanical drainage	1	Sum	1,950.00	1,950		1,950
1.14.9	Allowance for builder's work	1	Sum	7,790.00	7,790		7,790
<b>14</b>	<b><u>Hydraulics Services</u></b>						<b>85,725</b>
<b>1.15 Electrical Services</b>							
1.15.1	Based on Electrical estimate dated 15/10/21	1	Sum	76,400.58	76,401		76,401
<b>15</b>	<b><u>Electrical Services</u></b>						<b>76,401</b>
<b>1.16 Mechanical Services</b>							
1.16.1	Based on Mech estimate dated 15/10/21	1	Sum	58,519.59	58,520		58,520
<b>16</b>	<b><u>Mechanical Services</u></b>						<b>58,520</b>
<b>1</b>	<b>BUILDING 1 - CHANGING ROOM</b>						<b>726,685</b>

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Building: Mueha Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**2 BUILDING 2 - COMMUNITY CENTRE****2.1 Substructure**

2.1.1	Allowance for concrete slab and thickening including excavation, formwork and reinforcement	465	m2	150.00	69,677		69,677
<b>1</b>	<b>Substructure</b>						<b>69,677</b>

**2.2 Columns**

<b>Steel Columns</b>							
2.2.1	C1 - 89 x 89 x 5.0 SHA	1.02	t	10,000.00	10,200		10,200
2.2.2	C2 - 150 x 150 x 5.0 SHS	0.32	t	10,000.00	3,200		3,200
2.2.3	C3 - 150 x 100 x 6.0 RHS	0.48	t	10,000.00	4,800		4,800
2.2.4	Baseplate	33	No	150.00	4,950		4,950
2.2.5	Allowance for loose and attached connection	0.27	t	10,000.00	2,730		2,730
2.2.6	Allowance for surface treatment	2.09	t	1,000.00	2,093		2,093
<b>2</b>	<b>Columns</b>						<b>27,973</b>

**2.3 Roof**

<b>Roof Steel Structure</b>							
2.3.1	B1 - 89x89x5.0 SHS	0.18	t	10,000.00	1,800		1,800
2.3.2	B2 - 150x150x5.0 SHS	N/A	t	10,000.00	0		0
2.3.3	B3 - 150x100x6.0 RHS	0.78	t	10,000.00	7,800		7,800
2.3.4	R1 - 200UB25	N/A	t	10,000.00	0		0
2.3.5	R2 - 150 PFC	1.43	t	10,000.00	14,300		14,300
2.3.6	BR1 - 101x3.2 CHS	0.51	t	10,000.00	5,100		5,100
2.3.7	BR2 - 139x3.5 CHS	0.68	t	10,000.00	6,800		6,800
2.3.8	BR3 - 75x75x8 EA	0.14	t	10,000.00	1,400		1,400
2.3.9	WB1 - 89x89x5.0 SHS	N/A	t	10,000.00	0		0
2.3.10	WH1 - 89x89x5.0 SHS	0.71	t	10,000.00	7,100		7,100
2.3.11	<b>Truss</b>						
2.3.12	T1 - 150x100x4.0 Horizontal Top	0.34	t	12,000.00	4,080		4,080
2.3.13	T1 - 100x100x4.0 Horizontal Bottom	0.27	t	12,000.00	3,240		3,240
2.3.14	T1 - 75x50x4.0 RHS Diagonal and Vertical	0.60	t	12,000.00	7,200		7,200
2.3.15	T2 - 100x100x4.0 Horizontal Top	0.24	t	12,000.00	2,880		2,880
2.3.16	T2- 200 PFC	0.48	t	12,000.00	5,760		5,760
2.3.17	T2 - 75x50x4.0 RHS Diagonal and Vertical	0.50	t	12,000.00	6,000		6,000
2.3.18	FR1 - 100x100x4.0 Horizontal Top	0.38	t	12,000.00	4,560		4,560
2.3.19	FR1 - 100x100x4.0 Horizontal Bottom	0.38	t	12,000.00	4,560		4,560

## Cost Plan Details Breakdown

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 211020\_Schematic Design Cost plan

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>2 BUILDING 2 - COMMUNITY CENTRE (Continued)</b>							
<b>2.3 Roof (Continued)</b>							
2.3.20	FR1 - 75x50x4.0 RHS Diagonal and Vertical	0.85	t	12,000.00	10,200		10,200
2.3.21	<u>Miscellaneous</u>						
2.3.22	Loose and attached connection	1.27	t	10,000.00	12,705		12,705
2.3.23	Surface treatment	9.74	t	1,000.00	9,741		9,741
2.3.24	<u>Purlin</u>						
2.3.25	B2-Purlin 200x100x4.0 RHS	96	m	100.00	9,600		9,600
2.3.26	B2-Purlin 20019_1000CC	263	m	20.00	5,260		5,260
2.3.27	B2-Purlin Z15019_1000cc	279	m	18.00	5,022		5,022
2.3.28	Allow roof steel structure for link roof	71	m2	196.00	13,916		13,916
2.3.29	<u>Roof Covering</u>						
2.3.30	Metal roof covering (assumed Corrugated sheet)	735	m2	65.00	47,775		47,775
2.3.31	Allowance for insulation	735	m2	15.00	11,025		11,025
2.3.32	Roof flashing and drainage	735	m2	50.00	36,750		36,750
<b>3</b>	<b><u>Roof</u></b>						<b><u>244,573</u></b>
<b>2.4 External Wall</b>							
2.4.1	Allow for lightweight wall including metal cladding and framing	257.77	m2	480.00	123,730		123,730
2.4.2	Allow for fixed glazed wall	104.69	m2	700.00	73,283		73,283
2.4.3	Allow for lightweight wall including pre-finish FC board and framing	54.78	m2	270.00	14,791		14,791
<b>4</b>	<b><u>External Wall</u></b>						<b><u>211,803</u></b>
<b>2.5 External Door</b>							
2.5.1	Single solid timber door including frame, hardware and painting	3	No	1,700.00	5,100		5,100
2.5.2	Double metal door including frame and hardware	1	No	2,000.00	2,000		2,000
2.5.3	Extra over double door including frame and hardware	5	No	1,476.00	7,380		7,380
2.5.4	Allow for door signage	2	No	150.00	300		300
<b>5</b>	<b><u>External Door</u></b>						<b><u>14,780</u></b>
<b>2.6 Window</b>							
2.6.1	Allowance for window	6	m2	650.00	3,900		3,900
<b>6</b>	<b><u>Window</u></b>						<b><u>3,900</u></b>
<b>2.7 Internal Screen and Borrow Light</b>							
2.7.1	Toilet partition including door and hardware	3	No	1,750.00	5,250		5,250

**Project:** Site Architecture Studio  
**Building:** Mueha Recreation Centre

**Details:** 211020\_Schematic Design Cost plan

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>2 BUILDING 2 - COMMUNITY CENTRE (Continued)</b>							
<b>2.7 Internal Screen and Borrow Light (Continued)</b>							
<b>7</b>	<b>Internal Screen and Borrow Light</b>						<b>5,250</b>
<b>2.8 Internal Wall</b>							
2.8.1	Assumed internal wall 2.80m height						
2.8.2	Moisture resistance plasterboard both sides on steel stud framing including insulation	10.89	m2	195.50	2,129		2,129
2.8.3	Plasterboard both sides on steel stud framing including insulation	144.09	m2	170.50	24,567		24,567
2.8.4	1 layer plasterboard and 1 layer moisture resistance plasterboard each side on steel stud framing including insulation	113.04	m2	185.50	20,969		20,969
2.8.5	Allow for operable wall	65.50	m2	500.00	32,750		32,750
2.8.6	Allowance for bulkhead (above 3.5m)	35.84	m2	190.00	6,810		6,810
<b>8</b>	<b>Internal Wall</b>						<b>87,225</b>
<b>2.9 Internal Door</b>							
2.9.1	Single solid door including frame, hardware and paint finish	10	No	1,525.00	15,250		15,250
2.9.2	Allow for door signage	10	No	150.00	1,500		1,500
2.9.3	Allow roller shutter at Kitchen (assumed 2200x900mmH)	2	No	2,100.00	4,200		4,200
2.9.4	Allow roller shutter at Bar (assumed 2760x1500mmH)	3	No	2,500.00	7,500		7,500
2.9.5	Allow roller door at Judo and Furn store	2	No	3,000.00	6,000		6,000
<b>9</b>	<b>Internal Door</b>						<b>34,450</b>
<b>2.10 Wall Finishes</b>							
2.10.1	Allow selected wall tiles including waterproofing	110	m2	140.00	15,340		15,340
2.10.2	Allowance for splashback to Kitchen	1	Sum	2,800.00	2,800		2,800
2.10.3	Painting to wall	586	m2	20.00	11,711		11,711
<b>10</b>	<b>Wall Finishes</b>						<b>29,851</b>
<b>2.11 Floor Finishes</b>							
2.11.1	Tile floor finish						
2.11.2	Allow fully vitrified ceramic floor tile, R12 slip resistance rating	34	m2	140.00	4,722		4,722
2.11.3	Fully ceramic skirting tile, 150mm high	68	m	20.00	1,370		1,370
2.11.4	Allow for waterproofing	34	m2	40.00	1,349		1,349
2.11.5	Vinyl floor finish						
2.11.6	Allowance for Vinly flooring	58	m2	80.00	4,627		4,627
2.11.7	Allowance for coved skirting	20	m2	35.00	707		707

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Details: 211020\_Schematic Design Cost plan

Building: Muchea Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**2 BUILDING 2 - COMMUNITY CENTRE****(Continued)****2.11 Floor Finishes****(Continued)**

2.11.8	Allow for moisture barrier underneath vinyl	58	m2	15.00	868		868
2.11.9	<u>Carpet floor finish</u>						
2.11.10	Allowance for carpet flooring	320	m2	55.00	17,617		17,617
2.11.11	Allowance for skirting	72	m	35.00	2,534		2,534
2.11.12	<u>Concrete floor</u>						
2.11.13	Sealed concrete flooring	36	m2	40.00	1,446		1,446
2.11.14	<u>Entrance Mats</u>						
2.11.15	Allow entrance mats at corridor	1	No	2,000.00	2,000		2,000
<b>11</b>	<b>Floor Finishes</b>						<b>37,240</b>

**2.12 Ceiling Finishes**

2.12.1	Perforated acoustic ceiling at Hall	251	m2	140.00	35,140		35,140
2.12.2	Flushed plasterboard suspended ceiling including paint	168	m2	100.00	16,774		16,774
2.12.3	Moisture resistant plasterboard suspended ceiling including paint	29	m2	110.00	3,229		3,229
2.12.4	Soffit lining paint finish	194	m2	75.00	14,540		14,540
2.12.5	Allowance for shadowline angle trim	287	m	10.00	2,875		2,875
2.12.6	Allowance fo access panel	1	Sum	2,000.00	2,000		2,000
<b>12</b>	<b>Ceiling Finishes</b>						<b>74,557</b>

**2.13 Fitments**

2.13.1	<u>Built in joinery</u>						
2.13.2	Kitchenette bench with cabinet below	3	m	850.00	2,873		2,873
2.13.3	No allowance for Kitchen U shape bench with cabinet below						Excluded
2.13.4	No allowance for bar counter						Excluded
2.13.5	<u>Toilet</u>						
2.13.6	Toilet roll holder	6	No	125.00	750		750
2.13.7	Soap dispenser	5	No	180.00	900		900
2.13.8	Paper towel dispenser	5	No	200.00	1,000		1,000
2.13.9	Mirror	5	No	350.00	1,750		1,750
2.13.10	Grabrail set	1	No	650.00	650		650
2.13.11	Grab bar	2	No	400.00	800		800
2.13.12	Coat hook	6	No	40.00	240		240
2.13.13	Curtain track and curtain	1	No	700.00	700		700

Project: Site Architecture Studio

Details: 211020\_Schematic Design Cost plan

Building: Mueha Recreation Centre

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**2 BUILDING 2 - COMMUNITY CENTRE****(Continued)****2.13 Fitments****(Continued)**

2.13.14	Cistern backrest	1	No				Incl in Hydraulic services
2.13.15	Folding shower seat	1	No				Incl in Hydraulic services
2.13.16	<u>Sanitary fixtures</u>						
2.13.17	Water cistern	6	No				Incl in Hydraulic services
2.13.18	Shower rose	1	No				Incl in Hydraulic services
2.13.19	Wall basin	5	No				Incl in Hydraulic services
2.13.20	Kitchen sink	2	No				Incl in Hydraulic services
2.13.21	Kitchen hand basin	1	No				Incl in Hydraulic services
2.13.22	Urinal	2	No				Incl in Hydraulic services
<b>13</b>	<b>Fitments</b>						<b>9,663</b>

**2.14 Special Equipment**

2.14.1	<u>Coolroom and freezer room</u>						
2.14.2	Coolroom and freezer room door including hardware	2	No	2,550.00	5,100		5,100
2.14.3	Cool room and freezer insulated ceiling panel	16	m2	300.00	4,944		4,944
2.14.4	Cool room and freezer insulated panel	64	m2	300.00	19,161		19,161
2.14.5	Sealed concrete flooring	16	m2	40.00	659		659
2.14.6	No allowance for refrigerator and shelving	Note					
<b>14</b>	<b>Special Equipment</b>						<b>29,864</b>

**2.15 Fire Services**

2.15.1	Not required						
<b>15</b>	<b>Fire Services</b>						<b>0</b>

**2.16 Hydraulics Services**

2.16.1	Allowance for hydraulics services (based on Hydraulic consultant's est. dated 20/10/21)						
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<b>Project:</b> Site Architecture Studio	<b>Details:</b> 211020_Schematic Design Cost plan
<b>Building:</b> Muehea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**2 BUILDING 2 - COMMUNITY CENTRE**

*(Continued)*

**2.16 Hydraulics Services**

*(Continued)*

2.16.2	- Fixtures and tapware	1	Sum	17,552.50	17,553		17,553
2.16.3	Property sewer, wastes and vents	1	Sum	4,095.00	4,095		4,095
2.16.4	- Cold water services	1	Sum	2,205.00	2,205		2,205
2.16.5	- Hotwater services and units	1	Sum	8,400.00	8,400		8,400
2.16.6	- LP Gas services	1	Sum	3,412.50	3,413		3,413
2.16.7	- Grease trap	1	Sum	5,250.00	5,250		5,250
2.16.8	- Mechanical drainage	1	Sum	1,050.00	1,050		1,050
2.16.9	Allowance for builder's work	1	Sum	4,200.00	4,200		4,200
<b>16</b>	<b>Hydraulics Services</b>						<b>46,165</b>

**2.17 Electrical Services**

2.17.1	Based on Electrical estimate dated 15/10/21	1	Sum	158,599.42	158,599		158,599
<b>17</b>	<b>Electrical Services</b>						<b>158,599</b>

**2.18 Mechanical Services**

2.18.1	Based on Mech estimate dated 15/10/21	1	Sum	121,480.41	121,480		121,480
<b>18</b>	<b>Mechanical Services</b>						<b>121,480</b>
<b>2</b>	<b>BUILDING 2 - COMMUNITY CENTRE</b>						<b>1,207,051</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 211020_Schematic Design Cost plan
<b>Building:</b> Muchea Recreation Centre	

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**3 LANDSCAPE TURFING**

**3.1 Landscaping**

3.1.1	No allowance for turf and irrigation	715.52	m2	40.00	28,621		Excluded
<b>1</b>	<b>Landscaping</b>						<b>0</b>
<b>3</b>	<b>LANDSCAPE TURFING</b>						<b>0</b>

Project: Site Architecture Studio

Details: 211020\_Schematic Design Cost plan

Building: Muchea Recreation Centre

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**4 BREAKOUT & VIEWING AREA****4.1 Spectator limestone retaining wall tier seating**

4.1.1	Terraced seating	74.90	m2	700.00	52,430		52,430
4.1.2	Staircase at terraced seating	2	Nos	3,750.00	7,500		7,500
4.1.3	Allow step at grass bank	1	Sum	2,000.00	2,000		2,000
<b>1</b>	<b>Spectator limestone retaining wall tier seating</b>						<b>61,930</b>

**4.2 Breakout and viewing area**

4.2.1	Allowance for concrete slab including excavation, formwork and reinforcement	567	m2	150.00	85,050		85,050
4.2.2	Allow for trowel concrete finish	567	m2	12.00	6,804		6,804
<b>2</b>	<b>Breakout and viewing area</b>						<b>91,854</b>

**4.3 Retaining wall and grass bank**

4.3.1	Retaining wall grass bank	86	m2	350.00	30,261		30,261
<b>3</b>	<b>Retaining wall and grass bank</b>						<b>30,261</b>
<b>4</b>	<b>BREAKOUT &amp; VIEWING AREA</b>						<b>184,045</b>

Project: Site Architecture Studio

Details: 211020\_Schematic Design Cost plan

Building: Muehea Recreation Centre

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**5 EXTERNAL SERVICES****5.1 External Services**

5.1.1	<u>Water Treatment Works</u>						
5.1.2	Aquarius 18KL ATU and flatbed leach drains	1	Sum	132,800.00	132,800		132,800
5.1.3	RO, filtration and storage tank with chlorine dosing	1	Sum	56,480.00	56,480		56,480
5.1.4	<u>Electrical</u>						
5.1.5	Building main switchboard for the new clubroom	1	Sum	15,000.00	15,000		15,000
5.1.6	Building main switchboard for the new changeroom	1	Sum	5,000.00	5,000		5,000
5.1.7	Submain cabling for the new buildings	1	Sum	10,000.00	10,000		10,000
5.1.8	Underground trenching and conduits	1	Sum	15,000.00	15,000		15,000
5.1.9	Relocation of the Telstra lead in, including underground trenching and conduits	1	Sum	5,000.00	5,000		5,000
5.1.10	Netball Lighting				Excl		0
5.1.11	SMSB works				Excl		0
<b>1</b>	<b><u>External Services</u></b>						<b><u>239,280</u></b>
<b>5</b>	<b>EXTERNAL SERVICES</b>						<b>239,280</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 211020_Schematic Design Cost plan
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**6 DESIGN CONTINGENCY**

**6.1 Design Contingency**

6.1.1	Allowance for Design Contingency	4.0	%	2,357,338.90	94,300		94,300
<b>1</b>	<b>Design Contingency</b>						<b>94,300</b>
<b>6</b>	<b>DESIGN CONTINGENCY</b>						<b>94,300</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 211020_Schematic Design Cost plan
<b>Building:</b> Muchea Recreation Centre	

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**7 CONSTRUCTION CONTINGENCY**

**7.1 Construction Contingency**

7.1.1	Allowance for Design Contingency	5	%	2,357,338.9 0	117,900		117,900
<b>1</b>	<b>Construction Contingency</b>						<b>117,900</b>
<b>7</b>	<b>CONSTRUCTION CONTINGENCY</b>						<b>117,900</b>

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 211020\_Schematic Design Cost plan

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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Attachment 1  
Attachment 4

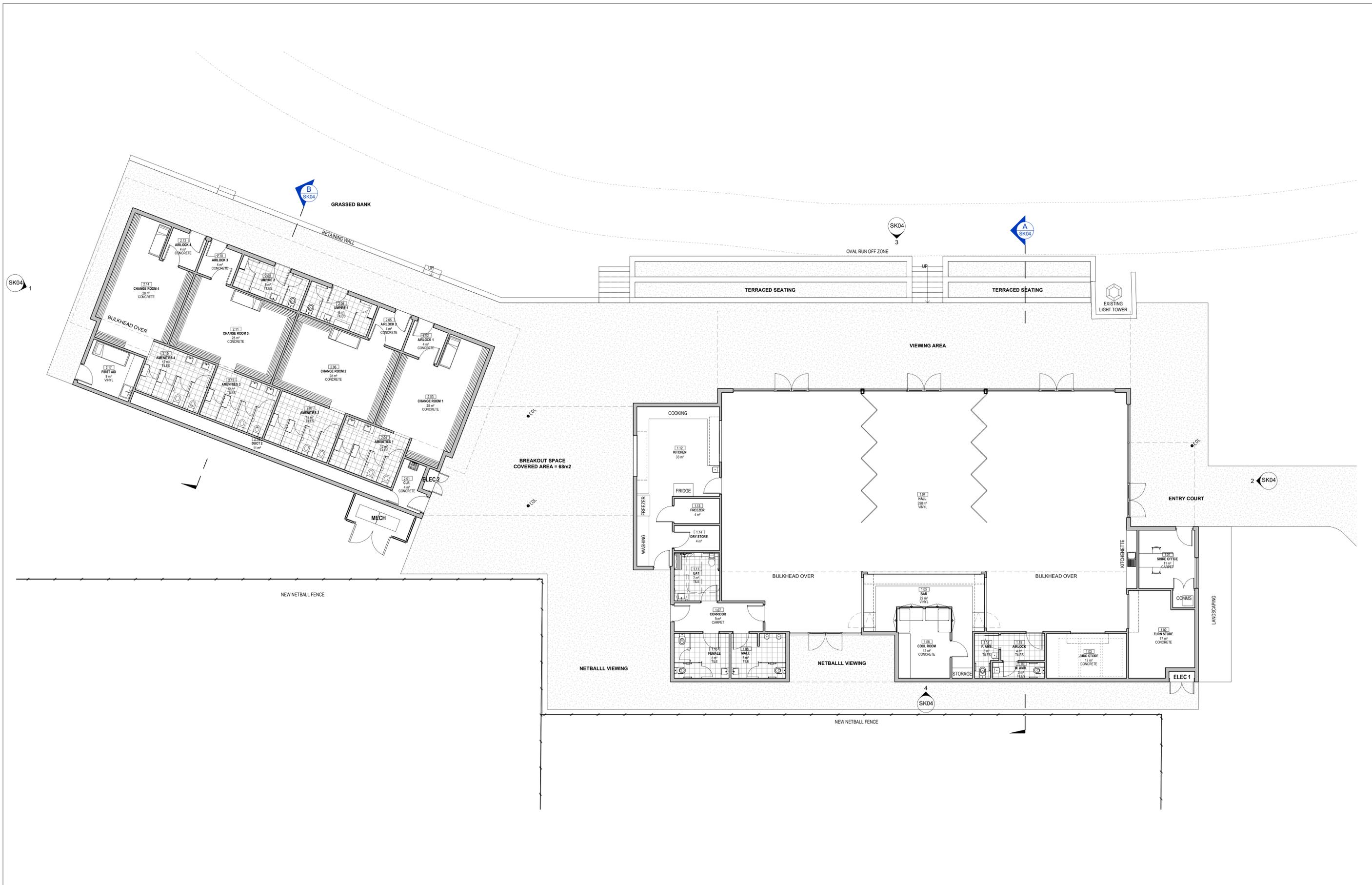
**8 PROFESSIONAL FEES**

**8.1 Professional fees**

8.1.1	Allowance for Professional fees based on Site email dated 18/10/21	1	Sum	200,000.00	200,000		200,000
<u>1</u>	<u>Professional fees</u>						<u>200,000</u>
<b>8</b>	<b>PROFESSIONAL FEES</b>						<b>2,769,261</b>

CEO03 - 05/22  
CEO04 - 02/22





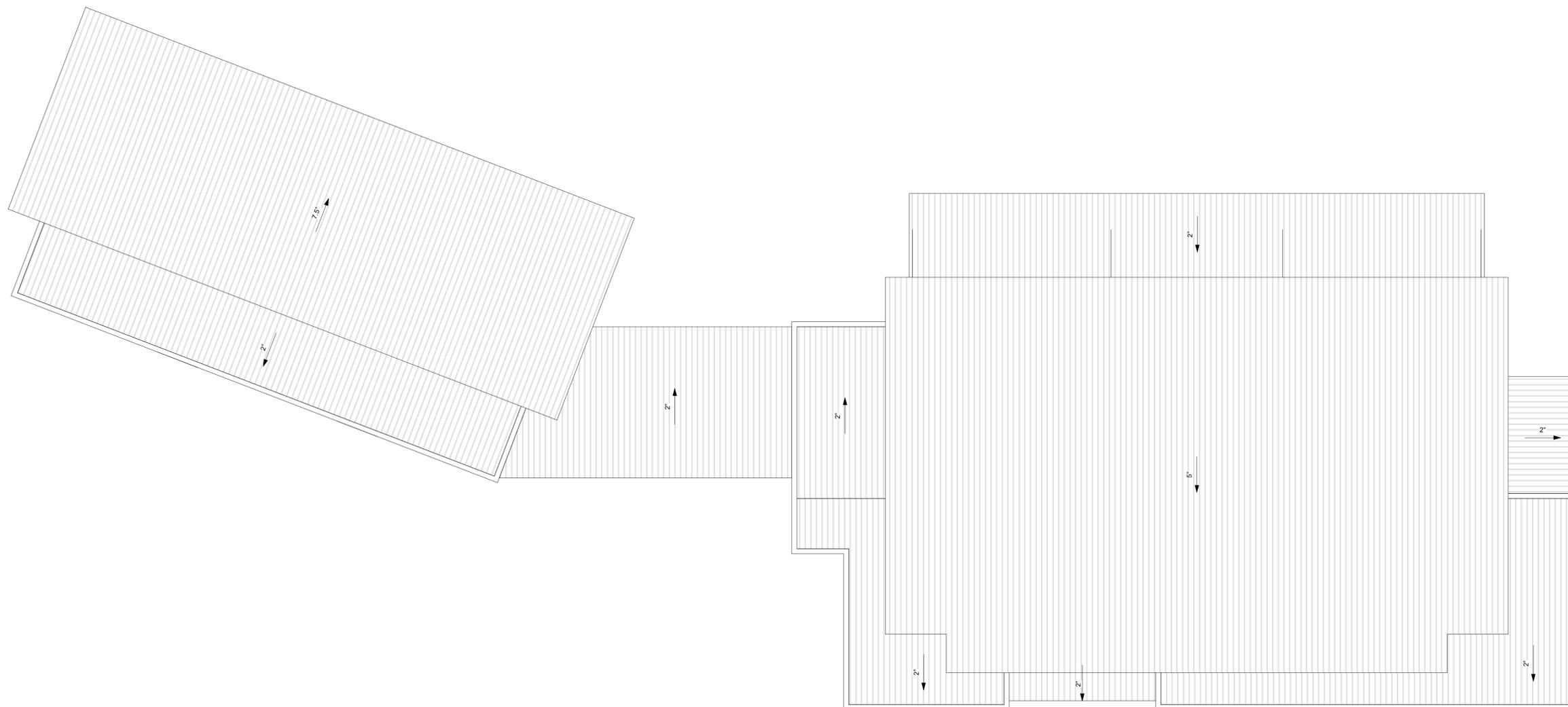
SK02 FLOOR PLAN  
Scale 1 : 100



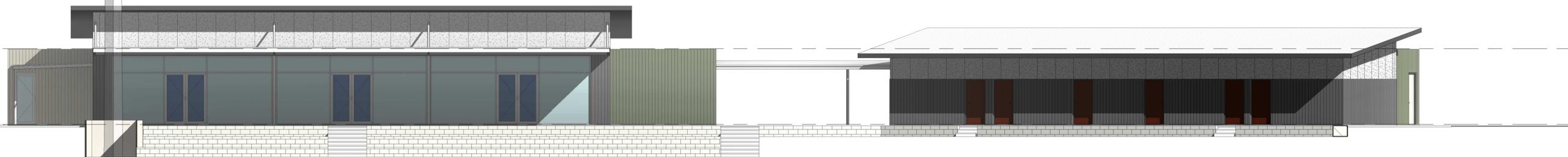
MUCHEA RECREATION CENTRE  
Shire of Chittering

Project number 22105  
OCTOBER 2021



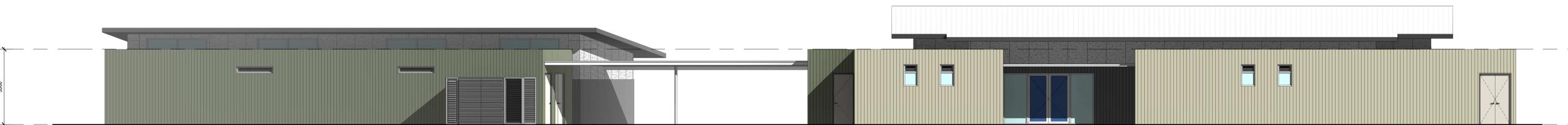


57.460 FCL ▾ PARAPET  
3500  
53.960 FFL ▾ GROUND FLOOR



**EAST ELEVATION**  
1 : 100

57.460 FCL ▾ PARAPET  
3500  
53.960 FFL ▾ GROUND FLOOR



**WEST ELEVATION**  
1 : 100

57.460 FCL ▾ PARAPET  
3500  
53.960 FFL ▾ GROUND FLOOR

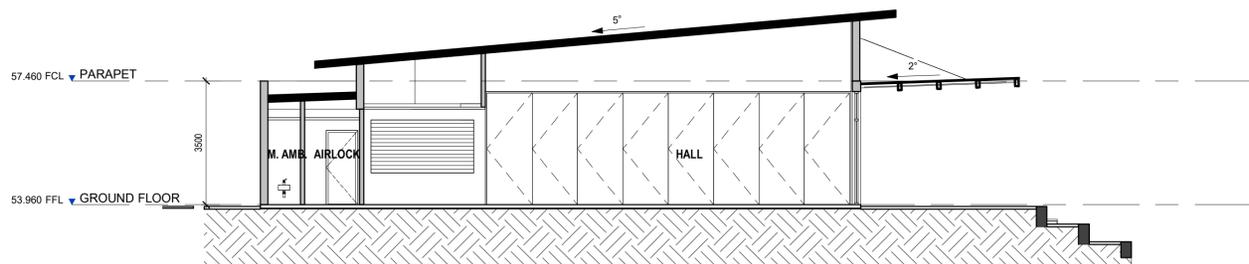


**NORTH ELEVATION**  
1 : 100

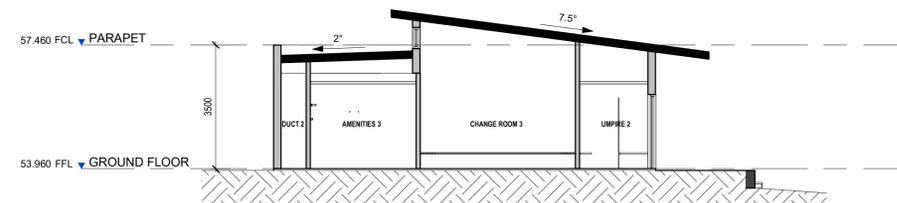
57.460 FCL ▾ PARAPET  
3500  
53.960 FFL ▾ GROUND FLOOR



**SOUTH ELEVATION**  
1 : 100



**SECTION A - BUILDING 1**  
1 : 100



**SECTION B - BUILDING 2**  
1 : 100

**CEO04 – 12/21 Muchea Recreation Centre – Project Update**

<b>Applicant</b>	SOC
<b>File ref</b>	GRT.CSRFF.Muchea Hall
<b>Author</b>	Community Development Coordinator
<b>Authorising Officer</b>	CEO
<b>Disclosure of interest</b>	Neither the Author nor Authorising Officer have any Impartiality, Financial or Proximity Interests that requires disclosure or relevant details
<b>Voting requirements</b>	<b>Absolute Majority</b>
<b>Attachments</b>	<ol style="list-style-type: none"> <li>1. Muchea Recreation Centre SD Cost Report. QS estimate</li> <li>2. Budget exclusions</li> <li>3. In kind funding</li> <li>4. Floor plans and elevations</li> <li>5. Muchea Changerooms only Cost Estimate &amp; Site plan.</li> <li>6. Muchea Function and Changerooms on Hall Site Cost Estimate &amp; site plan.</li> <li>7. Muchea Total Project (Reference Group Design) cost estimate &amp; site plans.</li> <li>8. Project Tracker – MRC.</li> <li>9. Muchea Cost Estimates. Option 1 &amp; 3</li> </ol>

	<b>Authority / Discretion</b>	<b>Definition</b>
<input type="checkbox"/>	Advocacy	<i>When Council advocates on its own behalf or on behalf of its community to another level of government/body/agency.</i>
<input checked="" type="checkbox"/>	Executive	<b><i>The substantial direction setting and oversight role of Council. e.g. adopting plans and reports, accepting tenders, directing operations, setting and amending budgets.</i></b>
<input type="checkbox"/>	Legislative	<i>When Council initiates or adopts a policy position, or a local law.</i>
<input type="checkbox"/>	Quasi-Judicial	<i>When Council determines an application/matter that directly affects a person's rights and interests. The judicial character arises from the obligation to abide by the principles of natural justice. Examples of Quasi-Judicial authority include development applications, building permits, applications for other permits/licences (e.g. under Health Act, Dog Act or Local Laws) and other decisions that may be appealable to the State Administrative Tribunal.</i>
<input type="checkbox"/>	Information	<i>Includes items for information purposes only and do not require a decision of Council (to 'note' only).</i>

**Executive Summary**

Council is requested to make a decision to provide further direction to officers on how to proceed with the Muchea Recreation Centre project in light of recent discussion by Council.

**Background**

The Muchea Recreation Centre Reference Group resolved at the 25 October 2021 meeting that the Muchea Recreation Centre Project would be placed on hold to enable Shire staff to seek direction from Council with regard to the budget of the project, in light of potential funding shortfalls and sharply increasing costs of construction across Western Australia.

It was suggested that Council would need to consider the following three options:

1. Resolve not to proceed with the project;
2. Re-design the project to reduce the scale of the project, to reduce the cost to within budget; or
3. Approve a contingency amount to be drawn down on, likely to be in the order of 30% of the total project cost.

The following items were to be updated and submitted to the November Ordinary Council Meeting:

- The Project Manager to provide Council with an up to date total project budget outlining inclusions/exclusions, list and cost breakdown of all other materials and services to be provided by the Shire of Chittering as part of the project, any proposed future staging and an up to date funding strategy including clubs contributions and potential staging:
  - Stage 1: Construction of the Muchea Recreation Centre
  - Stage 2: Demolition of Muchea Town Hall
  - Stage 3: Upgrade of the Muchea Netball Courts
- Additionally, the Shire Project Manager was to document the contracting strategy including in-kind costs as this will be required for the tendering process.

At this meeting it was acknowledged that any delays will impact on the capacity of Site Architecture Studio to meet agreed timeframes.

Due to the time required to prepare this information, the above items were not available for the November Ordinary Council Meeting and have subsequently been tabled for the December 2021 Ordinary Council Meeting. See attachments 1 – 7.

It was requested that a session for Council be held that would cover the background of the project, progress to date, and a potential path forward. As part of the discussion that was to take place, it was requested of staff to prepare costings of the following three options:

1. Option 1: Retain the current design concept, demolish the existing hall and develop a new layout over the sight of the existing hall.
2. Option 2: Retain the existing club rooms (hall), build the proposed change rooms only, and delay construction of the new club rooms to a later date:
3. Option 3: Proceed to tender based on the designs developed in conjunction with the Muchea Recreation Centre Reference Group.

A Council Workshop for the project was held on Thursday, 2 December 2021. The intention of this session was to brief new Councillors on the background of the project, progression of the project to date and for Council to consider the financial implications of any decisions pertaining to this project as determined by Council Resolution at the December Ordinary Council Meeting. While no decisions were made at the workshop, there appeared to be a mixture of support for all three options, however, a majority appeared to indicate a desire to proceed with trying to complete the project in full.

### **Consultation/Communication Implications**

#### Local

The following Muchea Recreation Centre Reference Group Meetings have been held with minutes tabled at Council.

- 22 July 2021
- 17 August 2021
- 30 August 2021
- 13 September 2021
- 28 September 2021

- 25 October 2021

A project page is available on the Shire Website with all relevant publically available documents uploaded to this page.

State

Not applicable

**Legislative Implications**

State

Nil

Local

Nil

**Policy Implications**

State

Nil

Local

Nil

**Financial Implications**

Nil – the additional costs will be covered under an already established budget for the project, however future decisions as a result of the direction set may have a financial implication.

**Strategic Implications**

Local

- Strategic Community Plan 2017-2027

Focus area:	Our community
Objective:	S1.1 An active and supportive community
Strategy:	S1.1.2 Develop and enhance existing recreation and social facilities for local communities
Objective:	S1.2 Strong sense of community
Strategy:	S1.2.3 Activate our local centres and towns
Focus area:	Our Build Environment
Objective:	S3.1 Development of local hubs
Strategy:	S3.1.1 Plan for new and enhanced community facilities
Objective:	S3.3 Improved infrastructure and amenities
Strategy:	S3.3.1 Improved asset management across all asset classes
Focus Area	Strong Leadership
Objective:	S5.3 Accountable Governance
Strategy:	S5.3.1 Good governance which supports efficient and effective service delivery

State

Nil

**Site Inspection**

Not applicable

**Risk Assessment / Implications**

Potential risk implications for Council to consider as part of this agenda item are outlined below:

*Reputational Risk*

The intention of the Muchea Recreation Centre Reference Group was to provide valuable input to inform site placement and floor plan based on their knowledge of the facility's construction and operational activities. To this end significant time has been invested by the Project Manager and Architect to understand and design in user needs and requirements. For Council to override the preferences of a community based reference group, a reputational risk exists. Council remains the overriding decision making body, however, even despite the best of reasons, this may only mitigate the risk to a certain extent.

**Officer Comment/Details**

A point of contention that has arisen out of the course of the development of this project has been the standard of netball courts and the need to have four courts should the Muchea Netball Club grow to a position where they have the ability to, and desirability to return to the South Midlands Netball Association. The last time that the Muchea Netball courts have been used for this purpose was for a single round in 2018. Over the past few years, there have been several representations made to the Shire regarding the inability for netball clubs to grow in a Shire that has a small population, the netball courts not being of a sufficient standard and the netball courts being of a sufficient standard. Currently the facility is only used as a training venue and has not required four courts of a competition standard. It should be noted that this has not stopped Council from continuing to support the need for four courts.

The current netball courts have been problematic for several years with issues due to underground water, aging surface, poor lighting and limited viewing options due to the proximity of the boundary fencing to the court area. The opportunity to redevelop the remaining three courts and along with the installation of a new 4<sup>th</sup> court to meet local competition standard could attract funding under the Community Sporting and Recreation Facilities Fund Small Grants Program for projects up to \$300,000 or the Annual Grants Program for projects up to \$500,000, where up to one third of the total project cost can be awarded.

Site Architecture Studio, at the 17 August 2021 Muchea Recreation Centre Reference Group Meeting, outlined that a site feature survey had been undertaken. This survey informs the room available to build the facility and the relationship of the facility to users. It also enabled the architects to consider how the community can take best advantage of the facility. The survey enabled site to look critically at the location and the proposed building. Site Architecture provided 2 alternative site solutions to the placement and design of the building for consideration of the group of which Option 1 above was presented along with Option 3. Option 3 as presented by Site Architect was the preferred option of MRC for the site position for the new building.

Shire Officers have recently been advised by the Department of Local Government Sport & Cultural Industries of the Minamata Convention on Mercury, ratified by Australia on 7 December 2021. The Convention aims to eliminate the source of mercury pollution by prohibiting the manufacture and trade of certain lamps containing mercury. Australia is expected to implement this by March 2022. This may have implications for the existing Netball Court lighting and necessitate a replacement of these which has not been included in existing plans and will mean that any lighting works required by building a new court will be required in the coming years anyway. There will be opportunity for the Shire to seek funding under the Club Night Lights Program for sports floodlighting infrastructure of up to one third of the total estimated project cost (excluding GST) up to a maximum grant of \$1 million.

At the Council briefing session held on 2 December 2021 Council discussed the implications of resource and

material shortages and the potential for cost escalation. Highlighting that there is considerable risk that the Total Project Cost will exceed Budget.

Council discussed that the total redevelopment cost including all other items and services are not yet known. With the Shire's total contribution potentially exceeding \$1.846M for the total site redevelopment, Council must acknowledge and approve the total redevelopment cost, including all exclusions.

Amongst all of the discussion and costings, a consideration has not been made toward the opportunity cost of staff time. That the cost does not change, the staff time for this project could be utilised for other projects and services that Council wish to provide, so further efforts to further define costs may reduce other projects and services provided to the community.

Three of the options that have been discussed are:

**Option 1 - Demolish the existing hall, retain the current change rooms design and develop a new layout over the sight of the existing hall.**

Whilst this has an obvious short term impact on the majority of users within the facility, 'for the greater good' this approach may lead to an improved layout, retention of existing netball facilities, slightly lower capital cost and overall long term benefit to the community.

Whilst there will be savings in retaining the original netball court, the court is reaching end of life. The subsequent upgrade to the existing court and development of a new architectural design to fit into the space currently occupied by the existing hall will add further cost. Refer to costings as supplied by Project Manager in Attachment 9.

While there is a slight saving, in pursuing this option, it will be a less attractive option for the users of the facility as it will provide inferior usage and viewing for football and cricket and less connection with netball for the coming fifty year lifespan of the facility.

**Option 2 - Retain the existing club rooms (hall), build the proposed change rooms only, and delay construction of the new club rooms to a later date.**

Council discussion outlined that this fulfills the immediate user requirements for new change rooms at reduced site development cost, and may lessen the impact on Netball.

In the short term it would alleviate Council of the exposure to rising construction prices however it then exposes Council to construction price variations over the longer term, increasing the risk. This option would also leave Council with the maintenance and upgrade of an aged facility that has reached its end of life projections and requires considerable upgrade to meet existing user requirements, particularly the ablutions and kitchen facilities.

Financing costs in the future are also unknown, while currently financing is the cheapest it has been for the past sixty years and sits lower than historical averages. The ability of the Shire to lock in interest rates below the Consumer Price Index targets set for the Reserve Bank make financing projects at this time very attractive.

**Option 3 – proceed to tender based on the designs developed in conjunction with the Muchea Recreation Centre Reference Group.**

Council discussed that this option retains the existing hall for the duration of the build, enabling existing hall user needs to be met, however has a short term impact on the Netball Courts with the need to utilise

the space of one of the existing courts for optimal building placement.

While this plan may be slightly more expensive, potentially only \$1,000 per year for the life of a 20 year loan that has a 0% real interest rate, it does provide a better long term solution for the site.

While it does create a problem of having a netball facility that cannot host rounds of the South Midlands Netball Association, though this may not be different to the current situation. This could be rectified by as early as 2023, and due to the building schedule, at most only a couple of months of the season may be missed. This hardship would be less than that of missing the full season of one of the sports should the hall be required to be demolished first. The hardship would also only eventuate should the Mucnea Netball Club move to the South Midlands Competition in 2021, an option that they could forego for one year to minimise the hardship on the club.

Having spent considerable time working on this project and the problems of the project, further delays to the project may not in the end make large difference to the overall cost, especially when taken into account over the long term, and the true costs will not be known until a tender is received. This is some of the reasons why the officer recommendation is to proceed to tender utilising a design that places the clubrooms over the site of a current netball court.

It is noted that in follow up discussions with Council, opinions may differ and the Council preference may be to seek further costings. If this is the case, then the decision for Council to make may be:

That Council:

1. Instruct the CEO to develop designs for option 1 & 3 with detailed costings for both of these designs.
2. Instruct the CEO to procure professional services to provide detailed costings of all of the project exclusions.
3. Support "in principle" a stage 3 plan that will incorporate the redevelopment of the Mucnea Netball Courts to provide 4 courts that are consistent with competition standards as specified by Netball Australia
4. Direct the CEO to undertake an audit of the existing courts at Mucnea hall to inform a detailed report and subsequent budget for the stage 3 plan.

#### OFFICER RECOMMENDATION

That Council:

1. Approve the Chief Executive Officer to proceed to tender for the construction of the Mucnea Recreation Centre Project based on the designs developed in conjunction with the Mucnea Recreation Centre Reference Group;
2. Instruct the Chief Executive Officer to procure professional services to provide detailed cost estimates for the project, including all of the assignment exclusions. To be completed by the Council Meeting that at which Council is to receive the tender;
3. Support "in principle" the third stage of a plan that will incorporate the redevelopment of the Mucnea Netball Courts to provide four (4) courts that are consistent with competition standards as specified by Netball Australia; and
4. Direct the Chief Executive Officer to undertake an audit of the existing courts at Mucnea Hall to inform a report and budget for Stage Three of the plan that is to be included in Council's consideration of the 2022/2023 Annual Budget.

**ALTERNATIVE MOTION / COUNCIL RESOLUTION 111221****Moved Cr King, seconded Cr Hughes****That Council:**

1. Instruct the CEO to procure professional services to provide detailed cost estimates for each of the three options listed in item 2 below, including all of the assignment exclusions and services proposed to be supplied the Shire, associated infrastructure, services and utilities;
2. Confirm the three options to be costed are:
  - a) Option 1 – Retain the Muchea Hall, build the proposed new club room over the existing netball court, build the new change room, build a new fourth netball court (in a 2 x 2 configuration) with lighting, refurbish the existing three netball courts with upgraded lighting as required, replace the existing machinery storage shed, then demolish the Muchea hall and redevelop the area;
  - b) Option 2 – Demolish the Muchea Hall upfront, retain the current change rooms design and develop a new layout over the site of the existing hall, refurbish the netball court surfaces and upgrade lighting, and replace the existing machinery storage shed
  - c) Option 3 - Retain the Muchea Hall and allow for essential refurbishment only, build the new Change Rooms only, decommission the existing change rooms, and refurbish the existing four netball court surfaces and upgrade lighting.
3. Instruct the CEO to provide a report on the sources of secured project funding, including the Shire's contribution, community contribution from grants, donations and in-kind sources;
4. Authorise the Architects professional services fee to be funded from the undrawn budget allocation for professional services; or if not sufficient, authorises additional allocation from the current budget;
5. Instruct the CEO to table a report at the February 2022 Ordinary Council Meeting or at a Special Council Meeting if the information is available earlier.

**CARRIED BY ABSOLUTE MAJORITY 4 / 3**

TIME: 7.52pm

***For: Cr King, Cr Hughes, Cr Dewar, Cr Curtis******Against: Cr Ross, Cr Angus, Cr Campbell***



**REQUEST FOR TENDER:  
CONSTRUCTION OF MUCHEA  
RECREATION CENTRE AT MUCHEA  
WA**

RFT 9/02/2022

<b>RFT Number:</b>	9/02/2022
<b>Request for Tender (RFT)</b>	CONSTRUCTION OF MUCHEA RECREATION CENTRE AT MUCHEA WA
<b>Issue date:</b>	Midnight, [date]
<b>Clarification Deadline:</b>	2:00 pm (WST), [date]
<b>Submission Deadline:</b>	2:00 pm (WST), [date]
<b>Address for Delivery:</b>	<a href="https://360providers.apetsoftware.com.au/request/open/lcs">https://360providers.apetsoftware.com.au/request/open/lcs</a>

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## 1 PRINCIPAL'S REQUEST

### 1.1 REQUEST DOCUMENTS

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This Request is comprised of the following parts:

- (a) Part 1 – Principal's Request (read and keep this part);
- (b) Part 2 – Conditions of Responding (read and keep this part);
- (c) Part 3 – Scope of Requirements (read and keep this part);
- (d) Part 4 – Conditions of Contract (read and keep this part);
- (e) Part 5 – Respondent's Offer (complete and return this part using 360);
- (f) Part 6 – Regional Price Preference Form (respond as applicable using 360)

## 2 CONDITIONS OF RESPONDING

### 2.1 DEFINITIONS

Below is a summary of some of the important defined terms used in this Request and not necessarily defined in the Conditions of Contract:

<b>Addendum:</b>	Additional information of clarification of information relating to the Request for Tender, provided by the Shire after the initial advertising date.
<b>Assessment Criteria:</b>	This is a set of assessment criteria. Refer to Section 5.3 SELECTION CRITERIA.
<b>Canvassing:</b>	Means directly or indirectly, discussing a Tender with any Councillor, or communicating with an employee of the Shire at any time in an attempt, in the Principal's opinion, to influence the decision making process in the award of that Tender. The Tender of any Respondent involved in canvassing activity will be rejected.
<b>Clarification Deadline:</b>	The date and time by which suppliers seeking clarification on the Specification must ask their queries. Clarifications sought after the Clarification Deadline will not be responded to by the Shire.
<b>Collusive Tendering:</b>	Means the participation in or condoning of collusive activity by a Respondent including but not limited to: <ul style="list-style-type: none"> <li>• Any agreement as to who should be the successful Respondent;</li> <li>• Any meeting of Respondents to discuss their Tenders prior to submission to Council, unless Council is present at that meeting(s);</li> <li>• Any exchange of information between Respondents about their Tenders;</li> <li>• Any agreement for the payment of money or a reward or benefit for unsuccessful Respondents by the successful Respondent;</li> <li>• Any agreement or collaboration of Respondents to fix prices, rates of payment of industry association fees or conditions of contract;</li> <li>• The submission of a "cover Tender", being a Tender submitted as genuine but which has been deliberately priced not to win the contract.</li> </ul>
<b>Commissioning</b>	The process of assuring that all systems and components of the buildings and plant are designed, installed, tested, operated, and fit for purpose according to the operational requirements of the Shire.
<b>Conflict of Interest</b>	A conflict of interest can be pecuniary (involving financial gain or loss) or non-pecuniary (based on animosity, friendship or family connection). A conflict of interest can also arise from avoiding personal losses as well as gaining personal advantage, financial or otherwise. Conflicts of interest can be actual, perceived, or potential.
<b>Contract:</b>	A legally binding agreement resulting from acceptance of an offer by the Shire, including such modifications that may have been agreed by the Shire and the Respondent before that acceptance.

<b>Contractor:</b>	Means the person or persons, corporation or corporations whose Tender is accepted by the Principal, and includes the executors or administrators, successors and assigns of such person or persons, corporation or corporations.
<b>Evaluation Panel:</b>	Means the person or persons appointed by the Shire to undertake the evaluation of the Respondent's Offers.
<b>General Conditions of Contract:</b>	Means the Minor Works Contract and its Annexures.
<b>Non-Conforming Tender:</b>	A Tender that is not lodged prior to the Submission Deadline, or a Tender that does not contain all the information and documents required by the Request for Tender.
<b>Offer OR Response OR Submission OR Tender:</b>	An offer to supply the Requirements and includes prices, bids, Tenders and consultant proposals and means the lodgement of a Tender containing all requested information and accompanying documentation.
<b>Principal OR Shire:</b>	The Shire of Chittering or the Shire of Chittering's authorised representative as appropriate according to context.
<b>Regional Business:</b>	Is a business (Respondent) which has been operating continuously out of a premise in the Shire for at least six (6) months prior to the closing date of Tenders.
<b>Regional Content:</b>	Applies to non-Regional Businesses, and is the value of goods or services purchased within the Shire locality.
<b>Regional Price/Content Preference:</b>	Is a price assessment discount that is applied to Regional Businesses / Regional Content at the time of Tender evaluation.
<b>Request OR RFT:</b>	This document, the Request for Tender.
<b>Special Conditions of Contract:</b>	Provisions of a Contract that are peculiar to the project under consideration and do not fall under the general conditions or supplementary conditions.
<b>Specification</b>	The statement outlining the details of the performance (supply of goods and/or services) under a contract, and may include technical references, drawings, or a consultant's brief.
<b>Subcontractor</b>	Means a Subcontractor contracted to the Contractor to provide goods or services to the Contractor for the latter to perform the Contract.
<b>Submission Deadline:</b>	The deadline for lodgement of your Tender.
<b>Respondent:</b>	Someone who has or intends to submit a Tender to the Principal.
<b>The Works:</b>	Means the whole of the works to be carried out and completed in accordance with the Contract including variations.

<b>Works Under Contract (WUC):</b>	Means the work which the Contractor is or may be required to carry out and complete under the Contract and includes variations and remedial work.
<b>Validity Period:</b>	A period of time for which an offer will remain open for consideration and acceptance by the Shire.
<b>360</b>	The Principal's electronic procurement portal for Requests for Tenders. <a href="https://360providers.apetsoftware.com.au/">https://360providers.apetsoftware.com.au/</a>
<b>Value for Money</b>	The Shire will identify a preferred Contractor by determining relative value for money comprising 50% qualitative and 50% quantitative (price) evaluation criteria weighting. <b>The preferred Contractor may not necessarily be the lowest price offer.</b>

## 2.2 HOW TO PREPARE YOUR RESPONSE

- (a) Carefully read all parts of this document.
- (b) Ensure you understand the Requirements.
- (c) **Use 360 (the Shire's eTendering portal) to complete and return the Offer (Part 5) in all respects and include all attachments.**
- (e) Lodge the Response before the Deadline.
- (g) Do not alter any Response documents.

## 2.3 CLARIFICATIONS

All Clarifications to Request for Tender details must be lodged via 360's Contact Request Manager 'button'.

If you require a Guide to using 360 please refer to:

<https://360providers.apetsoftware.com.au/360%20Providers%20Quick%20Reference%20Guide.pdf?2019-04-19>

Or contact:

Name: Colin Lange

Position: External Procurement and Contracts Officer

email: [clange@langeconsulting.com.au](mailto:clange@langeconsulting.com.au)

## 2.4 CLARIFICATION DEADLINE

Clarifications to this Request for Tender (RFT) shall be received up to to the time nominated on Page 2 of this Request.

## 2.5 MANDATORY TENDER BRIEFING

A mandatory tender briefing **WILL BE HELD** by the Principal at [time] [date] 48 Archibald Street Muchea. Tenderers must advise the RFT contact officer by [time] [date] of their intention to attend including the names, telephone number and email address of proposed attendees.

## 2.6 RESPONDENTS TO INFORM THEMSELVES

Respondents will be deemed to have:

- (a) Examined the Request and any other information available in writing to Respondents for the purpose of Tendering;

- (b) Examined all further information relevant to the risks, contingencies, and other circumstances having an effect on their Tender which is obtainable by the making of reasonable enquires;
- (c) Satisfied themselves as to the correctness and sufficiency of their Tenders including quoted prices which will be deemed to cover the cost of complying with all the Conditions of Tendering and Conditions of Contract and of all matters and things necessary for the due and proper performance and completion of the work described therein;
- (d) Acknowledged that the Principal may enter into negotiations with a chosen Respondent and that negotiations are to be carried out in good faith;
- (e) Satisfied themselves that they have a full set of the Request documents and all relevant attachments; and
- (f) Satisfied themselves that they understand the requirements as per part 3 “*Specification*” of this document.

## 2.7 ALTERATIONS

---

The Respondent must not alter or add to the request documents unless required by these Conditions of Tendering.

The Principal will issue an Addendum to all registered Respondents where matters of significance make it necessary to amend or supplement the issued Request documents.

## 2.8 FORM OF TENDER

---

In preparing a Submission, Respondents are to consult Part 5 to ensure all required components are included with the Submission.

## 2.9 ALTERNATIVE TENDERS

---

No tenders may be submitted as Alternative Tenders or made subject to conditions other than the Conditions of Contract.

## 2.10 LODGEMENT OF TENDERS

---

The Local Government (Functions and General) Regulations 1996 state that “A tender is required to be rejected unless it is submitted at a place, and within the time, specified in the invitation for tenders”. In this regard the “place” shall be the Shire Chittering’s 360 Request for Tender as titled on Page 2 of this Request and the “time” shall be before the Submission Deadline nominated in this Request for Tender, also on Page 2 of this Request.

Respondents experiencing technical difficulties with loading tender submissions, may direct enquiries to:

SimplyLogical Help Desk

[support@simplylogical.net](mailto:support@simplylogical.net)

Access a quick reference guide at:

<https://360providers.apetsoftware.com.au/360%20Providers%20Quick%20Reference%20Guide.pdf?2019-04-19>

Only those Tenders that are within the electronic tender box at the time of closing will be assured of being regarded as being “submitted at a place, and within the time, specified”.

The Principal will not be responsible for tenders which are not received in the electronic tender box by the closing date and time.

Only in exceptional circumstances and at the Principal's sole discretion, will the Principal approve a request to submit the Tender in a hardcopy format via the tender box located at the Shire of Chittering's administration building, Railway Avenue, Chittering.

### 2.11 SUBMISSION DEADLINE

---

Submissions must be received in the 360 electronic tender box by no later than the time nominated on page 2 of this Request.

### 2.12 COSTS OF TENDERING

---

The Principal will not be liable for payment to the Respondent for any costs, losses or expenses incurred by the Respondent in preparing their Tender or for providing additional information or Clarification during the evaluation of the Submission.

### 2.13 TENDER OPENING

---

All Respondents and members of the public may attend or be represented at the opening of Tenders. Tenders will be opened electronically, following the advertised Submission Deadline.

The names of the Respondents who submitted a Tender by the Submission Deadline may be read out at the Tender opening. No discussions will be entered into between Respondents and the Principal's officers present or otherwise, concerning the Tenders submitted.

The Tender opening will be held immediately after the closing time of Tenders, at the Shire of Chittering administration office, 80 Monger Street BENCUBBIN WA.

### 2.14 PRICE BASIS

---

Unless otherwise agreed by the Principal, all prices for goods/services offered by the Respondent or prescribed by the Principal in the Tender shall be fixed for the term of any resultant Contract.

#### **Tendered prices must be inclusive of Goods and Services Tax (GST).**

Unless otherwise indicated, prices outlined in the Submission shall include all overheads, including but not limited to, disbursements, allowances, printing, delivery, transport, training, equipment and all applicable fees, levies, duties, taxes and charges.

Any charge not stated in the Submission, as being additional will not be allowed as a charge for any transaction under any resultant Contract.

### 2.15 REJECTION OF TENDERS

---

A Tender will be rejected without consideration of its merits in the event that:

- (a) It is not submitted before the deadline;
- (b) It is not submitted at the place specified in the request.

A Tender may be rejected if it fails to comply with any other requirements of the Request.

## 2.16 SELECTION CRITERIA

The Tendered prices will be assessed against qualitative and compliance criteria to determine the most advantageous outcome to the Principal. The extent to which a Tender demonstrates greater satisfaction of each of these criteria will result in a greater score. The aggregate score of each Tender will be used as one of the factors in the final overall assessment of value for money.

### 2.16.1 COMPLIANCE CRITERIA

These criteria are detailed within Part 5 of this document and will not be point scored. Each Tender will be assessed on a **Yes/No** basis as to whether the criterion is satisfactorily met.

An assessment of “No” against any criterion may eliminate the Tender from further consideration.

### 2.16.2 QUALITATIVE CRITERIA

In determining the most advantageous Tender, the Evaluation Panel will score each Respondent's Offer against the qualitative criteria as detailed within Part 5 of this document. Each criterion will be weighted to indicate the relative degree of importance that the Principal places on that aspect of the goods or services being purchased.

**NOTE: It is essential that Respondents address each qualitative criterion, and provide suitable evidence to satisfactorily address each criterion.**

Information that is provided addressing each qualitative criterion will be point scored by the Evaluation Panel.

Failure to provide the specified information may result in elimination from the Tender evaluation process or may result in a low score.

The Principal may use any additional information available to it in its assessment of Offers.

Before responding to the selection criteria, Tenderers must note that:

- (a) All information relevant to the response to each criterion is to be contained within your Tender;
- (b) Tenderers are to assume that the Evaluation Panel has no previous knowledge of the Tenderer, its activities or experience; Tenderers are to provide full details for any claims, statements or examples used to address each criterion; and
- (c) Tenderers are to address each issue outlined within a qualitative criterion.

## 2.17 EVALUATION PROCESS

Tenders will be evaluated using information provided in the Tender and using other information or experience regarding the Respondent of which the Principal may be aware.

### 2.17.1 STEP 1 – COMPLIANCE CRITERIA

The Evaluation Panel will assess Tenders for compliance with the requirements of the Conditions of Tender and all Contract requirements, including requirements included in this RFT, those detailed in the Specifications and in any Design drawings.

These criteria are detailed within Section 5 (Respondent's Offer) of this document and will not be point scored. Each Tender will be assessed on a **Yes/No** basis as to whether the criterion is satisfactorily met. An assessment of **No** (meaning non-conforming) against any

criterion may, at the Principal’s absolute discretion, eliminate the Tender from further consideration.

**2.17.2 STEP 2 – QUALITATIVE CRITERIA**

Qualitative Criteria will be assessed using a point scoring system with a score being awarded for each area of part of each criterion.

Submissions will be assessed substantially using information and evidence provided within the Submission. The score will be weighted as detailed within Section 5 of this document.

Scoring of the Non- Priced component will take into account those aspects of the Tender that do not readily translate into absolute dollar values, but provide a measure of the Respondent’s capacity to satisfactorily provide the requirements of the Tender.

Each criterion is weighted to reflect its relative importance. Weighted scores are then summed to yield a total score.

**2.17.3 STEP 4 – PRICED ATTRIBUTE**

The non-weighted cost method is used where functional considerations such as capacity, quality and adaptability are seen to be crucial to the outcome of the contract.

**2.17.3.1 REGIONAL PRICE PREFERENCE**

The Principal’s Regional Price Preference will apply to this Request for Tender. Two Preferences apply:

- (a) Regional Business Preference: a business that has been operating continuously out of a premise within the Shire for at least six (6) months prior to the closing date of tenders is eligible for the application of the preference rate against their total Submission;
- (b) Regional Content Preference: businesses who do not qualify as a Regional Business but will purchase goods and services from within the Shire are eligible to receive the preference rate against that value of goods / services sourced within the Shire.

For the purposes of this RFT the following preference rate will apply to Regional Businesses / Regional Content:

<b>Applicable Category:</b>	<b>Preference Rate:</b>	<b>To a maximum price discount of:</b>
Goods/Services	10%	\$50,000
Construction (Building) Services	10%	

To qualify for the application of the Regional Price Preference, Respondents must provide evidence as specified by Part 5.

#### 2.17.4 TENDER EVALUATION CLARIFICATION PERIOD

The Principal as part of the tender evaluation process may seek clarifications from Respondents on details of its tender submission. All clarification correspondence relevant to the successful Respondent will form part of the final contract.

#### 2.17.5 RISK ASSESSMENT

The Principal may have access to and give consideration to:

- (a) Any risk assessment undertaken by any credit rating agency;
- (b) Any information produced by a Bank, financial institution, or accountant of a Respondent;
- (c) Any litigation history available to the Principal;
- (d) Reference to documented evidence information held by the Principal relating to the Respondent's past performance;
- (e) Performance references supplied by the Respondent; and
- (f) Any other information that the Principal may have available to it.

Respondents may be required to provide to the Principal (or its nominated agent) upon request all such information as the Principal reasonably requires to satisfy itself that Respondent is financially viable and has the financial and performance capabilities to provide the Services for which they are submitting and to meet their obligations under any proposed Contract. The Principal reserves the right to engage (at its own cost) an independent financial assessor as a nominated agent to conduct financial and performance assessments under conditions of strict confidentiality. For this assessment to be completed, a representative from the nominated agent may contact you concerning the financial and performance information that the Respondent is required to provide.

The financial assessment is specifically for use by the Principal for the purpose of assessing Respondents and will be treated as strictly confidential.

The Principal may consider information obtained as part of its risk assessment process prior to making a recommendation for award of tender. A Respondent, who at the Principal's discretion, is considered to pose an unacceptable risk will not be recommended for award of tender.

#### 2.17.6 STEP 5 – VALUE FOR MONEY

The evaluation panel will make a series of value judgements based on the capability of the Respondents to complete the Requirements and a number of factors will be considered including:

- a. the qualitative ranking of each Respondent;
- b. the pricing submitted by each Respondent;

- c. a risk assessment;
- d. the Principal's budget; and
- e. the Principal's regional price preference.

Once Tenders have been ranked, the evaluation panel will make a value judgement as to the cost affordability, qualitative ranking and risk of each Tender in order to determine the Tender which is most advantageous to the Principal, for recommendation for award of Tender. This means that, although price is considered, the Tender containing the lowest price will not necessarily be accepted, nor will the Tender ranked highest on the qualitative criteria.

## 2.18 ACCEPTANCE OF TENDERS

---

The Principal is not bound to accept the lowest price offered and may reject any or all Tenders submitted.

The Principal will not accept a tender for part of the Requirements.

## 2.19 NOTIFICATION OF ACCEPTANCE

---

A Tender shall be deemed to be accepted when a notice in writing of such acceptance is emailed to the Respondent.

Unless and until a Formal Agreement is prepared and executed, the Tender including the Tender documents, together with Principal's written acceptance thereof shall constitute the Contract between the Principal and the Respondent (referred to in the Contract as the Contractor).

## 2.20 EXECUTION OF FORMAL INSTRUMENT OF AGREEMENT

---

After acceptance of a Tender, the successful Respondent shall execute the Contract within 7 days of receiving it from the Principal.

## 2.21 TENDER VALIDITY PERIOD

---

All Tenders will remain valid and open for acceptance for a minimum period of ninety (90) days from the Submission Deadline unless extended by mutual agreement between the Principal and the Respondent in writing.

## 2.22 DISCLOSURE OF CONTRACT INFORMATION

---

Documents and other information relevant to the contract may be disclosed when required by law under the *Freedom of Information Act 1992* or under a Court order.

All Respondents will be given particulars of the successful Respondent(s) or advice that no Tender was accepted.

## 2.23 PRECEDENCE OF DOCUMENTS

---

In the event of there being any conflict or inconsistency between the terms and conditions in this Request and those in the Conditions of Contract, the terms and conditions appearing in the Conditions of Contract will have precedence.

## 2.24 OWNERSHIP OF TENDERS

---

All documents, materials, articles and information submitted by the Respondent as part of or in support of a Tender will become upon submission the absolute property of the Principal and will not be returned to the Respondent at the conclusion of the Tender process provided that the Respondent be entitled to retain copyright and other intellectual property rights therein, unless otherwise provided by the Contract.

## 2.25 CANVASSING OF OFFICIALS

---

A Tender will be rejected without consideration if the Principal is reasonably satisfied that the Respondent canvassed any Councillor or Shire officer. This does not include a bona fide demonstration of machinery, equipment or thing connected with the Tender.

## 2.26 IDENTITY OF THE RESPONDENT

---

The identity of the Respondent and the Contractor is fundamental to the Principal. The Respondent will be the person, persons, corporation or corporations named as the Respondent in Part 5 and whose execution appears on the Offer Form in Section 5.1 of this Request. Upon acceptance of the Tender, the Respondent will become the Contractor.

## 2.27 EVIDENCE OF RESPONDENT'S REGISTRATION

---

It is a statutory requirement of the State of Western Australia that a Contractor or Subcontractor be registered or licenced to carry out the Requirements as described in the Tender documents, Part 5.2.6 Evidence of Respondent's Registration shall be completed as applicable.

## 2.28 SUBCONTRACTORS

---

The Respondent shall provide the details of any Subcontractors to be engaged for the Principal's approval.

## 2.29 IN-HOUSE TENDERS

---

The Principal does not intend to submit an in-house Tender.

## 2.30 BUILDING AND CONSTRUCTION INDUSTRY TRAINING FUND LEVY

---

*The Building and Construction Industry Training Fund and Levy Collection Act 1990* legislates the requirement for the collection of a training levy on all residential, commercial and civil engineering construction projects undertaken in Western Australia.

All construction work exceeding \$20,000 attracts a levy equal to 0.2% of the total value of the construction contract and it is the responsibility of the successful Respondent (Contractor) to make the levy payment.

More information is available at: <https://bcitf.org/>

## 3 SCOPE OF REQUIREMENTS

### 3.1 INTRODUCTION

The Principal is seeking the services of a suitably qualified builder to undertake the CONSTRUCTION OF MUCHEA RECREATION CENTRE AT MUCHEA WA within the Shire of Chittering local government area at 48 Archibald Street Muchea. The proposed contract for the required construction is not separable. A single contract is intended to be awarded for the whole works - the construction of the building with a practical completion target date of the [date].

The contractor will:

- ~~1. Undertake a site geotechnical and soils investigation upon which the design of the earthworks and civil component is to be based upon;~~
- ~~2. Provide construction drawings and specifications based on the information provided within this RFT and attachments; and~~
3. Construct a new recreation centre including external works with associated services in accordance with the drawings and specification.

The building must be constructed as **fit-for-purpose**.

Tenders will be assessed as one overarching package to determine the best value for money option for the Shire.

Other parameters are included as part of the evaluation process, please see section 5 for further details.

### 3.2 SCOPE OF REQUIREMENTS

The work to be provided by the Contractor for this project includes but is not limited to the following key areas:

#### 3.2.1 Construction Services

- 3.2.1.1 Contractor services for the construction of the facility;
- 3.2.1.2 Contract Management services, including provision of monthly progress reports, Contract Administration and financial management on behalf of the Contractor;
- 3.2.1.3 Commissioning and Handover services; and
- 3.2.1.4 Rectification works for the 12 months defect liability period.

### 3.3 Stages & Deliverables

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The timely completion of the project is important and all required dates are considered maximum timeframes. Under the qualitative tender assessment, stage of Tenderers will be closely assessed to ascertain which provides the Principal the most favourable outcomes with respect to delivery. Construction to be completed as soon as practical. **The facility included in the contract is expected to reach practical completion before the end of [date].**

The following table outlines the major task and/or reports required, their content and **indicative** times when they are due:

**Table 1 - CONSTRUCTION**

Task	Description of content	Date required
Contract Administration/ Superintendence Monthly Progress Reports	<p><del>‘For Construction’ Documentation Start-up meeting.</del></p> <p>Administer the Contract/Superintend the works</p>	Duration of Construction Contract + Defects Liability period
Building Permit	<p>The Contractor will be responsible for acquiring the Building Permit and the payment of all associated fees and levies.</p> <p>A Certificate of Design Compliance (CDC) will be provided by the Principal at the Principal’s cost</p>	TBA
Practical Completion	<p>Contractor to submit all quality documentation, inspection and test plans, As Constructed Drawings, Warranties and Maintenance and Operating Manuals.</p> <p>Building is commissioned and all systems are operational.</p> <p>Building finishes in accordance with the contract documents.</p> <p>User training has been provided to Principal</p>	TBA
Final inspection with Superintendent	12 months after defects liability	PC + 12 Months

### 3.3.1 Sub-contractors and Suppliers

Within seven (7) days after the date of the letter of award, the Contractor shall supply to the Principal a confirmed list of sub-contractors and suppliers proposed for the Works.

### 3.3.2 ~~100% Documentation~~

- ~~• Review feedback provided and enact changes of previous stage. Ensure capture of changes and justification for delivery at stage end report.~~
- ~~• Construction documentation is to be completed to an adequate level so as to undertake construction.~~
- ~~• Any variation to the documentation including changes to materiality, and or constructability must be approved by the Principal before construction. Variations to the contract will not be accepted where they occur due to unapproved changes to the documentation initiated by the Contractor. The Principal will not be held responsible or accountable for errors, omissions or ambiguities within the construction documentation. No cost or time variations will be approved as a result of the above.~~
- ~~• All warranties are to be passed onto the Principal with the Principal noted as the beneficiary.~~

### 3.3.3 As Constructed

- Prior to reaching practical completion, As Constructed documentation is to be provided including all manuals, warranties, certificates and approvals as per heading 3.17 Manuals, Warranties, Testing and As Constructed Drawings. Practical Completion will not be granted until all of the nominated information has been provided.

## 3.4 Timeframe

- Delivery of this project is critical to the Principal and its stakeholders. The Contractor is encouraged to have final delivery occurring as soon as possible and seek to conduct staged construction and/or concurrent construction in order to minimise project duration.

## 3.5 General Requirements

- The Contractor shall deliver the Project to accomplish the following:
  - Maximise the Principal's benefit to the community.
  - Maximise the quality of the completed Project.
  - Maximise the value for money for the Principal.
  - Minimise the costs and contractual risks to the Principal.
  - Meet the key milestone dates in the Principal's program.
  - Ensure the Project construction remains within budgetary constraints.
- ~~• The Contractor shall complete documentation of the works appropriate for construction purposes.~~

### 3.5.1 Responsibilities of the Contractor

- The Contractor shall be responsible for carrying out all tasks necessary to complete and deliver the Project as described in this request including, but not necessarily limited to the following:
- The following list to be reviewed as it relates to a D&C contract
  - Final definition and agreement of the WUC, with the Principal, of the Project requirements.
  - Liaison and consultation with the Principal's Representative.
  - Liaison and consultation with the Stakeholder Review Group and other identified stakeholders and agencies as identified.
  - Convening and coordination of meetings, and other consultation requirements of the Project including the taking and distribution of minutes.

- Preparation of monthly reports to be submitted during the first week of the following month.
- Preparation and submission of other reports, documents and applications required by Statutory Authorities, Local Authorities and Utility Agencies for approval procedures.
- Provisions, management and coordination of all construction services required to complete the Project.
- Providing all consumable resources necessary to complete the Project.
- Engaging all required Sub-Consultants, Sub-Contractors and Specialist Suppliers under like terms and conditions to the Primary Construction Agreements, including but not limited to all insurances, indemnities, liabilities and statute periods. Main Contractor to include for all sub-consultants within fee.
- Coordination, management and monitoring of the Sub-Consultants and Sub-Contractors performance.

### 3.5.2 Professional Disciplines Required

- ~~The Contractor shall be providing professional services, either from their own resources or through the engagement of Sub-Consultants, in the following disciplines:~~
  - ~~Access Consultant;~~
  - ~~Building Surveyor;~~
  - ~~Fire engineering;~~
  - ~~Licensed Security Consultant;~~
  - ~~Geo-technical Engineer;~~
  - ~~Structural engineering~~
  - ~~Hydraulic engineering~~
  - ~~Electrical engineering~~
  - ~~Mechanical engineering; and~~
  - ~~Landscape design.~~
- ~~The Contractor shall be responsible for the complete coordination and integration of the work of the professional services.~~

### 3.5.3 SITE

- The work sites are to be fenced for the duration of the works. The fencing is to comply with AS 1926 .1 and the OSH Regulations 1996.

### 3.5.4 EXISTING SERVICES, STRUCTURES AND FACILITIES

- Any connection, disconnection or interference with existing services, facilities and structures shall be carried out under the supervision of the Principal . Refer to the specification for notice times relating to disconnection or services.

### 3.5.5 CONTRACTORS

- Contractors are to comply with the Principals and Worksafe WA safety regulations and policies. They are also to implement and administer a Safety Management Plan for the site.

### 3.5.6 NEW BUILDING

- All materials must be new and to the best quality. They must be installed in accordance with the Building Code and applicable Australian Standards and the Contract documents.

### 3.5.7 SITE ACCESS

- A site management plan must be submitted and approved showing proposed access to the site and storage prior to commencement of construction.

### 3.5.8 ENVIRONMENTAL PROTECTION

- The contractor will at all times take adequate measures to control noise, dust, dirt fumes and general nuisance emanating from the work site.

### 3.5.9 COMPLETION OF WORKS

- At the completion of the works the contractor will provide all as-constructed plans, warranties and certificates to the Shire.

### 3.5.10 Insurances

- The following insurance policies must be current, and certificates of currency for the following must be provided prior to commencement of the contract:
  - Public Liability
  - Workers Compensation
  - ~~Professional Indemnity~~
  - ~~Product Liability~~
  - ~~Contract Works Insurance~~

### 3.5.11 Period of Contract and Termination

- The contract is considered to be completed upon the issue of the final Certificate for Payment commissioning the building.

## 3.6 Specifications

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### 3.6.1 INTRODUCTION AND EXTENT OF PROPOSED WORKS:

The building will TBA.

## 3.7 Construction Considerations

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### 3.7.1 Water Availability

- The Principal advises that access to [water point] can be arranged through the Shire of Chittering. There will be an on charge of Water Corp charges for water taken from this facility.

### 3.7.2 Weekend Works

- Construction works are not permitted on weekends unless requested in advance and written approval has been given to the Contractor by the Principal. If the Contractor intends to work on weekends, the Contractor must seek written approval from the Principal a minimum of two (2) weeks before the weekend the Contractor wants to work on the site.

### 3.7.3 Security

- The Contractor shall adequately screen, protect and secure the site including all plant and equipment to ensure protection of the Works and safety of the public. The Principal does not take any responsibility for the actions of the public and the Principal shall not be held responsible for any damage to the Contractor's property, plant or equipment. Upon site possession, the Contractor will be responsible for any loss or damage of Principal's infrastructure.

### 3.7.4 Drawings

- At least one (1) full set of up to date drawings, specifications and any subsequent drawings issued shall be maintained on site for the full period of the Contract for reference by the Superintendent,

sub-consultants and/or Principal's Representative when on site.

### 3.7.5 Hold Points & Testing

- The Principal will issue a list of Construction hold points and/or material testing requirements that will need to be conducted as a part of Construction.
- The Superintendent will arrange for a Structural Engineer to attend site and review footings and structural steel works. The Tenderer must allow 10 days for independent review of structural steel drawings.
- The Superintendent will arrange for a Building Surveyor to attend site for the purposes of preparing the Certificate of Construction Compliance (CCC). Contractor to furnish all technical certificates specified to allow for CCC to be issued. Practical completion will not be granted without achieving CCC.
- The Tenderer will be responsible for the conduct and provision of material testing results in accordance with the Specification. As a minimum, the furnishing of compaction tests, concrete strength results and all electrical and security commissioning data will be required.

## 3.8 Practical Completion

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### 3.8.1 Notice of Anticipated Practical Completion

- The Contractor must provide two (2) weeks' notice to the Superintendent and Principal before the anticipated Practical Completion date. It is the responsibility of the Contractor to confirm the proposed Practical Completion date a minimum of two (2) working days beforehand to allow for inspections to be scheduled.

### 3.8.2 Pre-Practical Completion Inspection

- Following the notice of anticipated Practical Completion, a Pre-Practical Completion Inspection will be carried out by the Principal, Superintendent, Contractor and relevant sub-consultants and a list of 'Defects and Works Remaining' list will be presented to the Contractor.

### 3.8.3 Services, Appliances and Fittings

- All services (telecommunications, electricity) and appliances and fittings comprising hot water units, stoves, ovens, and radio antennas identified and installed by the Contractor shall be checked by the Contractor with the Principal's representative in attendance to ensure that they are in correct working order before Practical Completion.

### 3.8.4 Electrical Accounts

- The Contractor shall close all electrical accounts and must arrange for payment of all amounts owing as at the date of Practical Completion. The Contractor is to notify all service providers of the change of customer and provide meter readings for electricity to the Superintendent on the day of Practical Completion.

### 3.8.5 Provision of Documentation

- Provision of documentation detail in Section 3.14 *Manuals, Warranties, Testing and As Constructed Drawings*, comply with the requirements of the Specification in relation to the Certificate of Construction Compliance and and Occupancy Certificate.

### 3.8.6 Keys

- At the date for Practical Completion all keys shall be clearly tagged, identifying their use and

location of lock. Alike keys are to be grouped together using key rings. All keys are to be handed over to the Superintendent on the date Practical Completion is awarded.

### 3.8.7 Defect Liability Period

- The Defects period will extend for 12 months after Practical Completion has been awarded. The Contractor or any party acting under the Contractor's direction shall seek express written permission from the Principal before attending site to carry out works under the Contract during the Defects Liability Period. Notice is to be given to the Principal a minimum of five (5) working days before attending site as coordination is required between the tenants of the Principal, user groups of the facility and the Contractor. Failure to provide notice to the Principal may result in site access not being approved.

## 3.9 Indicative Program of Work and Cash Flow Forecast

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### 3.9.1 Indicative Program of Works

- The Tenderer must prepare and submit as part of the submission an indicative program of works in the form of a Gantt Chart using MS Project or other similar scheduling software.

### 3.9.2 Proposed Timeframe

- The indicative Program of Works is to show the proposed timeframe for construction; indicating construction beginning and completion dates, commissioning periods and the intended date for Practical Completion. The Program shall clearly demonstrate the sequential implementation of the works to accommodate any staging requirements and clearly identify the critical path for works.

### 3.9.3 Adequate Ordering Timeframes

- The Tenderer shall consider the availability and lead times of specified materials and demonstrate adequate ordering timeframes in the program of works.

### 3.9.4 Revision of Program

- As works are completed, the program is to provide clear indication of what has actually been completed on site. If there is a variance between items claimed under the Progress Certificates and items certified by the Superintendent, the program is to be revised to indicate what has been certified. This revised program is to be reissued within ten (10) working days to the Principal.

### 3.9.5 Cash Flow Forecast

- A cash flow forecast based on the indicative program of works is to be submitted to the Principal within two (2) weeks from the date of award. This forecast will define the progress claims anticipated by the Contractor on a monthly basis, or as agreed by the Principal. The progress claims are subject to approval.

### 3.9.6 Revision of Cash Flow Forecast

- As works are completed, the cash flow forecast is to provide clear indication of the amount previously paid. If there is a variance between the amount claimed and the amount certified by the Superintendent, the forecast is to be revised to indicate what has been certified. This revised forecast is to be reissued within ten (10) working days to the Principal.

### 3.9.7 Monthly Updates

- Both the program of works and the cash flow forecast are to be updated monthly and submitted to

the Superintendent and the Principal at the time of submitting Progress Claims.

### 3.9.8 Notice of Delays

- The Contractor upon becoming aware of anything which will cause delay shall promptly give the Superintendent and the other party written notice of that cause and the estimated delay.

### 3.9.9 Allowance for Inclement Weather

- Allowances for three (3) inclement weather days within each calendar month of construction are to be included within the construction programming. Inclement weather days are not transferrable or accumulating from month to month.

### 3.9.10 Review and Approval

- The program of work must make suitable allowance for Principal approval as per clause 3.4 *Stages & Deliverables*.

## 3.10 Progress Claims

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### 3.10.1 Monthly Progress Claims

- The Contractor shall submit Progress Claims at monthly intervals.

### 3.10.2 Preliminaries

- Preliminaries will only be claimed once works on site have started. The amount claimed for Preliminaries will only be accepted in increments over the course of the construction program and will not be accepted if claimed as a lump sum.

### 3.10.3 Assessment of Claims

- The Contractor is advised that all Progress Claims shall be assessed by the Superintendent, relevant sub-consultants. The Contractor is advised that approved claims may only be processed within the Principal's payment schedule, at monthly intervals.

## 3.11 Provisional Sums

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### 3.11.1 ~~Exclusive of Profit and Attendance~~

- ~~Provisional Sums included herein are EXCLUSIVE of the Contractor's profit and attendance.~~

### 3.11.2 ~~Quotations for Work~~

- ~~The Contractor's quotations for any of the work and/or supply under the Provisional Sums are to be inclusive of all profit and attendance, but which shall be separately identified, if the Contractor is permitted to submit such quotations.~~

### 3.11.3 ~~Kitchen Fit-Out~~

- ~~The items identified in the specification that are to be included under the provisional sum for Kitchen Fit-Out include the kitchen benches Laminex Formica on MDF (including double bowl sink), freestanding oven/cooktop, range hood equipment and fixed cupboards. All other kitchen items identified within the specification including tapware, electrical and hydraulic connections must be included in other line items of the pricing schedule.~~

### 3.11.4 ~~Provisional Sum Allowances~~

- ~~Provisional Sum allowances must be made for the following items as per clause 5.3.3 PRICE INFORMATION – QUANTITATIVE CRITERIA:~~

Table 3 – Provisional Sum Allowances

<p><del>Earthworks/Site Preparation</del></p> <p><del>For costs associated with Geotech &amp; Surveys, labour and materials required for earthworks necessary to meet ultimate design requirements and engineers requirements</del></p>	<p><del>\$30,000</del></p>
<p><del>Electrical Connection Headworks</del></p> <p><del>For costs associated with material, labour and application fees for establishing power connection to site</del></p>	<p><del>\$10,000</del></p>
<p><del>Kitchen Fit-Out</del></p> <p><del>For costs associated with supply and installation of benches and appliances</del></p>	<p><del>\$20,000</del></p>
<p><del>Building Signage</del></p> <p><del>For costs associated with supply and installation of non-statutory signage</del></p>	<p><del>\$5,000</del></p>

### 3.12 Communications

#### 3.12.1 Directions

- The Contractor shall liaise only with the Superintendent and shall not act on direction or instruction from any other member of the public or tenant of the Principal's facilities, or Principal's staff (unless related to a safety issue) under any circumstances. All issues and queries are to be referred to the Superintendent.

#### 3.12.2 Construction Meetings

- Following the initial start-up meeting, the Contractor shall be responsible for scheduling regular (minimum fortnightly) construction meetings to be conducted on the site.
- The Contractor shall schedule, chair and minute all construction meetings and be responsible for the distribution of associated documents for the duration of the Contract.
- All Construction meetings are to be held on dates to be confirmed by the Superintendent and the Principal in agreement with the Contractor, and are to coincide with the assessment of the monthly progress claims.

### 3.13 Manuals, Warranties, Testing and As Constructed Drawings

#### 3.13.1 Digital Copies

- The Contractor must provide three (3) digital copies (USB) of the complete set of all manuals and warranty documents, material testing reports and findings, As Constructed Drawings and complete handover training before the issuing of the Certificate of Practical Completion.

#### 3.13.2 Building Manuals

- Building Manuals are to contain at a minimum the following information, schedules and details:
  - Names and addresses of Superintendent's Representative, Project sub-consultants and

sub-contractors;

- Names, addresses and telephone numbers of all sub-contractors and suppliers, including licensing/registration numbers where applicable (plumber, electrician, painter);
- Name, address and telephone number for contact for defects liability period;
- Services, installations and equipment details including, but not limited to:
  - General description of installation;
  - Systems (with a separate description for each system);
  - Start up and stop procedures;
  - Equipment suppliers/manufacturers (including names, address and telephone numbers);
  - Equipment details;
  - Maintenance requirements;
  - Manufacturers Warranties and Handbooks;
  - Wiring diagrams and the like;
  - “As Constructed” drawings;
  - Termite Protection and warranty certificates;
  - Compaction certificates certified by the engineer;
  - All other engineer certification including retaining walls;
  - Completion fire wall certification, where applicable;
  - Plumbing certification, where applicable;
  - Gas notice of completion, where applicable;
  - Electrical safety certificates for all electrical installation work/testing;
  - Residual Current Device (RCD) testing records;
  - Smoke alarm inspections records; and
  - Roof cover certification and warranty.
- The Contractor is to provide a schedule of meter serial numbers as applicable.

### 3.1.4 Digital Format and Document (Re)Production

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#### 3.1.4.1 Digital Format

- Unless otherwise stated in other sections of these Requirements, any digital information provided to the Contractor by the Principal will be in:
  - All text – MS Office (version 2007 and above) format;
  - Drawings – Adobe Reader PDF (version 9 and above) drawing format;
  - Programming – Microsoft Excel or Adobe Reader PDF (version 9 and above)
- All output documents shall be in a digital form that is compatible with these formats;
- The Contractor shall allow for the following document reproduction (including all time and disbursement costs); and
- It is the Contractor’s responsibility that all issued documents are of a professional standard and do not contain any reference to the designer and the sub-consultants.

### 3.1.5 Occupational Safety and Health

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#### 3.1.5.1 Compliance with Act and Regulations

- The Contractor, Sub-Contractors and all employees shall comply with the requirements of the Occupational Safety and Health Act 1984 and Occupational Safety and Health Regulations 1996 and the Work Health and Safety Act 2020, including all updates to the Acts and Regulations.

#### 3.1.5.2 Site Specific Safety Management Plan

PART 3	READ AND KEEP THIS PART
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- The Contractor shall provide a Site Specific Safety Management Plan to the Principal electronically two (2) weeks before the beginning of works on site. This shall include but is not limited to the following:
  - On Site Occupational Health and Safety responsibilities and names of staff filling these positions;
  - Site Occupational Safety and Health induction process;
  - Schedule of site safety/toolbox meetings and templates used for these meetings;
  - Employee elected Health and Safety Representative for this site;
  - Training completed by staff and Sub-contractors performing works including White Card, Trade Certificates and Licences held;
  - Controlling risks associated with manual handling;
  - Site security and traffic management, including members of the public;
  - On site accident and incident reporting procedure and responsible staff member;
  - Permit to work for High Risk construction works (as defined Occupational Safety and Health Regulations 1996 Part 3 Division 12 clause 3.137);
  - Risk assessments, Safe Work Method Statements and Job Safety Analysis for all tasks that will be performed on site including those that will be performed by Sub-contractors;
  - Emergency response plan including identifying trained first aiders;
  - Personal Protective Equipment (PPE) to be used at all times and job specific PPE;
  - Material Safety Data Sheets for all products to be used on site by employees or Sub-contractors;
  - Register of plant and equipment including service records; and
  - Register of electrical equipment maintenance and must have current electrical safety tag.

**3.15.3 Safety Audit Inspection**

- The Principal, under the Occupational Safety and Health Act 1984 (WA), will from time to time inspect works carried out on site by the Contractor, to ensure that works are being completed in accordance with the relevant codes and regulations by carrying out a Safety Audit Inspection (“Inspection”).

**3.15.4 Notice of Inspection**

- The Contractor and the Superintendent will receive reasonable notice in writing of an Inspection. In the case of an emergency, the Principal need not give written notice, but must give oral notice before an Inspection.

**3.16 REFERENCE DOCUMENTS**

The following documents are made available for reference:

1. Attachment #1 – [TBA]
2. Attachment #2 – [TBA]

**3.17 TIMEFRAMES**

The following **indicative** timeframes apply:

Phase:	Timeframes:
Issue of Request for Tender	[date]
Tender open period	[date]

- Completion of Tender evaluation and report for administration [date]
- Contract execution [date]
- Practical completion [date]

## 4 CONDITIONS OF CONTRACT

### 4.1 Works Contract AS2124 - 1992

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4.1 Works Contract AS2124 – 1992 applies to this Request and any subsequent Contract formed.

**5 RESPONDENT'S OFFER**

**5.1 OFFER FORM**

The Chief Executive Officer  
 Shire of Chittering  
 6177 Great Northern Highway, Bindoon WA 6502  
 I/We \_\_\_\_\_

**(BLOCK LETTERS)**

Of \_\_\_\_\_

**(ADDRESS)**

ABN/GST Status \_\_\_\_\_ ACN (if any) : \_\_\_\_\_

Telephone No: \_\_\_\_\_ Facsimile No: \_\_\_\_\_

Postal Address (if different): \_\_\_\_\_

E-mail (if any): \_\_\_\_\_

**In response to this Request for Tender 9/02/2022 CONSTRUCTION OF MUCHEA RECREATION CENTRE AT MUCHEA WA**

I/We agree that I am/We are bound by, and will comply with this Request and its associated schedules, appendices, attachments, all in accordance with the Conditions of Responding contained in this signed and completed Request.

The quoted price is valid up to ninety (90) calendar days from the date of the Response closing unless extended by mutual agreement between the Principal and the Respondent in writing.

I/We agree that there will be no cost payable by the Principal towards the preparation or submission of this Response irrespective of its outcome.

The tendered consideration is as provided under the Schedule of Prices in the prescribed format and submitted with this Response.

Dated this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_

Signature of authorised signatory of Respondent: \_\_\_\_\_

Name of authorised signatory (BLOCK LETTERS): \_\_\_\_\_

Position: \_\_\_\_\_

Address: \_\_\_\_\_

PART 5	COMPLETE AND RETURN THIS PART
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## 5.2 RESPONDENT'S RESPONSE

Response forms are accessible for completion and lodgement in the Shire's e-Tendering portal (360).

**In 360** please respond to all the following questions starting from 5.2.1. Where requested to provide additional information, ensure that all documents are clearly marked with the relevant attachment title to assist the evaluation panel with their assessment.

**Failure to provide any of the information where requested may result in the termination of assessment and rejection of the submission.**

(NOTE: All pages within Part 5 must be completed and returned to the Principal via 360 as they form part of the Tender submission).

### 5.2.1 CONTACT DETAILS

<p>Name, Telephone number and Email address of Tenderer's contact person for <b>RFT enquiries</b>.</p> <p>Name, Telephone number and Email address of Tenderer's contact person for <b>inclusion in the contract/</b> or as above.</p>
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### 5.2.2 COMPLETION DATE

<p>Is the Respondent able to guarantee completion of the Works in accordance with Specification requirements, the nominated timeframes and the Conditions of Contract?</p>	<p>Yes / No</p>
--	-----------------

### 5.2.3 REFEREES

<p>Provide details of at least two referees, in an attachment labelled "<b>Referees</b>". Examples of work for the referees should be provided where possible. Details provided are to include referee contact phone numbers.</p> <p><i>NOTE: The Shire of Chittering may be cited as a referee if appropriate. <u>Do not</u> nominate a specific officer of the Shire. If the Shire is cited, an additional referee may be required.</i></p>
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### 5.2.4 AGENTS

<p>Are you acting as an agent for another party?</p>	<p>Yes / No</p>
<p>If Yes, provide details (including name and address) of your Principal in an attachment labelled "<b>Agents</b>".</p>	

## 5.2.5 SUBCONTRACTORS

Do you intend to subcontract any of the Requirements?	Yes / No
If Yes, in an attachment labelled “ <b>Subcontractors</b> ” provide details of the subcontractor(s) including: (a) the name, address and the number of people employed; and (b) The Requirements that will be subcontracted.	

## 5.2.6 RESPONDENT’S REGISTRATION

Do all employees and proposed Sub-contractors hold current licences and qualifications for all of the respective work areas? <i>(Copies of all licences and qualifications and will be required prior to the commencement of Works)</i>	Yes / No
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## 5.2.7 CONFLICTS OF INTEREST

Would there be any actual or potential conflict of interest for your organisation in the performance of a Contract resulting from this RFT, or are any such conflicts of interest likely to arise during such a Contract?	Yes / No
If Yes, please supply in an attachment labelled “ <b>Conflicts of Interest</b> ”, details of any actual or potential conflict of interest and the way in which any conflict would be dealt with.	

## 5.2.8 FINANCIAL POSITION

1. Are you presently able to pay all your debts in full as and when they fall due?	Yes / No
2. Are you currently engaged in litigation as a result of which you may be liable for \$50,000 or more? If Yes please supply in an attachment labelled “ <b>Current Litigation</b> ”, details of current litigation which includes supporting court documentation and expected approximate value of settlement, costs and likely disbursements.	Yes / No
3. If you are awarded the Contract, will you be able to fulfil the Requirements from your own resources or from resources readily available to you and remain able to pay all of your debts in full as and when they fall due?	Yes / No

## 5.2.9 MANDATORY SITE INSPECTION AND BRIEFING

Respondents are required to confirm their attendance at the mandatory site inspection and briefing.	Yes / No
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5.2.10 INSURANCE COVERAGE

<p>Tenderers are to supply evidence of their insurance coverage in a format as outlined below by supplying an attachment labelled “<b>Insurance</b>”. A blank formatted attachment (Insurance.docx) is available to download from 360. Insurance.docx is to be completed and uploaded to 360 at this clause.</p> <p>Copies of Certificates of Currency are to be provided to the Principal prior to the commencement of works.</p>				
Type	Insurer – Broker	Policy Number	Value (\$)	Expiry Date
Public Liability				
Contract Works				
Workers Compensation				
Vehicle and Equipment				

5.2.11 COMPLIANCE WITH THE CONDITIONS OF CONTRACT

<p>Respondents are required to indicate their agreement to be bound by and comply with the Contractual Conditions outlined in this Request for Tender. The Contractual Conditions outlined in this Request for Tender are hereby agreed and understood.</p>	<p>Yes / No</p>
---	-----------------

5.2.12 REGIONAL PRICE PREFERENCE

<p>Is your business eligible for the application of the Regional Price Preference?</p> <p><i>There are two (2) levels of preference; Regional Business and Regional Content. Consult Part 2.17.3 for more information.</i></p>	<p>Yes / No</p>
<p>If Yes, please refer to the “<b>Regional Price Preference Form</b>” contained in Part 6 for more information on claiming the Preference.</p>	

5.2.13 ELECTRONIC SIGNATURE CONSENT

<p>If successful, do you consent to signing the contract electronically?</p> <p><i>The Principal uses Adobe Sign to facilitate its Contract execution process for consenting signatories. Use is <u>free</u> for signatories, however consent must be substantiated to validate signatures under the Electronic Transactions Act 2011.</i></p>	<p>Yes / No</p>
<p><b>If Yes, the details of your authorised signatory(s) will be requested upon award</b></p>	

## 5.3 SELECTION CRITERIA

### 5.3.1 COMPLIANCE CRITERIA

Please select either **yes** or **no** below to indicate compliance with the following Compliance Criteria.

An assessment of “No” against any of the compliance criteria below may result in the termination of assessment and rejection of the submission.

Description of Compliance Criteria	
1) Did the Respondent indicate compliance with the Completion Date?	Yes / No
2) Have details of two <b>referees</b> been provided?	Yes / No
3) Has section <b>5.2.4 Agents</b> been complied with?	Yes / No
4) Has section <b>5.2.5 Subcontractors</b> been complied with?	Yes / No
5) Has section <b>5.2.6 Respondents Registration</b> been responded to in the affirmative (Yes)?	Yes / No
6) Has section <b>5.2.7 Conflicts of Interest</b> been complied with?	Yes / No
7) Has section <b>5.2.8 Financial position 1)</b> been responded to in the affirmative (Yes)?	Yes / No
8) Has section <b>5.2.8 Financial position 2)</b> been complied with?	Yes / No
9) Has section <b>5.2.8 Financial position 3)</b> been responded to in the affirmative (Yes)?	Yes / No
10) <del>Was the mandatory site inspection attended by a representative of the Respondent?</del> DELETED – THIS CRITERION IS NOT APPLICABLE TO THIS TENDER	N/A
11) Have details of <b>Insurance Coverage</b> been provided?	Yes / No
12) Has section <b>5.2.12 Compliance with Conditions of Contract</b> been responded to in the affirmative (Yes)?	Yes / No
13) Has section <b>5.2.13 Regional Price Preference</b> been complied with?	Yes / No
14) Has section <b>5.2.14 Electronic Signature Consent</b> been complied with?	Yes / No
15) Did the Respondent provide a properly completed <b>Offer Form, Pricing Schedule</b> and <b>Safety Management Questionnaire</b> ?	Yes / No
16) Are the provided documents unaltered other than for the addition of requested information?	Yes / No

5.3.2 QUALITATIVE CRITERIA

Before responding to the following qualitative criteria, Respondents must note the following:

- All information relevant to responses to each criterion are to be contained within the Tender;
- Respondents are to assume that the Evaluation Panel has no previous knowledge of the organisation, its activities or experience, although the Evaluation Panel may use any additional information available to it in its assessment of Tenders;
- Respondents are to provide full details in support of any claims, statements or examples used to address the qualitative criteria; and
- Respondents are to address each issue outlined within each qualitative criterion.

<p><b>1) Relevant Experience</b></p> <p>Respondents should, as a minimum, address the following:</p> <ul style="list-style-type: none"> <li>a. Provide specific details of similar project works that the organisation has undertaken in the last 5 years. Details to include:</li> <li>b. Client;</li> <li>c. Length of the Contract;</li> <li>d. Approximate value of Contract;</li> <li>e. Scope of Contract; and</li> <li>f. Client contact details (email address and phone number)</li> </ul> <p>Note: Supply details in an attachment labelled "<b>Relevant Experience</b>".</p>	<p><b>50%</b></p>
	<p><b>Tick if attached</b></p> <p style="text-align: center;"><input type="checkbox"/></p>

<p><b>2) Resources and Capacity</b></p> <p>Respondents should, as a minimum, address the following:</p> <ul style="list-style-type: none"> <li>a. Provide a copy of the organisation structure chart and provide background information on the organisation;</li> <li>b. Details of the proposed personnel including the last 5 years' experience in managing projects of a similar nature and their length of employment with the Tenderer</li> <li>c. Plant and equipment inventory;</li> <li>d. Information of additional personnel</li> <li>e. Any contingency measures or back up of resources including personnel and machinery; and</li> <li>f. Current Capacity: Provide a list of current contract commitments including commencement and programmed completion dates.</li> <li>g. List proposed engagement of resources and use of local suppliers (names and goods and services to be sourced locally plus estimated value) located in the Shire of Chittering LGA.</li> </ul> <p>Note: Supply details in an attachment labelled "<b>Resources</b>".</p>	<p><b>20%</b></p>
	<p><b>Tick if Attached</b></p> <p style="text-align: center;"><input type="checkbox"/></p>



2.3	<b>Please provide a completed training/qualification list for employees who will be carrying out work against Contract.</b>			<input type="checkbox"/>
2.4	<b>Is there a documented incident investigation procedure?</b> If yes, provide a copy of a standard incident report form			<input type="checkbox"/>
<b>3</b>	<b>Safety and Health Workplace Inspections</b>	<b>YES</b>	<b>NO</b>	<b>Tick if att.</b>
3.1	<b>Are regular health and safety inspections at worksites undertaken?</b> If yes, provide a copy of the workplace inspection process			<input type="checkbox"/>
3.2	<b>Is there a procedure by which employees can report hazards at workplaces?</b> If yes, provide hazard report form			<input type="checkbox"/>

PART 5	COMPLETE AND RETURN THIS PART
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**5.3.3 PRICE INFORMATION – QUANTITATIVE CRITERIA**

All prices are to be tendered inclusive of GST.

Pricing is required to construct the building as per the specification at Part 3; so that the building is able to be commissioned by no later than [date].

Respondents are to complete the pricing tables below and submit them with their tender:

**5.3.3.1 Lump sum breakdown**

Line No	Service Description	Total Price Tendered (inc GST)
	<b>Construction</b>	
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Tender	Lump sum Price Inc. GST
<b>RFT 9/02/2022</b> <b>CONSTRUCTION OF MUCHEA RECREATION CENTRE AT MUCHEA WA</b>	\$

## 5.3.3.2 Provisional sums response

	Provisional Sums	Allowance	Sufficient? Select Yes or No
21	Earthworks/Site Preparation		Yes <input type="checkbox"/> No <input type="checkbox"/>
22	Electrical Connection Headworks		Yes <input type="checkbox"/> No <input type="checkbox"/>
23	Water Connection Headworks		Yes <input type="checkbox"/> No <input type="checkbox"/>
24	Kitchen Fit-Out		Yes <input type="checkbox"/> No <input type="checkbox"/>
25	Building Signage (ex Statutory)		Yes <input type="checkbox"/> No <input type="checkbox"/>

## 5.3.3.3 Payment schedule

Respondents are invited to prepare and submit a proposed payment schedule based upon the draft works schedule or Gantt chart submitted as part of the response to the Methodology qualitative criterion.

## 5.3.3.4 Schedule of rates

PRICING – schedule of rates			NON-WEIGHTED	NON-WEIGHTED
Key personnel	Role	Experience (in years) and qualifications	Hourly rate (ex GST)	Daily rate (ex GST)

## 5.3.3.5 Price schedule – services contracts

Refer to the electrical, hydraulic and mechanical worksections in the specification and provide completed price schedules with your tender.

**PART 6: REGIONAL PRICE PREFERENCE FORM**

The following form has been developed to assist Respondents seeking to claim the Regional Price Preference. Respondents claiming the RPP may download Regional Price Preference.docx in 360, complete the form and upload it to 360.

**REGIONAL BUSINESS PREFERENCE**

To qualify as a Regional Business, Respondents are to include either one of the following with their Tender submission, clearly labelling the document as “Regional Price Preference”:

- (a) A Shire rates notice;
- (b) A utility bill; or
- (c) A premise lease document.

Documents (a)-(c) above **must** be held in the business name or the company directors name and **must** be dated for a period six (6) to twenty four (24) months prior to the closing date of Tenders.

**REGIONAL CONTENT PREFERENCE**

For Respondents who do not qualify as a Regional Business but who will be utilising Regional Content if successful, are eligible for a Regional Content Preference for the value of goods / services sourced from within the Shire. Respondents who seek to claim the Regional Content Preference acknowledge they may be required to demonstrate they have actually purchased the nominated goods / services, upon request from the Principal.

To qualify for the application of the Regional Content Preference, complete the below table for all Local Content:

Business name:	Business premise address:	Goods / Services to be provided:	\$ Value:	Corresponding Pricing Schedule line item(s):
Business name:	Business premise address:	Goods / Services to be provided:	\$ Value:	Corresponding Pricing Schedule line item(s):

## 1.1 GENERAL CONDITIONS OF CONTRACT

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### 1.1.1 PROPOSED CONDITIONS

The conditions of contract for these Works is AS 2124 – 1992.

It is the Tenderers responsibility to ensure they have read and understood AS 2124 – 1992 General Conditions of Contract.

Tenderers can obtain copies of AS 2124 – 1992 General Conditions of Contract from [www.saiglobal.com](http://www.saiglobal.com)

### 1.1.2 AS2124:1992 ANNEXURE A

The following information contains the minimum information required by the Principal in order to complete the annexure Part A to AS 2124 – 1992 General Conditions of Contract:

The law applicable is that of the State or Territory of: (Clause 1)	Western Australia
Payments under the Contract shall be made at: (Clause 1)	Perth W.A. - by “not negotiable” cheque posted to the address shown on the payment claim form
The Principal is: (Clause 2)	The Shire of Dalwallinu
The address of the Principal is:	
The Superintendent shall be: (Clause 2)	A nominee of the Shire of Chittering
The address of the Superintendent is:	Shire of Chittering
Limits of accuracy applying to quantities for which the Principal accepted a rate or rates: (Clause 3.3(b))	Not Applicable
Bill of Quantities - The alternative applying: (Clause 4.1)	N/A
The time for lodgement of the priced copy of the Bill of Quantities is: (subclause 4.2)	N/A
Contractor shall provide security in the amount of: (Clause 5.2)	5% of the Value of Work in lieu of retention moneys.
Principal shall provide security in the amount of: (Clause 5.2)	Not Applicable
The period of notice required of a party’s intention to have recourse to retention moneys and/or to convert security: (Clause 5.5)	5 days
The percentage to which the entitlement to security and retention moneys is reduced: (Clause 5.7)	50%
Interest on retention moneys and security - the alternative applying: (Clause 5.9)	Not Applicable

The number of copies to be supplied by the Principal: (Clause 8.3)	1 electronic copy
The number of copies to be supplied by the Contractor: (Clause 8.4)	2 hard copies and 1 electronic copy
The time within which the Superintendent must give a direction as to the suitability and return the Contractor's copies: (Clause 8.4)	14 days
Work which cannot be subcontracted without approval: (Clause 9.2)	<i>Work under the Contract that is carried out by Selected or Nominated Subcontractors, suppliers or other parties nominated by the Specification</i>
The percentage of profit and attendance: (Clause 11(b))	0 %
The amount or percentage for profit and attendance: (Clause 11(c))	0 %
Insurance of the works - the alternative applying: (Clause 18)	Alternative 1 (insurance by the Contractor)
The assessment for insurance purposes of the costs of demolition and removal of debris: (Clause 18(ii))	5% of Value of Work
The assessment for insurance purposes of consultants' fees: (Clause 18(iii))	10% of Value of Work
The value of materials to be supplied by the Principal: (Clause 18(iv))	nil
The additional amount or percentage: (Clause 18(v))	nil
Public liability insurance - the alternative applying: (Clause (19))	Alternative 1 (insurance by Contractor)
The amount of Public liability insurance shall be not less than: (Clause 19)	\$20 Million
The time for giving possession of the Site: (Clause 27.1)	Within 7 days after issue of Building Permit
The date for Practical Completion: (Clause 35.2)	40 weeks after possession of site
Liquidated damages per day: (Clause 35.6)	\$ 350.00 per day
Limit of Liquidated damages: (Clause 35.7)	Unlimited
Bonus per day for early Practical completion: (Clause 35.8)	Not applicable
Limit of bonus: (Clause 35.8)	Not Applicable

Extra costs for Delay or Disruption: (Clause 36)	No Extra Events
The Defects liability period: (Clause 37)	52 Weeks
The charge for overheads, profit etc. for daywork: (Clause 41(f))	10 % generally & 5 % for nominated subcontractors
Times for Payment claims: (Clause 42.1)	Same Date each Month
Unfixed plant and materials for which payment claims may be made notwithstanding that they are not incorporated in the works: (Clause 42.1 (ii))	nil
Retention moneys on: (Clause 42.3)	10% up to 5% of the contract sum
Unfixed plant or materials - the alternative applying: (Clause 42.4)	Alternative 1
The rate of interest on overdue payments: (Clause 42.9)	Supreme Court rates as at the Date of Acceptance of the Tender
The delay in giving possession of the site which shall be a substantial breach: (Clause 44.7)	60 days
The alternative required in proceeding with dispute resolution: (Clause 47.2)	Alternative 2
The person to nominate an arbitrator: (Clause 47.3)	The President of Arbitrators
Location of arbitration: (Clause 47.3)	Perth Western Australia

# MUCHEA RECREATION CENTRE

## Specification for the **Construction of Muchea Recreation Centre** 48 Archibald Street Muchea for **The Shire of Chittering**

Revision	Date	Approved by
Issue of PTE	29 April 2022	SH
Issue for client review	11 May 2022	SH



Site Architecture Studio  
Level 3, 56 William Street, Perth WA 6000  
P 9226 5661  
mail@sitearchitecture.com.au



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## 2 PRELIMINARIES – AS 2124 - 1992

## 2.1 GENERAL

## 2.1.1 GENERAL

**General conditions**

General: To AS 2124-1992, General Conditions of Contract as amended.

**Interpretation**

Cross reference: The clause **Interpretation**, in the *General requirements* worksection, also applies.

## 2.1.2 SUBCONTRACTING

**Agreement (Conditions of contract)**

The Contractor must legally bind all SubContractors and Suppliers (whether nominated or otherwise) by signed written Agreements in the form of the current Subcontract Agreement AS 2545 or other such comparable Agreement as may be approved by the Superintendent.

**Subcontracting**

- The Contractor must within 14 days of entering into a Contract with the City of Rockingham submit to the Superintendent a complete list of SubContractors and Suppliers proposed to be used, including names of contact personnel and telephone numbers.
- Where the specification nominates work to be done or goods to be supplied by an approved organisation, the Contractor must not subcontract that part of the works until he has submitted in writing the name of the proposed SubContractor or supplier and has the written approval of the Superintendent.

## 2.1.3 SELECTED AND NOMINATED SUBCONTRACTORS

**Selected SubContractors**

The following work is **SELECTED SUBCONTRACT WORK** in the terms of Contract Clause 10:

- Nil

Refer to relevant worksections for a list of **SELECTED SUBCONTRACTORS** and subcontract the relevant works to a Selected SubContractor on the list.

**Nominated subcontract work**

The Contractor is responsible for administering, coordinating, supervising and generally attending upon the execution of work under the Contract by each Nominated SubContractor.

The Contractor must provide for each Nominated SubContractor all normal facilities for the proper performance of the Nominated Subcontract Work under the Contract including the following:

- (a) access to the Site;
- (b) storage areas;
- (c) use of water (Nominated SubContractors must provide their own hoses and fittings);
- (d) use of electric light and power supply (Nominated SubContractors must provide their own cables and portable lamps);
- (e) use of scaffolding and hoisting facilities as provided for the Contractor's own use while in position and at reasonable times including operators, but not the labour for loading or unloading such hoisting facilities (Nominated SubContractors must pay the Contractor for the use of such scaffold and hoisting facilities at rates agreed between them);
- (f) sanitary conveniences;
- (g) statutory amenities for drinking water, messing and changing;
- (h) storage of tools;
- (i) first aid and safety measures; and
- (j) Rubbish removal from site.

Any additional facilities required and any cutting of holes, chases, making good or other builders work required in connection with the work of any Nominated SubContractor, must be the responsibility of the Nominated SubContractor concerned, unless otherwise specified or shown on the drawings.

**NOMINATED SUBCONTRACTOR**

If it appears to the Contractor that the Nominated SubContractor above is in serious breach of its subcontract agreement with the Contractor, the Contractor must immediately advise the Principal of that breach in writing.

**NOMINATED SUBCONTRACT DIRECTION**

Where in any Nominated Subcontract document it is specified that any matter or thing is to be referred, submitted, supplied, handed over or notified by the Nominated SubContractor to the Superintendent, or application is to be made to the Superintendent, then the Nominated SubContractor must as and when required initiate such action with the Contractor and thereafter the Contractor must, within 3 working days take the matter or thing or application to the Superintendent together with any amendments pursuant to the subcontract as the Contractor may consider necessary.

Where in any Nominated Subcontract document it is specified that any action or approval is required of the Superintendent or that any work of the Nominated SubContractor is to be done to the satisfaction of the Superintendent, then notification of such action, approval or work done to the satisfaction of the Superintendent or not approved or done as the case may be, must be given by the Superintendent to the Contractor and thereafter the Contractor must as soon as practicable give the notification to the Nominated SubContractor with such additional requirements, directions or instructions pursuant to the subcontract as the Contractor may consider necessary.

**Contractors work for nominated SubContractors**

- Where the extent of the Contractors work associated with Nominated SubContractors work has been detailed in the tender documents allowances for same must be made by the Contractor in his tender.

**ADJUSTMENT OF PROVISIONAL SUMS**

Despite subclause 11 of the General Conditions:

When an adjustment is to be made to the Contract Sum for a provisional sum item, a variation order must be issued:

- (1) Reducing the Contract Sum by the amount of the provisional sum and the provisions of clause 40 of the General Conditions and the clause of the specification headed “allowances on variations” must **not apply**; and
- (2) Adjusting the Contract Sum by the amount directed by the Superintendent on behalf of the Principal to be expended by the Contractor against the provisional sum item.
  - A) Where the Contract Sum is adjusted in accordance with this clause, the actual amount (if any) included by the Contractor in the Contract Sum on account of profit and attendance for that provisional sum item must be payable to the Contractor when the work to be done in relation to the provisional sum item is undertaken.
  - B) Where the Superintendent directs that work to which a provisional sum relates must not be undertaken, the Contractor must be paid fifty per centum of the profit and attendance of the priced amounts (if any) in respect of that provisional sum item as included by the Contractor in its Contract Sum. The Superintendent must certify the value of the total amount payable under this clause when determining the final Contract Sum.

**2.1.4 PROVISIONAL SUMS**

**Provisional sums**

General: Provisional sums identified in the **Provisional sums schedule** are for purposes stated in relevant worksections of the specification.

**Provisional sums schedule**

Item	Where specified	Provisional sum (\$) ex GST
Kitchen and Bar equipment	Section 8	140,000

Door hardware	Section 30	57,000
Non-Statutory signage	Section 41	5,000
Western Power headworks	Section 46	46,000
Telstra headworks	Section 46	3,000

### 2.1.5 LATENT CONDITIONS

#### General

General: Other conditions which are latent conditions: No other conditions.

### 2.1.6 STATUTORY REQUIREMENTS

#### Requirements of authorities

General: The Principal, before entering into the Contract, has given the notices, paid the fees, and obtained the permits, approvals and other authorisations stated in the **Prior applications and approvals schedule**.

#### Prior applications and approvals schedule

Prior notices given and applications made	Fees paid	Permits, approvals and authorisations received
Building license	Allow to submit an application to the local authority and to pay all fees associated with the application and works bond. A Certificate of Design Compliance will be provided by the Principal to accompany the application. The fee for the preparation of the Certificate of Construction Compliance will be paid by the Principal.	Assessment for the preparation of a Certificate of Design Compliance is in progress

#### Certificate of Construction Compliance (CCC) and Occupancy Permits

Allow to co-ordinate inspections, assessments and co-ordination of the completed building by the Building Certifier and any other parties required for production of the CCC and Occupancy Certificate or similar, and to submit and obtain all forms and applications required to obtain an Occupancy Permit or similar. Pay all Local Government fees and charges associated with the issue of an Occupancy Permit and to:

- (a) assist the Principal and its agents to properly and duly obtain a certificate of construction compliance to permit the timely application for an occupancy permit or building approval certificate as the case may be from the permit authority to enable lawful occupancy of the building(s) or any part(s) thereof within the program timeframes required by the Principal and the Contract;
- (b) take into account the time periods and limits prescribed under the *Building Act 2011* (WA) in its construction program;
- (c) provide such further information or materials that the permit authority may reasonably require to support an application or impose conditions on the permit or certificate;

### 2.1.7 PROTECTION OF PEOPLE AND PROPERTY

#### General

The Contractor must use all types and methods of protection (such as temporary safety fencing and warning signage) that are reasonably practicable and necessary to protect the public from hazards

associated with the work under the Contract. Protection must be consistent with the recommendations contained in the WorkSafe WA publication “Construction Work and the Public”. This publication is available from WorkSafe WA and can be accessed from the WorkSafe WA website at [www.safetyline.wa.gov.au](http://www.safetyline.wa.gov.au). Where a safety fence is used, it must be at least 1.8 metres in height.

### Safety

Accidents: Promptly notify the Superintendent of the occurrence, of the following:

- Accidents involving death or personal injury.
- Accidents involving loss of time.
- Incidents with accident potential such as equipment failure, slides and cave-ins.

Accident reports: Submit reports of accidents.

- Purpose of submission: Information only.

### Protective clothing

Protective clothing: Make available protective clothing for the use of visitors.

- Safety helmets: To AS/NZS 1801:2014, Type 1.
- Certification: Required.
  - . Certification provider: An organisation accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ).

## 2.1.8 CARE OF THE WORK AND REINSTATEMENT OF DAMAGE/DAMAGE TO PERSONS AND PROPERTY OTHER THAN THE WORKS

### General

Damage to services: The Contractor must not obstruct or damage roadways and footpaths, drains and watercourses and other existing services in use on or adjacent to the site. The Contractor must determine the location of such services prior to commencing work on site. The Contractor must rectify immediately any obstruction or damage to such services and provide temporary services whilst repairs are carried out at the Contractor's expense.

Damage to property: The Contractor must not interfere with or damage property which is to remain on or adjacent to the site, including adjoining property encroaching onto the site, and trees. The Contractor must rectify immediately any interference or damage to such property at the Contractor's expense.

### Existing services

Service to be continued: Repair, divert or relocate service, as documented.

Trenches: If the existing service crosses the line of a required trench, or will lose support when the trench is excavated, provide permanent support for the existing service.

Redundant services: Remove redundant parts, and make safe.

Interruption to services: Minimise the number and duration of interruptions.

Proposals: The Contractor must submit proposals for review to the Superintendent detailing the action to be taken with respect to existing services before starting this work. The Contractor must minimise the number and duration of interruptions.

- Purpose of submission: For review.

### Adjoining property – Dilapidation Report

Notice: At least 14 days before commencing work, submit to owners and occupants of adjoining property written notice of intention to commence work and an outline description of the type and extent of work.

Records: For each property described in the **Adjoining properties to be recorded schedule**:

- Inspect the property with the Superintendent and owner and occupant of the property, before commencement of work.
- Make detailed records of conditions existing within the property, including existing fences and vegetation and especially structural defects and other damage or defacement.
- Arrange for at least 2 copies of each record, including drawings, written descriptions, and photographs, endorsed by the owner and occupant of the property, or their representatives, as evidence of conditions existing before commencement of work.

Endorsed copies: Submit one endorsed copy of each record. Keep the other endorsed copy on site.

- Purpose of submission: Information only.

**Adjoining properties to be recorded schedule**

Each property which has an adjoining boundary

**Reinstatement**

General: The Contractor must clean and repair damage caused by installation or use of temporary work and restore existing facilities used during construction to original condition.

**Excepted risks**

No additional risks other than stated in clause 16.3 (a), and (c to f) of the Contract.

**2.1.9 SITE****Site restrictions**

Site limitations: The Contractor must comply with the following restrictions on the use of the site:

Restrictions: Access on to and around the site, and use of the site for temporary works and constructional plant, including working and storage areas, location of offices, workshops, sheds, roads and parking is restricted to the following areas:

The area of the Works shown on the drawings and or as agreed with and approved by the Superintendent

**Access roads**

Principal's existing roads: Use only designated roads.

**Existing improvements**

Where within the site, existing improvements such as roads, drainage, structures and services and associated infrastructure, are identified on the drawings to be retained or maintained, the Contractor must protect and maintain these items throughout the Contract.

The Contractor must allow for all traffic control measures to protect and maintain these items throughout the works.

**SITE CONTROL**

The Contractor must at all times comply with the regulations and restrictions imposed by the Superintendent relating to the storage of materials, the routing of construction traffic, the interruption of existing services and facilities and any other regulations in force on the site.

The Contractor must comply with all statutes, regulations and by-laws relating to the protection of the environment.

The Contractor must ensure that green waste, earth, fill, brick, mortar, concrete, and metal are recycled either for use on-site or by delivery to a recycling facility. The Contractor must provide the Superintendent with off-site disposal documentation detailing the recycling facility destinations that received the materials.

The Contractor must obtain written approval from the Superintendent for the formation of any temporary roads, the erection of temporary structures or any site clearing not specifically documented.

No trees or shrubs must be removed or destroyed without the written approval of the Superintendent. No fire must be lit without the written approval of the Superintendent.

Flammable or explosive products must be stored in accordance with the relevant statutes and to the approval of the Superintendent.

**2.1.10 WORKPLACE SAFETY AND HEALTH****COMPLIANCE**

The Contractor must comply with the *Occupational Safety & Health Act 1984* (the Act) and the *Occupational Safety & Health Regulations 1996* (the regulations) and with any amendments that may be made to the Act and regulations from time to time.

The Act, regulations, Codes of Practice and other safety information can be accessed from the WorkSafe WA website at [www.safetyline.wa.gov.au](http://www.safetyline.wa.gov.au).

The Contractor is deemed to have control of the Site for the purposes of executing the work under the Contract. Accordingly the Contractor is responsible for ensuring that, wherever practicable, its employees and all other persons entering and moving about the Site, for whatever purpose, are not exposed to hazards.

**OCCUPATIONAL SAFETY AND HEALTH ACT AND OCCUPATIONAL SAFETY AND HEALTH REGULATIONS**

The Contractor is deemed to be in control of all matters related to the execution of the work under the Contract and accordingly is responsible for all such matters under the Act and regulations.

The Contractor must, wherever practicable, appoint a Safety and Health Representative or Representatives to perform the functions as defined under Section 33 of the Act.

The Contractor must comply with its obligations under Section 23(2) of the Act and regulations 2.4 and 2.5 concerning notification of certain injuries and diseases. The Contractor must also report all such matters to the Superintendent within the close business of the next working day.

The Contractor must indemnify the Principal from and against any loss, damage or injury suffered or incurred by the Principal or any claim made against the Principal by reason directly or indirectly of the Contractor failing to comply with its obligations under this Clause and the Contractor must reimburse the Principal any fines, penalties costs and expenses which the Principal may incur as a result (directly or indirectly) of any non-compliance on the part of the Contractor with any of the provisions of the Act or with any of its obligations under this Clause. The Contractor must pay all fees payable under the Act which are payable in connection with the execution of the Works.

**Material safety data sheets**

The Contractor must ensure that a copy of all manufacturer/supplier Material Safety Data Sheets are available on a register on site for each hazardous substance used in connection with the work under the Contract. Material Safety Data Sheets must be consistent with the format of the National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC: 2011 (1994)].

**OCCUPATIONAL SAFETY AND HEALTH INFORMATION**

Prior to the commencement of work on Site, or at any other time the Superintendent directs, the Contractor must consult with the Principal and the Superintendent for the purposes of ensuring that, as far as practicable, the construction work can be done without risk to the health and safety of either those doing the work, or anyone else who may be at or near the construction site.

The Contractor must ensure that the following information is recorded, reviewed and updated regularly, and kept until the Works are completed:

1. The identification of hazards to which a person at the construction site is likely to be exposed;
2. An assessment of the risk of injury or harm to a person resulting from those hazards; and
3. The risk control measures through which the risk of injury or harm may be eliminated or otherwise controlled.

If the Contractor becomes aware that a change in the design of the Works could better eliminate or control a risk of injury or harm to those doing the construction work, or anyone else who may be at or near the Site, the Contractor must ensure that this information is passed on to the Superintendent.

The Contractor must ensure that any Occupational Safety and Health information it receives from the Principal or the Superintendent is incorporated into its hazard identification, risk assessment and risk control measures.

**SAFETY MANAGEMENT PLAN**

Prior to the commencement of the work on Site, the Contractor must prepare and implement a Safety Management Plan relevant to the works under the Contract. The Safety Management Plan must be maintained, and where necessary updated, throughout the Contract. The Safety Management Plan must be appropriate to the risks associated with the work under the Contract and must contain provision for, but not be limited to, the following elements:

- a) induction for new employees / Sub-Contractors;
- b) listing of competencies required for specialist work (eg. rigger, scaffolder);
- c) accident/incident reporting;
- d) accident/incident investigation;
- e) hazard identification, risk assessment and risk control including routine inspection processes;
- f) plant/equipment inspection processes;

- g) pre-job planning, procedural issues and JSA's (Job Safety Analyses). Within the Safety Management Plan, particular attention is to be given to identifying hazardous activities including, but not limited to, work in confined spaces, asbestos removal, demolition work, excavation work, working near power lines and live conductors and working at heights;
- h) emergency response and evacuation procedures;
- i) methods of communicating and consulting with employees and transmitting new work procedures to employees;
- j) hazardous substances exposure management;
- k) site security;
- l) purchasing/hiring controls (to avoid unknowingly bringing hazards onto the Site);
- m) quantitative performance measures (application to be determined by contract size and duration), and;
- n) any other matters that the Superintendent may direct from time to time.

Each element of the Safety Management Plan must specifically address:

- a) the person on the Site who must take responsibility for the successful implementation of each element;
- b) the hierarchical structure by which the responsibility is performed, and;
- c) the specific manner by which the element is performed.

The Contractor must prepare the Safety Management Plan in conjunction with a competent person suitably experienced and qualified in safety matters.

Prior to the commencement of the Works, the Contractor must certify to the Superintendent that its Safety Management Plan:

- has been prepared
- is available on Site
- has been implemented on Site.

#### **OCCUPATIONAL HEALTH AND SAFETY INDUCTION TRAINING**

The Contractor must not permit its employees, the employees of other parties or other persons to commence work on the Site until they have been inducted. Such induction must include but not necessarily be limited to:

- a) familiarisation with the Safety Management Plan;
- b) reporting of accidents and incidents - which must include the type of events to be reported, how an event is reported and to whom the event is reported;
- c) emergency procedures - which must cover the procedure for a medical emergency and for evacuation of the Site in the event of a life threatening situation arising;
- d) personal protective equipment (PPE) - the standard requirements for the Site;
- e) lifting and manual handling skills;
- f) sun protection;
- g) avoidance of noise induced hearing loss;
- h) location of and access to First Aid on the Site;
- i) legislative framework - an employees rights and responsibilities under the Act and Regulations;
- j) procedure for the resolution of safety issues at the workplace (in accordance with Sections 24 to 28A of the Act), and;
- k) Site security.

Refer to the WorkSafe WA Code of Practice: First Aid, Workplace Amenities and PPE for practical guidance for the provision of first aid, workplace amenities and access to these amenities.

The Contractor must induct its employees, the employees of other parties or other persons working on the Site with regard to JSA's and must prepare "Training Session Attendance" sheets signed by each attendee verifying that such induction has occurred.

Upon commencement of work on the Site, the Contractor must further induct each employee, the employees of other parties or other persons working on the Site with regard to all significant hazards associated with their particular activity and area of employment on the Site and where relevant must include the use of powered plant, tools and equipment.

### 2.1.11 MATERIALS, LABOUR AND CONSTRUCTIONAL PLANT

#### Items supplied by Principal

General: Materials and other items supplied free of charge to the Contractor for installation in the execution of the works. The Contractor must unload and take delivery of the items and inspect them for defects. If defects are found, advise the Superintendent within 24 hours. Return unused items to the Principal.

#### Items and work supplied by Principal schedule

The following items of material and work will be provided by the Principal at no cost to the Contractor:

- Mechanical plant – one VRF condensing unit as nominated in the Mechanical worksection. Allow to take delivery of the condensing unit, provide insurance cover when positioned on site, to protect the equipment and install it as documented.
- Kitchen equipment – refer to the Sundry Items worksection for a list of equipment provided by the Principal. Allow to take delivery of the equipment, provide insurance cover when positioned on site to protect the equipment and install it as documented.

#### Temporary services

The Contractor must arrange for temporary services as required to construct and commission the works.

#### Temporary fencing

##### Site fencing

The Contractor must maintain security of the building and the site generally, and control access to and from the site by whatever measure is required to ensure the safety and security of the workplace within the site and to control unauthorised entry to the site from outside the site.

#### Use of existing services

Existing services may be used as temporary services for the performance of the Contract subject to conditions stated in the **Existing services schedule**.

#### Existing services schedule

Service	Conditions of use
Electrical supply	Provide a separate metered service and provide regular readings. Reimburse the Principal for costs associated with power usage. Make good on completion
Water supply	Provide a separate metered service and provide regular readings. Reimburse the Principal for costs associated with water usage. Make good on completion
Waste water	Provide a separate service and or connection and comply with requirements of the Water Corporation and the local authority.

#### Parking

Parking will be allowed on site in designated areas.

#### Project signboard

Provide project-specific signboards:

- Locate where directed.

- Maintain in good condition for duration of the work.
- Obtain written permission for removal.
- Remove on completion.

Other signboards: Obtain approval before display of advertisements or provision of other signboards.

#### **Project signboard schedule**

The Contractor must provide a Project signboard within seven days of being provided with access to the Site. The Project signboard must be placed in a prominent location clearly visible from the roadway, at a location approved by the Superintendent.

The Project signboard must be 2.4m x 1.2m in dimension and constructed from durable aluminium and securely supported with galvanised steel posts and braced as required. The Principal will provide the content, design and artwork for the signboard which will include the Principal's logo. The signboard must be full colour and of material that is durable and able to withstand all weather conditions and must not fade over the duration of the Project.

The Contractor must maintain and ensure that the Project signboard is unobstructed at all times and remains in good condition until the Date of Practical Completion or until such time as directed by the Superintendent. If the Project Signboard needs to be moved for any reason the Contractor must do so at no cost to the Principal.

Remove the sign board and dispose of on completion of the works.

### **2.1.12 ENVIRONMENTAL PROTECTION**

#### **Noise control**

The Contractor must, at all times, take adequate measures to control noise on the site and comply with the requirements of the *Environmental Protection (Noise) Regulations 1997 (WA)* as amended insofar as they relate to construction work, and comply with any local government requirements relating to noise from construction sites.

The Contractor is required to meet all costs of complying with this clause.

The Superintendent may, at any time, direct the Contractor to take reasonable steps to control noise including (but not limited to):

- (a) The substitution of noisy equipment or processes with less noisy alternatives;
- (b) The modification of equipment (where this is practical and can be done safely and following consultation with the manufacturer);
- (c) Situating noisy equipment away from noise sensitive areas;
- (d) Undertaking noisy work in areas or at times specified by the Superintendent;
- (e) Installing screens to limit the impact of noise on noise-sensitive areas; and
- (f) Any other measure the Superintendent considers reasonable.

The Contractor must prepare a noise management plan, work must be carried out in accordance with that plan.

Where the construction work is carried out between 7pm and 7am, or on Sundays or Public Holidays, the Contractor must:

- Carry out the work in accordance with Section 6 of AS 2436-1981 Guide to noise and vibration control on construction, demolition and maintenance sites;
  - (a) Ensure the equipment used is the quietest reasonably available;
  - (b) Advise the occupants of all nearby properties of the work to be done at least 24 hours before it commences;
  - (c) Be able to establish that it was reasonably necessary for the work to be carried out at that time; and
  - (d) Prepare and have approved by the CEO of the Environmental Protection Authority a noise management plan if required by the CEO of the Environmental Protection Authority.

A local government may require the Contractor to submit a noise management plan and application fee. Where required, the Contractor must submit the noise management plan to the local government as well as any application fee due in relation to the noise management plan 7 calendar days prior to commencing the work. Where the Contractor has prepared a noise management plan, work must be carried out in accordance with that plan.

The Superintendent may direct the Contractor to provide to the Superintendent:

- (a) a written statement confirming it has complied with its requirements under this clause; and
- (b) a certificate of acoustic performance issued by a laboratory registered with the NATA for any equipment before permitting its use, or continued use, on the building site.

For the purpose of this clause, “equipment” has the same meaning as stated in section 3 of the *Environmental Protection Act 1986 (WA)*.

### 2.1.13 MATERIALS AND WORK

#### Changes to existing

At least 7 days before changing the following existing items, give notice:

- Services

### 2.1.14 WORKING HOURS

#### General

Hours: In accordance with the Local Authorities requirements.

Days: In accordance with the Local Authorities requirements.

### 2.1.15 PROGRESS AND PROGRAMMING OF THE WORKS

#### Order of work

The order of work must be as follows and as shown on the drawings:

All remaining Works.

#### Program of work

Construction program: The Contractor must furnish a construction program showing the following in the time and in the form directed by the Superintendent:

- Sequence of work.
- Site mobilisation.
- Critical paths of activities related to the work.
- Allowance for holidays.
- Activity inter-relationships.
- External dependencies including provision of access, document approvals and work by others.
- Plant and labour resources and projected productivity rates for each activity.
- Periods within which various stages or parts of the work must be executed.
- Procurement activities, such as subcontract tendering and appointment.
- Order dates and lead times for major components.
- Time allowed for product certification of imported goods.
- Time allowed for testing and commissioning of major items of equipment.
- Preparation and approvals for Contractor’s documents.
- Shop drawings
- Order off site material with long lead times
- Submission of warranties, as constructed drawings and operation manuals
- Contractor certification of installed works required for preparation of Certificate and Construction Compliance.

Revisions: The Contractor must revise the construction program at no cost to the Principal, as required by the progress of the work. The Contractor must submit revisions to the Superintendent with each progress claim, identify changes since the previous version, and show the estimated percentage

of completion for each item of work. Revisions to the Construction Program will be carried out at no cost to the Principal.

The Contractor must provide progress reports, fortnightly and as required by the Superintendent, on the progress of off site work.

Program chart: The Contractor must display in the Contractor's site office an up-to-date bar chart and network diagram based on Construction Program.

Purpose of submissions: The approved Construction Program will be used by the Superintendent to monitor rate of progress, and when determining extensions of time under the Contract.

#### **Site meetings**

The Contractor must hold and attend site meetings throughout the Contract and ensure attendance of appropriate SubContractors, the Superintendent, and appropriate Consultants.

**Frequency:** Once per fortnight and as required by the Superintendent.

**Contacts:** At the first site meeting, the Contractor must submit names and telephone numbers of responsible persons who may be contacted after hours during the course of the Contract.

The following minimum information must be reported on at each site meeting and included in the minutes of the meeting or provided as a separate report:

- Attendees, apologies and distribution
- New business with action and by date
- Previous business with action and close out date
- Work under the Contract currently in progress, highlighting critical activities
- Activities affected by or linked with delays whether the subject of time claims or not
- Work activities to commence in the next period
- Actions required by the Principal or Superintendent
- Program status
- On site disruptions
- Purpose of submission: Review.
- Sample register – to be updated at each meeting
- Request for information (RFI) register with status noted
- Superintendents Directions (SD) register with status noted
- Variation Orders (VO) register with status noted
- Shop drawings register with status
- Equipment register for approval – with status
- OH&S, Quality

#### **Records**

The Contractor must collect and maintain on site, on a daily basis, information on:

- work done on all activities;
- site attendance of all staff and work operatives; and
- presence and use of all constructional plant.

#### **Access to Records**

The Contractor must allow access to the records and assist in providing accurate information to enable the Superintendent to make independent assessment of Contract progress and program.

#### **NON-COMPLIANCE**

If the Contractor fails to provide the Construction Program, re-issues of the Construction Program, any site records or reports as covered by this clause, then, at the absolute discretion of the Superintendent, the Superintendent may have them prepared.

The cost of the re-issues to the Superintendent will be borne by the Contractor, by way of a variation under the Contract.

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## 2.2 CERTIFICATES AND PAYMENTS

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### 2.2.1 CERTIFICATE OF PRACTICAL COMPLETION

Notwithstanding any provision of the Contract to the contrary, a Certificate of Practical Completion will not be granted to the Contractor prior to the provision of the following items to the Superintendent:

- (a) satisfactory evidence of tests and inspections required under the Contract having been conducted and passed;
- (b) as constructed drawings which:
  - (i) match the CADD format of the Contract drawings and, if the Principal specifies another form or format in which those as constructed drawings should be provided, then as constructed drawings must be provided in that form or format; and
  - (ii) record the position of all in-ground services, man holes and service pits (for electrical, mechanical and hydraulic services) in .dwg format which are prepared and certified by a surveyor licensed pursuant to the *Licensed Surveyors Act 1909* (WA) and which:
    - (A) are supported by photographic evidence of the completion and location of in-ground services, man holes and service pits; and
    - (B) detail the depth of each in-ground service, man hole and service pit relative to finished ground level;
- (c) warranties and guarantees required to be provided pursuant to the Contract
- (d) operating manuals required for the use, operation and maintenance of the Works or any part thereof;
- (e) a Certificate of Construction Compliance; and
- (f) anything which is within or ought to be within the power, possession, custody or control of the Contractor to provide to the Principal, which the Principal is prescribed by the *Building Act 2011* (WA) or regulations to provide to a permit authority to obtain either an occupancy permit or building approval certificate.

Where there is a delay in the provision of a Certificate of Construction Compliance which is beyond the reasonable control of the Contractor, the Contractor must be entitled to an extension of time in accordance with clause 35.5 of the General Conditions.

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## 2.3 LIQUIDATED DAMAGES

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The Contractor acknowledges and agrees that the amount specified as liquidated damages is the best genuine pre-estimate of the detriment that the Principal will incur if the Date for Practical Completion is not achieved, and the Contractor further agrees to exclude and waive any right, or the benefit of the application of any legal rule or principle, including in accordance with statute equity and common law, relating to the enforceability of this clause or the characterisation of it or any amount specified as liquidated damages, as a penalty.

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## 2.4 ACCESS COMPLIANCE

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The Works under Contract must be constructed in accordance with AS1428 (current version) Design for Access and Mobility Part 1: General Requirements for Access - New Building Work. The Contractor must retain a copy of AS 1428 on site and familiarise themselves with, and implement the requirements of that standard as it applies to the Works. Variation claims to construct the Works or make good to defective or non-compliant Works as directed by the Superintendent will not be considered.

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## 2.5 TIMES FOR COMMENCEMENT AND PRACTICAL COMPLETION

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### General

In accordance with the Contract.

#### 2.5.1 CLEANING UP

##### Final cleaning

General - work by the Contractor: clean debris from site, roofs, gutters, downpipes and drainage systems and remove waste, surplus materials and rubbish from the Site.

Samples: The Contractor must remove non-incorporated samples, prototypes and sample panels.

The Contractor must remove temporary works and constructional plant from the Site at the completion of the works.

#### 2.5.2 CERTIFICATES AND PAYMENTS

##### Payment claims break-down

Break down: With each progress claim the Contractor must submit a statement of amounts claimed in respect of each item shown in the Price Schedule and Trade Breakup, including percentage claimed at each claim and progressively with values claimed, together with variations included in the claim.

Purpose of submission: Review.

##### Method of measurement

General: In accordance with the principles of the Australian Standard Method of Measurement of Building Works (ASMM).

Other civil engineering work: To AS 1181 - 1982

**3 GENERAL REQUIREMENTS****3.1 GENERAL****3.1.1 PRECEDENCE****General**

Order of precedence: If there is conflict or inconsistency between the worksections of this specification, the requirements of worksections take the following order of precedence:

- All worksection other than those listed below.
- *Mechanical systems, Hydraulic systems, Electrical systems* .
- *Common requirements* worksections.
- *General requirements*.

**3.1.2 CROSS REFERENCES****Common requirements**

Requirement: Conform to the other worksections as appropriate.

**Cross referencing styles**

General: Within the text, titles are cross referenced using the following styles:

- Worksection titles are indicated by *Italicised* text.
- Subsection titles are indicated by CAPITAL text.
- Clause titles are indicated by **BOLD CAPITAL** text.
- Subclause titles are indicated by **Bold Sentence case** text.

**3.1.3 REFERENCED DOCUMENTS****General**

Precedence: The requirements of worksections override conflicting requirements of their referenced documents. The requirements of the referenced documents are minimum requirements.

Contractual relationships: Responsibilities and duties of the principal, contractor and contract administrator are not altered by requirements in the documents referenced in this specification.

Current editions: Use referenced documents which are the editions, with amendments, current 3 months before the closing date for tenders.

Exception to current editions: If statutory requirements reference other editions, conform to those editions.

**Site Copy: AS 1428.1 Retain copy of this standard on site and refer to this Standard during the works.**

European standards: Any national European Standard (e.g. BS EN, IS EN or DIN EN) may be used in place of the equivalent referenced European Standard (EN).

**3.1.4 CONTRACT DOCUMENTS****Services diagrammatic layouts**

General: Layouts of service lines, plant and equipment shown on the drawings are diagrammatic only, except where figured dimensions are provided or calculable.

Before commencing work:

- Obtain measurements and other necessary information.
- Coordinate the design and installation in conjunction with all trades.

**Levels**

General: Spot levels take precedence over contour lines and ground profile lines.

**Drawings and manuals for existing services**

**Subsurface services: Information shown on the drawings relating to underground or submerged services is approximate only.:**

Warranty: No warranty is given as to the completeness or accuracy of drawings and/or manuals of existing services.

### 3.1.5 INTERPRETATION

#### Abbreviations

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

- AS: Australian Standard.
- BCA: National Construction Code Series Volume One: Building Code of Australia Class 2 to 9 Buildings and Volume Two: Building Code of Australia Class 1 and Class 10 Buildings.
- EN: European Norm (European Standard).
- GRP: Glass Reinforced Plastic.
- IP: Ingress protection.
- NATA: National Association of Testing Authorities.
- NCC: National Construction Code.
- NZS: New Zealand Standard.
- PCA: National Construction Code Series Volume 3: Plumbing Code of Australia.
- PVC: Polyvinyl Chloride.
- PVC-U: Unplasticised Polyvinyl Chloride. Also known as UPVC.
- SDS: Safety data sheets.
- VOC: Volatile Organic Compound.
- WHS: Work Health and Safety.

#### Definitions

General: For the purposes of this specification, the following definitions apply:

- Access for maintenance: Includes access for maintenance, inspection, measurement, operation, adjustment, repair, replacement and other maintenance related tasks.
- Accessible, readily: Readily accessible, easily accessible, easy access and similar terms mean capable of being reached quickly and without climbing over or removing obstructions, using a movable ladder, and in any case not more than 2.0 m above the ground, floor or platform.
- Accredited Testing Laboratory:
  - An organisation accredited by the National Association of Testing Authorities (NATA) to undertake the relevant tests; or
  - An organisation outside Australia accredited to undertake the relevant tests by an authority recognised by NATA through a mutual recognition agreement; or
  - An organisation recognised as being an Accredited Testing Laboratory under legislation at the time the test was undertaken.
- An organisation accredited for compliance with ISO/IEC 17025 to undertake the relevant tests.
- Appropriately qualified person: To NCC Schedule 3.
- Attendance: Attendance, provide attendance and similar expressions mean give assistance for examination and testing.
- Commissioning: Advancement of an installation from static completion to full working order, including verification that the systems, sub-systems, and their components meet the project requirements. This includes all work described as commissioning in referenced documents, even if carried out before static completion.
- Contract administrator: Has the same meaning as architect or superintendent and is the person appointed by the owner or principal under the contract.
- Contractor: Has the same meaning as builder and is the person or organisation bound to carry out and complete the work under the contract.
- Default: Specified value, product or installation method which is to be provided unless otherwise documented.
- Design life: The period of time for which it is assumed, in the design, that an asset will be able to perform its intended purpose with only anticipated maintenance but no major repair or replacement being necessary.
- Design parameters: Information used as the basis for design. It includes design requirements, performance criteria, performance parameters and similar terms.
- Documented: Documented, as documented and similar terms mean contained in the contract documents.

- Economic life: The period of time from the acquisition of an asset to the time when the asset, while still physically capable of fulfilling its function and with only anticipated maintenance, ceases to be the lowest cost alternative for satisfying that function.
- Electricity distributor: Any person or organisation that provides electricity from an electricity distribution system to one or more electrical installations. Includes distributor, supply authority, network operator, local network service provider, electricity retailer or electricity entity, as may be appropriate in the relevant jurisdiction.
- Errors and omissions: For the design prepared by the contractor, errors and omissions have the same meaning as defects.
- Fire hazard properties: To NCC Schedule 3.
- Gas Network Operator: Has the same meaning as network operator in AS/NZS 5601.1.
- Geotechnical site investigation: The process of evaluating the geotechnical characteristics of the site in the context of existing or proposed construction.
- Give notice: Give notice, submit, advise, inform and similar expressions mean give notice (submit, advise, inform) in writing to the contract administrator.
- High level interface: Systems transfer information in a digital format using an open system interface.
- Hot-dip galvanized: Zinc coated to AS/NZS 4680 after fabrication with coating thickness and mass to AS/NZS 4680 Table 1.
- Ingress protection: IP, IP code, IP rating and similar expression have the same meaning as IP Code in AS 60529.
- Joints:
  - Construction joint: A joint with continuous reinforcement provided to suit construction sequence.
  - Contraction joint: An opening control joint with a bond breaking coating separating the joint surfaces to allow independent and controlled contraction of different parts or components, induced by shrinkage, temperature changes or other causes. It may include unbound dowels to assist vertical deflection control.
  - Control joint: An unreinforced joint between or within discrete elements of construction which allows for relative movement of the elements.
  - Expansion joint: A closing control joint with the joint surfaces separated by a compressible filler to allow axial movement due to thermal expansion or contraction with changes in temperature or creep. It may include unbound dowels to assist vertical deflection control.
  - Sealant joint: A joint filled with a flexible synthetic compound which adheres to surfaces within the joint to prevent the passage of dust, moisture and gases.
  - Structural control joint: A control joint (contraction, expansion and isolation) in structural elements when used with applied material and finishes.
  - Substrate joint: A joint in the substrate which includes construction joints and joints between different materials.
  - Weakened plane joint: A contraction joint created by forming a groove, extending at least one quarter the depth of the section, either by using a grooving tool, by sawing, or by inserting a premoulded strip.
- Local authority (local council): A body established for the purposes of local government by or under a law applying in a state or territory.
- Low level interface: Systems transfer information via terminals and voltage free contacts.
- Manufacturer's recommendations: Recommendations, instructions, requirements, specifications (and similar expressions) provided in written or other form by the manufacturer and/or supplier relating to the suitability, use, installation, storage and/or handling of a product.
- Metallic-coated: Steel coated with zinc or aluminium-zinc alloy as follows:
  - Metallic-coated steel sheet: To AS 1397. Metal thicknesses specified are base metal thicknesses.
  - Ferrous open sections zinc coated by an in-line process: To AS/NZS 4791.
  - Ferrous hollow sections zinc coated by a continuous or specialised process: To AS/NZS 4792.
- Network Utility Operator: To NCC Schedule 3. A person who undertakes the piped distribution of drinking water or non-drinking water for supply; or is the operator of a sewerage system or a stormwater drainage system.
- Obtain: Obtain, seek and similar expressions mean obtain (seek) in writing from the contract administrator.

- Pipe: Includes pipe and tube.
- Practical completion or defects free completion: The requirements for these stages of completion are defined in the relevant building contract for the project.
- Pre-commissioning: Verifying that the installation of a system is complete and ready for commissioning.
- Principal: Principal has the same meaning as owner, client and proprietor and is the party to whom the contractor is legally bound to construct the works.
- Professional engineer: To NCC Schedule 3.
- Proprietary: Identifiable by naming the manufacturer, supplier, installer, trade name, brand name, catalogue or reference number.
- Prototype: A full size mock-up of components, systems or elements to demonstrate or test construction methods, junctions and finishes, and to define the level of quality.
- Provide: Provide and similar expressions mean supply and install and include development of the design beyond that documented.
- Record drawings: Record drawings has the same meaning as as-installed drawings, as-built drawings and work-as-executed drawings.
- Referenced documents: Standards and other documents whose requirements are included in this specification by reference.
- Required: Required by the contract documents, the local or statutory authorities.
- Restore: return to original state including roll on turf complete with irrigation where applicable.
- If required: A conditional specification term for work which may be shown in the documents or is a legislative requirement.
- Sample: A physical example that illustrates workmanship, materials or equipment, and establishes standards by which the work will be judged. It includes samples and sample panels.
- Statutory authority: A public sector entity created by legislation, that is, a specific law of the Commonwealth, State or Territory.
- Static completion: The state of a system when installation works are complete but have not been commissioned.
- Supply: Supply, furnish and similar expressions mean supply only.
- Tests - integrated system: Tests conducted on the project as a complete, integrated system to verify successful integration, interaction, and operation of all interrelated systems to the project requirements.
- Tests - production: Tests carried out on an item, before delivery to the site.
- Tests - site: Tests carried out on site.
- Tests - type: Tests carried out on an item identical with a production item, including with respect to materials, material suppliers, manufacturing processes, dimensions and marking.
- Tolerance: The permitted difference between the upper limit and the lower limit of dimension, value or quantity.
- Utility service provider: Includes Electricity distributor, Network Utility Operator, Gas Network Operator and organisations providing other reticulated utilities including data and telecommunications services.
- Verification: Provision of evidence or proof that a performance requirement has been met or a default exists.

### 3.2 SUBMISSIONS AND INSPECTIONS

#### 3.2.1 SUBMISSIONS

##### General

Contractor review: Before submitting, review each submission item, and check for coordination with other work of the contract and conformance to contract documents.

**Submit to:** Superintendents Representative

##### Submission times

Default timing: Submit information or other material for information, comment or approval at least 5 working days before ordering products or starting installation of the respective portion of the works.

**Submission response times:** Allow in the construction program for at least the following times:

- Shop drawings: 14 working days
- Samples and prototypes: 5 working days
- Manufacturers' or suppliers' recommendations: 48 hours
- Product data: 48 hours
- Product/design substitution or modification: 5 working days
- Services installation and location: progressively as the work proceeds and before services are concealed.

Proposed products schedules: If major products are not specified as proprietary items, submit a schedule of those proposed for use within 3 weeks of site possession.

#### Identification

Requirement: Identify the project, contractor, subcontractor or supplier, manufacturer, applicable product, model number and options, as appropriate and include relevant contract document references.

Non-conformance: Identify proposals that do not conform with project requirements, and characteristics which may be detrimental to successful performance of the completed work.

#### Errors

Requirement: If a submission contains errors, make a new or amended submission as appropriate, indicating changes made since the previous submission.

#### Electronic submissions

Electronic copies file format: PDF

Transmission medium: Email

#### Hard copy submissions

Hard copy quantity: 2

Standard contract drawing size: A1

#### Project requirements

General: Submit the following, as documented:

- Authority approvals: Notes of meetings with regulatory authorities utility service providers whose requirements apply to the work and evidence that notices, fees and permits have been sought and paid, that utility service provider connections are complete and that statutory approvals by the authorities whose requirements apply to the work have been received.
- Building penetrations: Details of the methods to maintain the required structural, fire and other properties to **BUILDING PENETRATIONS**.
- Certification: Certificates of conformance to documented requirements.
- Commissioning plan: For the whole of the work to **COMMISSIONING**.
- Commissioning program: For the whole of the work to **COMMISSIONING**.
- Electronic facility and asset management information: For the whole of the work to **ELECTRONIC FACILITY AND ASSET MANAGEMENT INFORMATION**.
- Execution details: Execution programs, schedules and details of proposed methods and equipment. For building services include the following:
  - Embedded services: Proposed method for embedding services in concrete walls or floors or chasing into concrete or masonry walls.
  - Fixing of services: Typical details of locations, types and methods of fixing services to the building structure.
  - Inaccessible services: If services will be enclosed and not accessible after completion, submit proposals for location of service runs and fittings.
  - Fire performance: Evidence of conformity to requirement for combustibility, fire hazard properties and fire-resistance of building elements.
- Marking and labelling: Samples and schedules of proposed marking and labels to **MARKING AND LABELLING**.
- Operation and maintenance manuals: For the whole of the work to **OPERATION AND MAINTENANCE MANUALS**.
- Products: Products and materials data, including manufacturer's technical specifications and drawings, product data sheets, type tests results, evidence of conformity to documented requirements, product certification, performance and rating tables, service connection requirements and installation and maintenance recommendations.

- Prototypes: Prototypes of components, systems or elements.
- Records: As-built documents, photographs, system diagrams, schedules and logbooks to **RECORD DRAWINGS**.
- Samples: Representative of proposed products and materials and including proposals to incorporate samples into the works, if any to **SAMPLES AND PROTOTYPES**.
- Shop drawings: To **SHOP DRAWINGS**.
- Substitutions: To **SUBSTITUTIONS**.
- Tests:
  - Test reports for testing performed under the contract.
- Warranties: To **WARRANTIES**.

### 3.2.2 INSPECTION

#### Notice

Concealment: If notice of inspection is required for parts of the works that are to be concealed, give notice when the inspection can be made before concealment.

#### Notification times

Minimum notice: As documented.

#### Light levels

Lighting levels for inspection: To AS/NZS 1680.2.4.

#### Attendance

General: Provide attendance for documented inspections and tests.

## 3.3 PERFORMANCE

### 3.3.1 CORROSION RESISTANCE

#### Atmospheric corrosivity category

General: Atmospheric corrosivity category as defined in AS 4312:

- Exterior atmospheric corrosivity category: C3
- Interior atmospheric corrosivity category: C2

#### Galvanizing

Severe conditions: Galvanize mild steel components (including fasteners) to AS/NZS 1214 or AS/NZS 4680 as appropriate, if:

- Exposed to weather.
- Embedded in masonry.
- Exposed to or in air spaces behind the external leaf of masonry walls.
- In contact with chemically treated timber, other than copper chrome arsenate (CCA).

### 3.3.2 NOISE LEVELS

#### General

General: Install systems to operate within the noise level limits, as documented for the contract design and documented equipment performance.

### 3.3.3 STRUCTURE

#### General

Requirement: If required, provide structures, installations and components as follows:

- Fixed accessways: To AS 1657.
- Structural design actions: To the AS/NZS 1170 series.

Importance level: 3

## 3.4 DESIGN

### 3.4.1 DESIGN DEVELOPMENT

#### General

Requirement: Complete the design of the work, including development of the design beyond that documented.

Conflict with the documents: If it is believed that a conflict exists between statutory requirements and the documents, notify the contract administrator immediately and provide a recommendation to resolve the conflict.

### 3.4.2 DESIGNER

#### General

Design by contractor: If the contractor provides design, use only appropriately qualified persons.

## 3.5 PRODUCTS AND MATERIALS

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### 3.5.1 GENERAL

#### Sources policy

General: A preference for Australian products.

#### Consistency

General: For each material or product use the same source or manufacturer and provide consistent type, size, quality and appearance.

#### Low VOC emitting paints

Paint types: To the recommendations of AS/NZS 2311 Table 4.2.

#### Prohibited materials

General: Do not provide the following:

- Materials, exceeding the limits of those listed, in the Safe Work Australia *Hazardous Chemical Information System* (HCIS) Workplace exposure standards.
- Blowing agents:
- Materials that use chlorofluorocarbon (CFC) or hydrochlorofluorocarbon (HCFC) in the manufacturing process.
- A blowing agent with a global warming potential (GWP)  $\geq 700$ .

### 3.5.2 PROPRIETARY ITEMS

#### Manufacturer's or supplier's recommendations

General: Provide manufactured items to the manufacturer's or supplier's recommendations.

Proprietary items/systems/assemblies: Assemble, install or fix to substrate to the manufacturer's or supplier's recommendations.

Project modifications: Advise of activities that supplement, or are contrary to the manufacturer's or supplier's recommendations.

#### Identification of proprietary items

Sealed containers: If items are supplied by the manufacturer in closed or sealed containers or packages, bring them to point of use in the original containers or packages.

Other items: Marked to show the following, as applicable:

- Manufacturer's identification.
- Brand name.
- Product type.
- Quantity.
- Reference code and batch number.
- Date of manufacture.

### 3.5.3 SUBSTITUTIONS

#### General

Identified proprietary items: Identification of a proprietary item does not necessarily imply exclusive preference for the identified item, but indicates the necessary properties of the item.

**Approval: No substitutions shall be made or will be accepted without the written approval of the Superintendents Representative.**

Alternatives: If alternatives to the documented products, methods or systems are proposed, submit sufficient information to permit evaluation of the proposed alternatives, including the following:

- Product, method or system identification.
- Manufacturer's contact details.

- Detailed comparison between the properties of the documented product and proposed substitution.
- Details of manufacturer and/or installer warranty.
- Statement of NCC compliance, if applicable.
- Evidence of conformity to a cited standard.
- Evidence that the performance is at least equal to that specified.
- Samples.
- Essential technical information, in English.
- Reasons for the proposed substitutions.
- Statement of the extent of revisions to the contract documents.
- Statement of the extent of revisions to the construction program.
- Statement of cost implications including costs outside the contract.
- Statement of consequent alterations to other parts of the works.

Availability: If the documented products or systems are unavailable within the time constraints of the construction program, submit evidence.

Criteria: If the substitution is for any reason other than unavailability, submit evidence that the substitution:

- Is of net enhanced value to the principal.
- Is consistent with the contract documents and is as effective as the identified item, detail or method.

### 3.5.4 SAMPLES AND PROTOTYPES

#### General

Incorporation of samples: Only incorporate samples that have been endorsed for inclusion in the works. Do not incorporate other samples.

Retention of samples: Keep endorsed samples in good condition on site, until the date for practical completion.

Unincorporated samples: Remove on completion.

### 3.5.5 SHOP DRAWINGS

#### General

Documentation: Include dimensioned drawings showing details of the fabrication and installation of structural elements, building components, services and equipment, including relationship to building structure and other services, cable type and size, and marking details.

**It is the Contractors responsibility to fully co-ordinate all shop drawings with the Architectural drawings. Shop drawings that have been submitted to the Superintendent which are found on review to have been prepared without full and complete reference to the Architectural drawings will be returned to the Contractor with a request to resubmit and no extensions of time will be considered for any delay caused by this event.**

Diagrammatic layouts: Coordinate work shown diagrammatically in the contract documents, and prepare dimensioned set-out drawings.

Services coordination: Coordinate with other building and service elements. Show adjusted positions on the shop drawings.

Space requirements: Check space and access for maintenance requirements of equipment and services indicated diagrammatically in the contract documents.

Commissioning requirements: Show provisions for testing and commissioning on the drawings.

Access for maintenance: Show space and provisions for access for maintenance.

Building work drawings for building services: On dimensioned drawings show the following:

- Access doors and panels.
- Conduits to be cast in slabs.
- Holding down bolts and other anchorage and/or fixings required complete with loads to be imposed on the structure during installation and operation.
- Openings, penetrations and block-outs.
- Sleeves.
- Plinths, kerbs and bases.
- Required external openings.

Submission medium: PDF and 3D CAD model compatible with Revit

Drawing size: As appropriate to the element being drawn

Record drawings: Amend all documented shop drawings to include changes made during the progress of the work and up to the end of the defects liability period.

### Shop drawings for elements which connect to an existing building

Prior to preparing shop drawings the whole or part of the existing building that will be affected by the new works must be surveyed by a Licensed Surveyor and the information provided to the Superintendent. The survey information must be used as a basis of preparing the shop drawings for the new element that will connect to or interface with the existing building. It is the Contractors responsibility to accurately determine all dimensions of the building that affect any new element that is documented to connect to or interact with the existing building.

## 3.6 ANCILLARY BUILDING WORK

### 3.6.1 WALL CHASING

#### Holes and chases

General: If holes and chases are required in masonry walls, make sure structural integrity of the wall is maintained. Do not chase walls with a fire-resistance level or an acoustic rating.

Parallel chases or recesses on opposite faces of a wall: Not closer than 600 mm to each other.

Chasing blockwork: Only chase core-filled hollow blocks or solid blocks which are not documented as structural.

#### Concrete blockwork chasing table

Block thickness (mm)	Maximum depth of chase (mm)
190	35
140	25
90	20

### 3.6.2 FIXING

#### General

Suitability: If equipment is not suitable for fixing to non-structural building elements, fix directly to structure and trim around penetrations in non-structural elements.

#### Fasteners

General: Use proprietary fasteners capable of transmitting the loads imposed, and sufficient for the rigidity of the assembly.

### 3.6.3 BUILDING PENETRATIONS

#### Penetrations

Requirement: Maintain the required structural integrity, fire performance, waterproofing performance and other properties when penetrating or fixing to the following:

- Structural building elements including external walls, fire walls, fire doors and access panels, other tested and rated assemblies or elements, floor slabs and beams.
- Membrane elements including damp-proof courses, waterproofing membranes and roof coverings. If penetrating membranes, provide a waterproof seal between the membrane and the penetrating component.

#### Sealing

Fire-resisting building elements: Seal penetrations with a system conforming to AS 4072.1.

Non fire-resisting building elements: Seal penetrations around conduits and sleeves. Seal around cables within sleeves. If the building element is acoustically rated, maintain the rating.

#### Sleeves

General: If piping, cables or conduits penetrate building elements, provide metal or PVC-U sleeves formed from pipe sections as follows:

- Movement: Arrange to permit normal pipe or conduit movement.
- Diameter (for non fire-resisting building elements): Sufficient to provide a ring shaped space around the pipe or pipe insulation of at least 12 mm.
- Ferrous surfaces: Prime paint.

- Sealing: Seal between pipes or conduits and sleeves to prevent the entry of vermin.
- Terminations:
  - Cover plates fitted: Flush with the finished building surface.
  - Fire-resisting and acoustic rated building elements: 50 mm beyond finished building surface.
  - Floors draining to floor wastes: 50 mm above finished floor.
  - Other locations: 5 mm beyond finished building surface.
- Termite management: To AS 3660.1.
- Thickness:
  - Metal: 1 mm or greater.
  - PVC-U: 3 mm or greater.

### 3.6.4 SUPPORT OF PLANT AND EQUIPMENT

#### Concrete plinths

General: Provide concrete plinths as documented and under all equipment located on concrete floor slabs as follows:

- Surround: Zinc (hot-dipped) coated steel, at least 75 mm high and 1.6 mm thick. Fix to the floor with masonry anchors. Fill with concrete.
- Height: 75 mm or greater, as documented.
- Reinforcement: Single layer of F62 fabric.
- Concrete: Grade N20.
- Finish: Steel float, flush with top edge of the surround.

#### Support of ground level plant and equipment

Ground level: Conform to the following:

- If the ground slope is 15° or more, or the area of the plant and equipment is extensive, obtain the advice of a professional engineer for the documentation of a suitable slab or platform.
- In all other cases, provide proprietary plastic or concrete supports installed with falls that achieve a raised, impervious and water shedding bearing surface.

Balustrades: If balustrades or screening are required, obtain the advice of a registered architect.

#### Support of plant and equipment mounted on roofs or elevated platforms

Platforms: If a platform is required, or the area of the plant and equipment mounted on roofs or elevated platforms is extensive, obtain the advice of a professional engineer for the documentation of a suitable platform.

Balustrades: If balustrades or screening are required, obtain the advice of a registered architect.

Roof level support: If any of the following apply to roof level support, obtain the advice of a professional engineer:

- The total load from any unit of plant or equipment exceeds 500 kg.
- The load from a unit of plant or equipment to any single support point exceeds 100 kg.
- The average loading of plant and equipment over the area extending 1 m on all sides beyond the plant and equipment exceeds 25 kg/m<sup>2</sup>.

### 3.6.5 SEISMIC RESTRAINT OF NON-STRUCTURAL COMPONENTS

#### General

Requirement: Seismic restraint to AS 1170.4

Earthquake design category: EDC II

## 3.7 BUILDING SERVICES

### 3.7.1 SERVICES CONNECTIONS

#### Connections

General: Connect to utility service provider services or service points. Excavate to locate and expose connection points. Reinststate the surfaces and facilities that have been disturbed.

#### Utility service provider requirements

General: If the utility service provider elects to perform or supply part of the works, make the necessary arrangements. Install equipment supplied, but not installed, by the utility service provider.

### 3.7.2 SERVICES INSTALLATION

#### General

Fixing: If non-structural building elements are not suitable for fixing services to, fix directly to structure and trim around penetrations in non-structural elements.

Installation: Install equipment and services as follows:

- Plumb and securely fixed.
- Allow for movement in both structure and services.
- Arrange services running together, parallel to each other and adjacent building elements.

Concealment: Conceal all cables, ducts, trays and pipes except where installed in plant spaces, ceiling spaces and riser cupboards or documented to be exposed. If alternative routes are available, do not locate on external walls.

Lifting: Provide heavy items of equipment with permanent fixtures for lifting to the manufacturer's recommendations.

Suspended ground floors: Keep all parts of services suspended under ground floors at least 150 mm clear of the ground surface. Make sure services do not impede access.

#### Dissimilar metals

Jointing: Join dissimilar metals with fittings of electrolytically compatible material.

#### Temporary capping

Pipe ends: During construction, protect open ends of pipe with metal or plastic covers or caps.

#### Piping

General: Install piping in straight lines at uniform grades without sags. Arrange to prevent air locks. Provide sufficient unions, flanges and isolating valves to allow removal of piping and fittings for maintenance or replacement of plant.

Spacing: Provide at least 25 mm clear between pipes and between pipes and building elements, additional to insulation.

Changes of direction: Provide as follows:

- If practicable, long radius elbows or bends and sets, and swept branch connections.
- If pipes are led up or along walls and then through to fixtures, provide elbows or short radius bends.
- Do not provide mitred fittings.

Vibration: Arrange and support piping to prevent vibration whilst permitting necessary movement. Minimise the number of joints.

Embedded pipes: Do not embed pipes that operate under pressure in concrete or surfacing material.

Valve groupings: If possible, locate valves in groups.

Pressure testing precautions: Isolate items not rated for the test pressure. Restrain pipes and equipment to prevent movement during pressure testing.

#### Support and structure

Requirement: Provide incidental supports and structures to suit the services.

#### Pipe support systems

General: Provide proprietary support systems of metallic-coated steel construction.

Vertical pipes: Provide anchors and guides to maintain long pipes in position, and supports designed for the mass of the pipe and its contents.

Saddles: Provide saddle supports only on DN 25 or smaller pipes.

Dissimilar metals: If pipe and support materials are dissimilar, provide industrial grade electrically non-conductive material securely bonded to the pipe to separate them. Provide fasteners of electrolytically compatible material.

Uninsulated pipes: Clamp piping supports directly to pipes.

Insulated pipes:

- Spacers: Provide spacers at least as thick as the insulation between piping supports and pipes. Extend either side of the support by at least 20 mm.
- Spacer material: Rigid insulation material of sufficient strength to support the piping and suitable for the temperature application.
- Support spacing: As follows:
- Cold and heated water pipes: To AS/NZS 3500.1 Table 5.6.4. Provide additional brackets, clips or hangers to prevent pipe movement caused by water pressure effects.

- Sanitary plumbing: To AS/NZS 3500.2 Table 10.2.1.
- Fuel gas: To AS/NZS 5601.1 Table 5.5.
- Other pipes: To AS/NZS 3500.1 Table 5.6.4.

**Hanger size table**

Nominal pipe size (DN)	Minimum hanger diameter for single hangers (mm)
50 maximum	10
65 to 90	12
100 to 125	16
150 to 200	20

**Differential movement**

General: If the geotechnical site investigation report predicts differential movements between buildings and the ground in which pipes or conduits are buried, provide control joints in the pipes or conduits, as follows:

- Arrangement: Arrange pipes and conduits to minimise the number of control joints.
- Magnitude: Accommodate the predicted movements.

**3.7.3 PLANT AND EQUIPMENT****General**

Location: Locate so failure of plant and equipment (including leaks) does not create a hazard for the building occupants and causes a minimum or no damage to the building, its finishes and contents including water sensitive equipment or finishes.

Safe tray and an overflow pipe: Provide to each tank, hot water heater and storage vessel.

**3.7.4 ACCESS FOR MAINTENANCE****General**

Requirement: Provide access for maintenance of all items requiring inspection, measurement, operation, adjustment, repair, replacement and other maintenance-related tasks.

Standards: Conform to the relevant requirements of AS 1657, AS 1892.1, AS 2865 and AS/NZS 3666.1.

Work Health and Safety: Conform to the requirements of the applicable Work Health and Safety regulations.

Refrigerated or cooling plant: If the space is a refrigerated or cooling chamber inside a duct, air handling plant or similar, provided with an access door or personnel access panel and of sufficient size for a person to enter, provide the following to BCA G1.2:

- An access door.
- Internal lighting with external indicator lamp.
- An alarm.

Protection from injury: Protect personnel from injury caused by contact with objects including those that are sharp, hot or protrude at low level.

Plant room flooring surfaces: R10 Slip resistance classification to AS 4586.

Trip hazards: Do not run small services including drains and conduits across floors where they may be a trip hazard.

Manufacturer's standard equipment: If necessary, modify manufacturer's standard equipment to provide the plant access documented.

**Clearances**

Minimum clearances for access: Conform to the following:

- Vertical clearance:  $\geq 2100$  mm, vertically above horizontal floors, ground and platforms.
- Horizontal clearance: Preferably  $\geq 750$  mm clear, but in no case less than 600 mm between equipment or between equipment and building features including walls.
- If tools are required to operate, adjust or remove equipment, provide sufficient space so the tools can be used in their normal manner and without requiring the user to employ undue or awkward force.
- Hinged or removable components: To the manufacturer's recommendations.

1. Within plant items: Conform to the preceding requirements, and not less than the clearances recommended in BS 8313.

### Elevated services other than in occupied areas

Access classifications:

- Access class A: Readily accessible. Provide clear and immediate access to and around plant items. If plant or equipment is located more than 2.0 m above the ground, floor or platform, provide a platform with handrails accessible by a stair, all to AS 1657.
- Access class B: If the plant item requiring access is located more than 2.0 m above the ground, floor or platform, provide a platform with handrails accessible by a non-vertical ladder, all to AS 1657.
- Access class C: Locate plant so temporary means of access conforming to Work Health and Safety regulations can be provided.
- Temporary means of access: Make sure there is adequate provision in place which is safe and effective.
- Areas in which access is restricted to authorised maintenance personnel: Provide access as follows:
- Instruments, gauges and indicators (including warning and indicating lights) requiring inspection at any frequency: Readily accessible.
- Access required monthly or more frequently: Access class A.
- Access required between monthly and six monthly: Access class A or B.
- Access required less frequently than six monthly: Access class A, B or C.
- Other areas: Provide access as follows:
- Locate to minimise inconvenience and disruption to building occupants or damage to the building structure or finishes.
- In suspended ceilings, locate items of equipment that require inspection and/or maintenance above tiled parts. If not possible, provide access panels where located above set plaster or other inaccessible ceilings. Arrange services and plant locations to reduce the number of access panels. Coordinate with other trades to use common access panels where feasible.
- Do not locate equipment requiring access above partitions.
- Instruments, gauges and other items requiring inspection at any frequency: Readily accessible.
- Labelling: If equipment is concealed in ceilings, provide marking to **MARKING AND LABELLING, Equipment concealed in ceilings.**

### Facilities for equipment removal and replacement

Requirement: Provide facilities to permit removal from the building and replacement of plant and equipment, including space large enough to accommodate it and any required lifting and/or transportation equipment. Arrange plant so large and/or heavy items can be moved with the minimum changes of direction.

Removal of components: Allow sufficient space for removal and replacement of equipment components including air filters, tubes of shell and tube heat exchangers, removable heat exchanger bundles, coils and fan shafts. Provide access panels or doors large enough to permit the safe removal and replacement of components within air handling units.

### Facilities for access

Equipment behind hinged doors: Provide doors opening at least 150°.

Equipment behind removable panels: Provide panels with quick release fasteners or captive metal thread screws.

Removable panels: Provide handles to permit easy and safe removal and replacement.

Insulated plant and services: If insulation must be removed to access plant and services for maintenance, arrange it to allow for removal and replacement without damage.

### Piping

Requirement: Conform to the following:

- Provide access and clearance at fittings which require maintenance, inspection or servicing, including control valves and joints intended to permit pipe removal.
- Arrange piping so it does not interfere with the removal or servicing of associated equipment or valves or block access or ventilation openings.
- Preferably run piping, conduits, cable trays and ducts at high level and drop vertically to equipment.

### Electrical equipment and controls

Electrical equipment: Provide clearances and access space to AS/NZS 3000.

Switchboards and electrical control equipment: Locate near the main entrance to plant space and with switchboards visible from the plant being operated.

Control panels: Locate near and visible from the plant being controlled.

### 3.7.5 VIBRATION SUPPRESSION

#### General

Requirement: Minimise the transmission of vibration from rotating or reciprocating equipment to other building elements.

#### Standard

Machinery noise and vibration: Vibration severity in Zone A to ISO 20816-1 and ISO 10816-3.

#### Speeds

General: If no maximum speed is prescribed, do not exceed 1500 r/min for direct driven equipment.

#### Connections

General: Provide flexible connections to rotating machinery and assemblies containing rotating machinery. Isolate pipes by incorporating sufficient flexibility into the pipework or by use of proprietary flexible pipe connections installed to prevent placing stress on pipes due to end reaction.

#### Inertia bases

General: If necessary to achieve the required level of vibration isolation, provide inertia bases having appropriate mass and to the following:

- Construction: Steel or steel-framed reinforced concrete with reinforcing bars welded between base sections. Position foundation bolts for equipment before pouring concrete.
- Supports: Support on vibration isolation mountings using height saving support brackets.

#### Vibration isolation mountings

General: Except for external equipment that is not connected to the structure of any building, support rotating or reciprocating equipment on mountings as follows:

- For static deflections < 15 mm: Single or double deflection neoprene in-shear mountings incorporating steel top and base plates and a tapped hole for bolting to equipment.
- For static deflections  $\geq$  15 mm: Spring mountings.
- Selection: Provide mountings selected to achieve 95% isolation efficiency at the normal operating speeds of the equipment.
- Installation: Set and adjust vibration isolation mounting supports to give clearance for free movement of the supports.
- Spring mountings: Provide freestanding laterally stable springs as follows:
  - Clearances:  $\geq$  12 mm between springs and other members such as bolts and housing.
  - High frequency isolation: 5 mm neoprene acoustic isolation pads between baseplate and support.
  - Levelling: Provide bolts and lock nuts.
  - Minimum travel to solid:  $\geq$  150% of the designated minimum static deflection.
  - Ratio of mean coil diameter to compressed length at the designated minimum static deflection:  $\geq$  0.8:1.
  - Snubbing: Snub the springs to prevent bounce at start-up.
  - Vertical resilient limit stops: To prevent spring extension when unloaded, to serve as blocking during erection and which remain out of contact during normal operation.

### 3.7.6 FINISHES TO BUILDING SERVICES

#### General

Requirement: If exposed to view (including in plant rooms), paint building services and equipment.

Surfaces painted or finished off-site: Conform to *0183 Metals and prefinishes*.

Exceptions: Do not paint chromium or nickel plating, anodised aluminium, GRP, stainless steel, non-metallic flexible materials and normally lubricated machined surfaces. Surfaces with finishes applied off-site need not be re-painted on-site provided the corrosion resistance of the finish is not less than that of the respective finish documented.

Standard: Conform to the recommendations of AS/NZS 2311 Sections 3, 6 and 7 or AS 2312.1 Sections 6, 7 and 8, as applicable.

Inaccessible surfaces: If surfaces are inaccessible after installation, complete finish before installation.

**Painting systems**

New unpainted interior surfaces: To AS/NZS 2311 Table 5.1.

New unpainted exterior surfaces: To AS/NZS 2311 Table 5.2.

**Paint application**

Coats: Apply the first coat immediately after substrate preparation and before contamination of the substrate can occur. Make sure each coat of paint or clear finish is uniform in colour, gloss, thickness and texture and free of runs, sags, blisters or other discontinuities.

Combinations: Do not combine paints from different manufacturers in a paint system.

Protection: Remove fixtures before starting to paint and refix in position undamaged when painting is complete.

**Underground metal piping**

Requirement: Provide corrosion protection for the following:

- Underground ferrous piping.
- Underground non-ferrous metal piping in chemically aggressive soils and environments.
- Corrosion protection: Select from the following:
  - Cathodic protection: Sacrificial anodes or impressed current. Incorporate a facility for periodic testing. Conform to the recommendations of AS 2832.1.
  - Continuous wrapping using proprietary petroleum taping material.
  - Impermeable flexible plastic coating.
  - Sealed polyethylene sleeve.
- Aggressive soils: If metallic piping or components are installed in chemically aggressive soil, provide additional protection as follows:
  - Material: Continuous polyethylene sleeve to ASTM D1248 with a minimum thickness of 0.25 mm.
  - Installation: Wrap or sleeve pipes and components. Tape joints between sections of polyethylene and between polyethylene and piping.

**Repairs to finishes**

Requirement: Repair damaged finishes to restore their corrosion protection, appearance and service life.

Painting of pipe threads: After pipe installation and before other finishes or insulation are applied, paint exposed threads in metallic-coated steel pipe with zinc rich paint.

**3.7.7 MARKING AND LABELLING****General**

Requirement: Mark and label services and equipment for identification purposes as follows:

- Locations exposed to weather: Provide durable materials.
- Pipes, conduits and ducts: To AS 1345 throughout its length, including in concealed spaces.
- Cables: Label to indicate the origin and destination of the cable.
- Consistency: Label and mark equipment using a consistent scheme across all services elements of the project.

**Label samples and schedules**

Requirement: For each item or type of item, prepare a schedule of marking and labelling, including the following:

- A description of the item or type of item for identification.
- The proposed text for marking or labelling.
- The proposed location of the marking and labelling.

Submission timing: Before marking or labelling.

**Electrical accessories**

Circuit identification: Label isolating switches and outlets to identify circuit origin.

**Operable devices**

Requirement: Mark to identify the following:

- Controls.
- Indicators, gauges, meters.
- Isolating switches.

**Equipment concealed in ceilings**

Location: Provide a label on the ceiling, to indicate the location of each concealed item requiring access for routine inspection, maintenance and/or operation and as follows:

- Tiled ceilings, locate the label on the ceiling grid closest to the concealed item access point.
- Flush lined ceilings, locate adjacent to closest access panel.
- Concealed equipment: Items to be labelled include the following:
  - Fan coil units and terminal equipment (e.g. VAV terminals).
  - Fire and smoke dampers.
  - Isolating valves not directly connected to items otherwise labelled.
  - Motorised dampers.

**Wall mounted equipment in occupied areas**

Location: Provide labels on wall mounted items in occupied areas including the following:

- Services control switches.
- Temperature and humidity sensors.

**Points lists**

Automatic control points: Provide plasticised, fade-free points lists for each automatic control panel and include terminal numbers, point addresses, short and long descriptors in the lists. Store in a pocket on the door of the panel.

**Pressure vessels**

General: Mount manufacturer's certificates in glazed frames on a wall next to the vessel.

**Valves and pumps**

General: Label to associate pumps with their starters and valves. Screw fix labels to body or attach label to valve handwheels with a key ring.

**Underground services**

Survey: Accurately record the routes of underground cables and pipes before backfilling. Include on the record drawings.

Records: Provide digital photographic records of underground cable and pipe routes before backfilling. Include in operation and maintenance manual.

Location marking: Accurately mark the location of underground cables and pipes with route markers consisting of a marker plate set flush in a concrete base, engraved to show the direction of the line and the name of the service.

Markers: Place markers at ground level at each joint, route junction, change of direction, termination and building entry point and in straight runs at intervals of not more than 100 m.

Marker bases: 200 mm diameter x 200 mm deep, minimum concrete.

Direction marking: Show the direction of the cable and pipe run by means of direction arrows on the marker plate. Indicate distance to the next marker.

Plates: Brass, aluminium or stainless steel with black filled engraved lettering, minimum size 75 x 75 x 1 mm thick.

Plate fixing: Waterproof adhesive and 4 brass or stainless steel countersunk screws.

Marker height: Set the marker plate flush with paved surfaces, and 25 mm above other surfaces.

Marker tape: Where electric bricks or covers are not provided over underground wiring, provide a 150 mm wide yellow or orange marker tape bearing the words WARNING – electric cable buried below, laid in the trench 150 mm below ground level.

Plastic pipe: Provide a detectable marker tape with trace wire to identify the route of buried piping. Terminate with 1000 mm coil in a readily accessible location. Tag to match the record drawings.

**Labels and notices**

Materials: Select from the following:

- Cast metal.
- For indoor applications only, engraved two-colour laminated plastic.
- Proprietary pre-printed self-adhesive flexible plastic labels with machine printed black lettering.
- Stainless steel or brass minimum 1 mm thick with black filled engraved lettering.
- Emergency functions: To AS 1319.
- Colours: Generally to AS 1345 as appropriate, otherwise black lettering on white background except as follows:

- Danger, warning labels: White lettering on red background.
- Main switch and caution labels: Red lettering on white background.
- Edges: If labels exceed 1.5 mm thickness, radius or bevel the edges.
- Labelling text and marking: To correspond to terminology and identifying number of the respective item as shown on the record drawings and documents and in operating and maintenance manuals.
- Lettering heights:
  - Danger, warning and caution notices: Minimum 10 mm for main heading, minimum 5 mm for remainder.
  - Equipment labels within cabinets: Minimum 5 mm.
  - Equipment nameplates: Minimum 40 mm.
  - Identifying labels on outside of cabinets: Minimum 5 mm.
  - Isolating switches: Minimum 5 mm.
  - Switchboards, main assembly designation: Minimum 25 mm.
  - Switchboards, outgoing functional units: Minimum 10 mm.
  - Switchboards, sub assembly designations: Minimum 15 mm.
  - Valves:
    - $\geq$  DN65: Minimum 25 mm.
    - $<$  DN65: Minimum 10 mm.
  - Self-adhesive flexible plastic labels:
    - Labels less than 2000 mm above floor: 5 mm.
    - Labels minimum 2000 mm above floor: 10 mm.
    - Other locations: Minimum 5 mm.

Label locations: Locate labels so they are easily seen and are either attached to, below or next to the item being marked.

Fixing: Fix labels securely using screws, rivets, proprietary self-adhesive labels or double-sided adhesive tape and as follows:

- If labels are mounted in extruded aluminium sections, use rivets or countersunk screws to fix the extrusions.
- Use aluminium or monel rivets for aluminium labels.
- Vapour barriers: Do not penetrate vapour barriers.

### 3.8 COMPLETION

#### 3.8.1 TOOLS AND SPARE PARTS

##### Spare parts

General: Provide spare parts listed as documented.

Replacement: Replace spare parts used during the maintenance period.

##### Tools and spare parts schedule

Submission timing: At least 8 weeks before the date for practical completion.

- Requirement: Prepare a schedule of tools, portable instruments and spare parts necessary for maintenance of the installation. For each item state the recommended quantity and the manufacturer's current price. Include the following in the prices:
  - Checking receipt, marking and numbering in conformance with the spare parts schedule.
  - Packaging and delivery to site.
  - Painting, greasing and packing to prevent deterioration during storage.
  - Referencing equipment schedules in the operation and maintenance manuals.
  - Suitable means of identifying, storing and securing the tools and instruments. Include instructions for use.

#### 3.8.2 TRAINING

##### General

Standard: To SA TS 5342.

Duration: Instruction to be available for the whole of the commissioning and running-in periods.

Format: Conduct training at agreed times, at system or equipment location. Also provide seminar instruction to cover all major components.

Operation and maintenance manuals: Use items and procedures listed in the final draft operation and maintenance manuals as the basis for instruction. Review contents in detail with the principal's staff.

Certification: Provide written certification of attendance and participation in training for each attendee. Provide register of certificates issued.

#### **Demonstrators**

General: Use only qualified manufacturer's representatives who are knowledgeable about the installations.

#### **Operation**

General: Explain and demonstrate to the principal's staff the purpose, function and operation of the installations.

#### **Maintenance**

General: Explain and demonstrate to the principal's staff the purpose, function and maintenance of the installations.

#### **Seasonal operation**

General: For equipment requiring seasonal operation, demonstrate during the appropriate season.

### **3.8.3 CLEANING**

#### **Final cleaning**

General: Before the date for practical completion, clean throughout, including all exterior and interior surfaces except those totally and permanently concealed from view.

Labels: Remove all visible labels not required for maintenance.

### **3.8.4 WARRANTIES**

#### **General**

Requirement: If a warranty is documented, name the principal as warrantee. Register with manufacturers as necessary. Retain copies delivered with components and equipment.

Approval of installer: If installation is not by manufacturer, and product warranty is conditional on the manufacturer's approval of the installer, submit the manufacturer's written approval of the installing firm.

Principal's responsibilities: Submit details of responsibilities of the principal required to keep warranties in force.

## **3.9 TESTING AND COMMISSIONING**

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### **3.9.1 TESTING - GENERALLY**

#### **Inspection and testing plan**

Requirement: Provide inspection and testing plan consistent with the construction program including details of test stages and procedures.

#### **Notice**

Site tests: Give notice of the time and place of documented tests.

Inspection: Give sufficient notice for inspection to be made of the commissioning, testing and verification tests on completion of commissioning.

#### **Attendance**

General: Provide attendance at tests.

Suppliers: If necessary to carry out documented tests, arrange equipment suppliers to assist.

#### **Testing authorities**

Requirement: Have tests carried out by an Accredited Testing Laboratory, accredited for the documented test method, except for site tests or test methods that do not have an accredited testing laboratory.

#### **Test equipment**

Accuracy: Use testing equipment designed to test and/or measure system performance within the documented tolerances.

Calibration: Use only instruments that have current calibration certificates issued by an Accredited Testing Laboratory. Tag or label instruments with calibration date and calibration authority name. Provide copies of certification if requested.

Maximum period since last calibration: As recommended by the manufacturer but less than 12 months, except as documented.

Recalibration: If dropped or damaged, recalibrate instruments.

Testing equipment: Provide test equipment and tools to perform documented tests as follows:

- Special testing equipment: If documented, provide special equipment, tools and instruments required for testing or calibration.
- Other testing equipment: Provide standard testing equipment.

### Testing procedures

Verification: Verify test procedures by:

- Manual testing.
- Monitoring performance and analysing results using the control system trend logs.
- A combination of the above methods.
- Sampling: Sampling may be used subject to the following:
  - Use a sampling strategy only for multiple identical pieces of non-life-safety or otherwise non-critical equipment.
  - If at any point, more than one identical item has failed, stop testing, determine the cause, rectify and document changes made to remaining units, before continuing with functional testing of the remaining units.

### Type tests

Type test reports: Required, as evidence of conformance of proprietary equipment.

### Sound pressure level measurements

Requirement: Conform to the following:

- Correction for background noise: To AS/NZS 2107 Table B1.
- External: To AS 1055.
- Internal: To AS/NZS 2107.
- Measurement positions: If a test position is designated only by reference to a room or space, do not take measurements less than 1 m from the floor, ground or walls. For large equipment items including chillers, measure at 2 m and 7 m from the equipment item.
- Sound pressure level analysis: Measure the sound pressure level and the background sound pressure level over the full range of octave band centre frequencies from 31.5 Hz to 8 kHz at the designated positions.
- Sound pressure levels: Measure the A-weighted sound pressure levels and the A-weighted background sound pressure levels at the designated positions.

### Test outcome

Requirement: Test as documented and achieve the following:

- Pass the documented Pass/Fail test, and/or
- Values that meet documented requirements, and/or
- Verification of manufacturer's claimed performance.

### Failure of multiple items

Requirement: If 10% or 3, whichever is greater, of identical pieces (size does not constitute a difference) of equipment fail to perform as documented for any reason, treat all identical units as having failed. Submit notice of failure and conform to the following:

- Within one week of notification, examine all other identical units and record the results. Submit a report of the findings within two weeks of the original failure notice.
- Within two weeks of the original failure notification, submit a signed and dated explanation of the problem, including the cause of failure, the proposed solution, full equipment details and any other information. Do not exceed the documented requirements of the original installation with the proposed solution.

### Rectification of failure under test

Requirement: If an item fails a documented test, rectify the cause of failure and repeat the test.

Submissions: If submission of test results is documented, submit results of both successful and unsuccessful tests.

### Test reports

Requirement: Include the following:

- Documented performance criteria including, if documented, tolerances.
- Observations and results of tests and conformance or non-conformance with documented requirements.

**Test validity period**

Requirement: As documented or, if no validity period is documented, no older than 5 years.

**Controls**

General: Calibrate, set and adjust control instruments, control systems and safety controls.

**Circuit protection**

General: Confirm that circuit protective devices are sized and adjusted to protect installed circuits.

**Certification**

General: On satisfactory completion of the installation, testing and commissioning and before the date for practical completion, certify that each installation is operating correctly.

**Integrated system tests**

Requirement: Conduct integrated system tests as documented.

Tests: Provide the following:

- Test the integrated operation of the systems listed in each mode documented.
- Restoration of the systems to their pre-test condition on completion of the tests above.

Failure: If any of the systems fails to perform as documented, including return to normal operation, rectify the cause and repeat the integrated system test.

**Deferred and seasonal tests**

Deferred tests: If documented testing cannot be completed at the scheduled or documented time, the Superintendent may direct that they be deferred to a later time but as soon as possible after the scheduled or documented time.

Seasonal tests: If documented tests are dependent on specific weather conditions, they may be deferred to a time when weather conditions are close to the documented test conditions. Complete seasonal testing as soon as possible but no later than one month before the end of the defects liability period.

**Functional tests**

Function: Carry out functional and operational tests on each energised equipment item and circuit.

**3.9.2 COMMISSIONING****Standard**

Requirement: Conform to SA TS 5342.

**Static completion**

Requirement: Systems, components and building elements are statically complete when:

- Their construction and installation is complete and as documented, including completion of all systems, components and building elements on which they are dependent for commissioning.
- All pre-commissioning tests have been successfully completed.
- They are safe and ready for commissioning.
- All cleaning that may adversely affect commissioning is complete.
- They have been inspected and all outstanding remedial work that may adversely affect commissioning is complete.
- All spaces required for access for commissioning are safe to use and cleared of obstructions that may adversely affect commissioning.

**Commissioning plan**

Requirement: Provide a commissioning plan to SA TS 5342 including the following:

- A summary of the work covered by the commissioning plan.
- The parties responsible for this work and any commissioning interrelationships.
- The basis of the design.
- General sequence of commissioning.
- Project specific commissioning methodologies for each system and building element to be commissioned.
- Pre-commissioning requirements.

- Project specific commissioning procedures for each commissioning activity including integrated system tests, deferred and seasonal tests
- A project specific building tuning plan for all commissioned systems. Include building tuning procedures and tuning team members.
- Requirements for witnessing of tests and documented demonstrations of completion of commissioning.
- Commissioning program to **COMMISSIONING, Commissioning program.**

### Commissioning program

Submissions: Submit a program consistent with, and forming part of, the construction program as follows:

- Set out the proposed program for completion, commissioning, testing and instruction.
- Identify related works and timing of the works prerequisite to successful and timely completion of the works.

Revisions: Submit revisions of the program as the project proceeds.

Plant operating period: Include time in the program for the documented plant operating period before the date for practical completion.

### Commissioning activities

Requirement: Provide the following to SA TS 5342:

- Manage the commissioning process.
- Establish and manage the completion process.
- Review design documents for commissionability. Submit a report including any recommended changes.
- Review documented commissioning requirements. Submit a report including any recommended changes.
- Review construction documents for commissionability. Submit a report including any recommended changes.
- Develop, review and update the commissioning plan and commissioning program.
- Develop, review and update commissioning methodologies.
- Develop, review and update commissioning procedures.
- Report on interdependencies between trades that may affect commissioning.
- Develop, review and update procedures for initial start-up of systems.
- Develop, review and update integrated system test procedures.
- Carry out pre-commissioning activities. Record results and submit pre-commissioning records.
- Conduct commissioning activities to the commissioning methodologies and procedures. Record and submit commissioning records.
- Facilitate and conduct integrated system tests and demonstrations. Record and submit integrated system test records.
- Conduct documented demonstrations of completion of commissioning.
- Report on the progress of commissioning work.
- Report on conformance to the commissioning plan and program.
- Report on commissioning defects and issues and progress on their resolution.
- Develop, review and update commissioning report.
- Develop, review and update training materials, conduct training sessions to **TRAINING.**
- Develop, review and update operation and maintenance manuals to **OPERATION AND MAINTENANCE MANUALS.**
- Manage and report deferred and seasonal testing activities to **TESTING - GENERALLY.**
- Management and reporting of building tuning process.
- Periodically review performance data.

### Verification of commissioning

Requirement: On completion of commissioning of the equipment or system, provide additional tests to verify that it is fully commissioned and operating to documented requirements.

### 3.9.3 BUILDING TUNING

#### General

Standard: To SA TS 5342.

Frequency: Three monthly or more frequently.

Duration: Until the end of the maintenance period. Provide last building tuning in the month before the end of the maintenance period.

Requirement: Provide the following:

- Review data from all recording systems against documented requirements.
- Review of building occupant feedback.
- If discrepancies are identified from the above, take corrective action to rectify them.
- Report on the findings of the reviews, corrective action and effect of corrective action.
- Recommend other action to improve the effectiveness, reliability and efficiency of systems.

### 3.10 PROJECT RECORDS

#### 3.10.1 TACTICAL FIRE DRAWINGS

##### General

Requirement: Provide sets of colour coded tactical fire drawings, showing all items and systems relevant in a fire to BCA Spec E1.8.

Scale: 1:200 or larger if required to be easily read under emergency conditions.

Coordination: Agree the format, colour coding and contents of the tactical fire plans with the Local Fire Authority before beginning documentation.

Location: Provide one set of the laminated drawings fixed to the wall or supplied in a vertical plan hanger in the fire control room.

Loose set: Provide a second set of identical drawings.

Operation and maintenance manuals: Provide a set of colour coded tactical fire drawings in each copy of the operating and maintenance manual.

##### Inclusions

Requirement: Include the following on the tactical fire drawings:

- Legend sheet at front of set.
- Colour coding key.
- Building: As follows:
  - Floor plans.
  - Pressurised and non-pressurised fire isolated stairs and passages.
  - Smoke and fire compartments.
  - Special risk areas.
- Fire services: As follows:
  - Automatic fire detection systems.
  - Automatic suppression systems including gas flooding systems.
  - Communications including Warden Intercom Points.
  - Fire control room.
  - Fire equipment including booster connections.
  - Fire hydrants, hose reels, portable fire extinguishers.
  - Fire detection control and indicating equipment (FDCIE).
  - Fire service lifts.
  - Fire telephone and control panel.
  - Hydrant and sprinkler pumps.
  - Hydrant/hose reels.
  - Sprinkler and hydrant, suction and booster connections.
  - Sprinkler control valves.
- Electrical services: As follows:

- Emergency power supplies.
- Essential services switchboards.
- Evacuation warning panel.
- Standby power plant.
- Substations/transformers.
- Switchboards, main switch room.
- Mechanical ventilation and air handling equipment: As follows:
  - Air intakes, fans, ducts, shafts.
  - Conditioners and mixing boxes.
  - Fire dampers.
  - General exhaust air fans, ducts, shafts, discharges.
  - Smoke dampers.
  - Smoke fans including exhaust fans, zone and stair pressurisation fans.
  - Stair pressurisation systems.
  - Supply air system.
- Mechanical ventilation and air handling equipment operation: As follows:
  - Statement of normal condition.
  - Condition upon fire alarm.
  - Manual controls available.
- Hydraulic services: As follows:
  - Gas meters.
  - Gas supply control.
- Incoming water supplies and valves for the sprinkler, hydrant and fire hose reel systems.
- Water tank.

### 3.10.2 RECORD DRAWINGS

#### General

Requirement: Prepare record drawings showing the following:

- Installed locations of building elements, services, plant and equipment.
- Off-the-grid dimensions and depth if applicable.
- Any provisions for the future.

#### Recording, format and submission

Requirement: Record changes made during the progress of the works on a set of drawings kept on site for that specific purpose.

Drawing layout: Use the same borders and title block as the contract drawings.

Quantity and format: Conform to **SUBMISSIONS**.

Endorsement: Sign and date all record drawings.

Accuracy: If errors in, or omissions from, the record drawings are found, amend the drawings and re-issue in the quantity and format documented for **SUBMISSIONS**.

Date for submission: Not later than 2 weeks after the date for practical completion.

#### Services record drawings

General: To **RECORD DRAWINGS**, **General** and **Recording, format and submission** and the following:

- Extensions and/or changes to existing: If a drawing shows extensions and/or alterations to existing installations, include sufficient of the existing installation to make the drawing comprehensible without reference to drawings of the original installation.
- Detention: If on-site detention tanks or pondage are provided, include the volume required on the drawing and the permitted flow rate to the connected system.
- Domestic cold water or fire mains: Show the pressure available at the initial connection point and the pressure available at the most disadvantaged location on each major section of the works.
- Stormwater: If storm water pipes are shown, include the pipe size and pipe grade together with the maximum acceptable flow and the actual design flow.

- Diagrams: Provide diagrammatic drawings of each system including the following:
- Controls.
- Piping including all valves and valve identification tags.
- Principal items of equipment.
- Single line wiring diagrams.
- Acoustic and thermal insulation.
- Access provisions and space allowances.
- Fasteners.
- Fixtures.
- Switchgear and control gear assembly circuit schedules including electrical service characteristics, controls and communications.
- Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

Subsurface services: Record information on underground or submerged services to the documented quality level, conforming to AS 5488.1.

### 3.10.3 OPERATION AND MAINTENANCE MANUALS

#### General

Standard: To SA TS 5342.

Authors and compilers: Personnel experienced in the maintenance and operation of equipment and systems installed, and with editorial ability.

Referenced documents: If referenced documents or worksections require submissions of manuals, include corresponding material in the operation and maintenance manuals.

Subdivision: By installation or system, depending on project size.

Revisions: Amend operation and maintenance manuals to include changes made to the installation during the work.

#### Contents of manual

Table of contents: Include a table of contents in each volume. Title to match cover.

Table of amendments: Include a table of amendments.

Directory: Include names, addresses, email addresses and telephone and facsimile numbers of principal consultant, subconsultants, contractor, subcontractors and names of responsible parties.

Record drawings: Include complete set of record drawings, full size.

Drawings and technical data: Include as necessary for the efficient operation and maintenance of the installation.

Installation description: Include a general description of the installation.

Systems descriptions and performance: Include a technical description of the systems installed including the basis of design, the interrelation with other systems and the building and mode of operation, presented in a clear and concise format readily understandable by the principal's staff. Identify function, normal operating characteristics, safety features and limiting conditions.

Baseline data: Include the baseline data to AS 1851, including baseline data to AS 1668.1, AS 1682.2, AS 1670.1 and AS/NZS 2293.1.

Commissioning records: Include commissioning records to SA TS 5342. Link commissioning records to item codes on the record drawings.

Fire systems and equipment: Include documentation to AS 1851, including the schedule of essential functionality and performance requirements.

Digital photographic records: Include records to **MARKING AND LABELLING, Underground services**.

Equipment: Include schedules with the following details for installed equipment:

- Item code for use on record and diagrammatic drawings, and spare parts schedule.
- Equipment name plate data including serial number, if any.
- Name and contact details of the manufacturer and supplier.
- Catalogue list number(s).
- Location.
- Function.

- Performance figures and capacity data.
- Date of manufacture.
- Manufacturer's product data sheets including only relevant matter for the project. Mark each product data sheet to clearly identify specific products and component parts used in the installation, and data applicable to the installation.
- Additional information and commentary to illustrate relations of component parts.
- Certificates:
  - Certificates from authorities.
  - Product certification.
  - Test certificates for each service installation and all equipment.
- Warranties.
- Trends: 7 day record of all trends at commissioning.
- Operation procedures: Include for systems installed:
  - Manufacturer's technical literature as appropriate.
  - Safe starting up, running-in, operating and shutting down procedures. Include logical step-by-step instructions for each procedure.
  - Control sequences and flow diagrams.
  - Legend for colour-codes services.
  - Schedules of fixed and variable equipment settings established during commissioning and maintenance.
  - A list of special safety devices and their set points.
  - Procedures for seasonal changeovers.
  - Warnings to operators.
  - Recommendations for efficient plant operation.
  - If the installation includes cooling towers, recommendations for water efficiency.
  - Building tuning plan and procedure to **COMMISSIONING, Commissioning plan.**

#### Maintenance procedures:

- Detailed recommendations for periodic maintenance and procedures, including schedule of maintenance work with frequency and manufacturers' recommended tests.
- Manufacturer's technical literature as appropriate. Register with manufacturer as necessary. Retain copies delivered with equipment.
- Safe trouble-shooting, disassembly, repair and reassembly, cleaning, alignment and adjustment, balancing and checking procedures. Provide logical step-by-step instructions for each procedure.
- Schedule of spares, recommended to be held on site, for those items subject to wear or deterioration and that may involve the principal in extended deliveries when replacements are required. Include complete nomenclature and model numbers, and local sources of supply.
- Schedule of normal consumable items, local sources of supply, and expected replacement intervals up to a running time of 40 000 hours. Include lubrication schedules for equipment.
- Instructions for use of tools and testing equipment.
- Troubleshooting procedures.
- Emergency procedures, including telephone numbers for emergency services, and procedures for fault finding.
- Safety data sheets (SDS).
- Instructions and schedules conforming to AS 1851, AS/NZS 3666.2, AS/NZS 3666.3 and AS/NZS 3666.4.

#### Maintenance records:

- Prototype routine service records conforming to AS 1851 prepared to include project specific details.
- Prototype periodic maintenance records and report to AS/NZS 3666.2, AS/NZS 3666.3 and AS/NZS 3666.4 as appropriate, prepared to include project specific details.
- Hard copies: Binders to match the manuals, containing loose leaf log book pages designed for recording completion activities including operational and maintenance procedures, materials used, test results, comments for future maintenance actions and notes covering the condition of the

installation. Include completed log book pages recording the operational and maintenance activities performed up to the date for practical completion.

- Number of pages: The greater of 100 pages or enough pages for the maintenance period and a further 12 months.

Emergency information: For each type of emergency, including fire, flood, gas leak, water leak, power failure, water failure, system or sub system failure, chemical release or spill, include the following:

- Emergency instructions.
- Emergency procedures including:
  - Instructions for stopping or isolating.
  - Shutdown procedures and sequences.
  - Instructions for actions outside the property.
  - Special operating instructions relevant to the emergency.
- Contact details relevant to the emergency.

#### **Emergency information manual**

Form of emergency information: Provide one of the following:

- An index and coloured tabs identifying emergency information for each type of emergency within the Operation and maintenance manual.
- A separate Emergency manual containing copies of emergency information from the main Operation and maintenance manual.

#### **Format – electronic copies**

Scope: Provide the same material as documented for hardcopy in electronic format.

Quantity and format: Conform to **SUBMISSIONS, Electronic submissions**.

Printing: Except for drawings required in **RECORD DRAWINGS** provide material that can be legibly printed on A4 size paper.

#### **Format – hard copies**

General: A4 size loose leaf, in commercial quality, 4 ring binders with hard covers, each indexed, divided and titled. Include the following features:

- Cover: Identify each binder with typed or printed title *OPERATION AND MAINTENANCE MANUAL*, to spine. Identify title of project, volume number, volume subject matter, and date of issue.
- Dividers: Durable divider for each separate element, with typed description of system and major equipment components. Clearly print short titles under laminated plastic tabs.
- Drawings: Fold drawings to A4 size with title visible, insert in plastic sleeves (one per drawing) and accommodate them in the binders.
- Pagination: Number pages.
- Ring size: 50 mm maximum, with compressor bars.
- Text: Manufacturers' printed data, including associated diagrams, or typewritten, single-sided on bond paper, in clear concise English.

Number of copies: 3.

#### **Date for submission**

Draft submission: The earlier of the following:

- 4 weeks before the date for practical completion.
- Commencement of training.

Final submission: Within 2 weeks after practical completion.

### **3.11 MAINTENANCE**

#### **3.11.1 PERIODIC MAINTENANCE OF SYSTEMS AND EQUIPMENT**

##### **General**

Requirement: Carry out periodic inspections and maintenance work as recommended by manufacturers of supplied systems and equipment and to statutory requirements.

Duration: From the time systems and equipment are put into service to the end of the maintenance period.

Maintenance period: The greater of the defects liability period and the period documented in the **Maintenance requirements schedule**.

Faults: Rectify promptly.

Emergencies: Attend emergency calls promptly.

Annual maintenance: Carry out recommended annual maintenance procedures before the end of the maintenance period.

#### **Maintenance program**

General: Submit details of maintenance procedures and program, relating to installed plant and equipment, 6 weeks before the date for practical completion. Indicate dates of service visits. State contact telephone numbers of service operators and describe arrangements for emergency calls.

#### **Maintenance records**

General: Record in binders provided with the operation and maintenance manuals.

Referenced documents: If referenced documents or technical worksections require that log books or records be submitted, include this material in the maintenance records.

Certificates: Include test and approval certificates.

Service visits: Record comments on the functioning of the systems, work carried out, items requiring corrective action, adjustments made and name of service operator. On completion of the visit, obtain the signature of the principal's designated representative on the record of the work undertaken.

#### **Site control**

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

### **3.11.2 STATUTORY INSPECTIONS AND MAINTENANCE**

#### **General**

Duration: From the time systems and equipment are put into service to the end of the maintenance period.

Requirement: Provide inspections and maintenance of safety measures required by the following:

- AS 1851.
- Other statutory requirements applicable to the work.

Records: Provide mandatory records.

Certification: Certify that mandatory inspections and maintenance have been carried out and that the respective items conform to statutory requirements.

Annual inspection: Perform an annual inspection and maintenance immediately before the end of the maintenance period.

### **3.12 SELECTIONS**

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#### **3.12.1 COMPLETION**

##### **Warranty schedule**

Refer to each worksection and provide the warranties specified.

**4 ENVIRONMENTAL MANAGEMENT****4.1 GENERAL****4.1.1 RESPONSIBILITIES****General**

Requirement: Provide environmental management, as documented.

**Management and control plans**

Implementation: To approved management plans.

**Management and control measures**

Implementation: To the documented management and control measures.

**4.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**4.1.3 INTERPRETATION****Abbreviations**

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

- EIA: Environmental impact assessment.
- EMP: Environmental management plan.

**Definitions**

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

- Clearances: A formal certificate, approval or condition issued by a statutory authority allowing work in a particular area.
- Contamination of land: The presence of a substance in, on or under the land which is designated hazardous material and/or is at a concentration above that which is normally found in that locality, and presents a risk of harm to human health or to the environment.
- Environment: The physical factors of the surroundings of human beings including the land, waters, atmosphere, climate, sound, odours, tastes; and the biological factors of animals; and plants and the social factor of aesthetics.
- Environmental audit: A review of environmental management practices, in particular the evaluation of a site for environmental liability.
- Environmental impact assessment (EIA): A method for predicting environmental impacts of a proposed development including strategies for minimising identified impacts.
- Environmental management plan (EMP): A project or site specific plan describing the management of the environmental issues and considerations for the activity being undertaken. This applies to the design, construction and operation of the buildings, external works and infrastructure.
- Organic waste: Includes all food wastes, vegetative wastes from land clearing and pruning operations, biosolids produced from the treatment of liquid wastes, garden wastes and forestry waste (bark and saw dust) and paper and cardboard products.
- Pollution incident: An incident or set of circumstances during or as a consequence of which there is, or is likely to be, a leak, spill or other escape of a substance as a result of which pollution has occurred, is occurring or is likely to occur.
- Weed: An invasive plant that degrades natural areas, reduces the sustainability or affects the health of people and animals.

**4.1.4 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Non-conforming items, e.g. ground contamination.
- Completed removal or rectification of non-conforming items.
- Unexpected finds.

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## 4.2 ENVIRONMENTAL ADMINISTRATION, MONITORING AND REPORTING

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### 4.2.1 PROCEDURAL AND PERSONNEL

#### Community liaison

General: Notify residents of construction activities that will affect access to, or disrupt the use of, their properties.

Notice: Minimum 5 working days, unless the work is of an urgent nature with safety implications.

Notification content:

- Description of the work.
- Reason for the work.
- Expected duration.
- Changes to traffic arrangements and property access.
- 24-hour contact number of the representative responsible.

#### Emergency response

Emergency response personnel: Provide staff names and contact details.

#### Complaints

Reporting: Within 1 working day of receiving a complaint about an environmental impact, including pollution incidents, submit a written report detailing the complaint and remedial action taken.

Register: Keep a register of all complaints and action taken.

#### Unexpected finds

Requirement: Give notice and close off affected site area with barrier tapes and warning signs to prevent access. Unexpected finds include asbestos and other hazardous or volatile contaminants, archaeological finds and items of heritage value.

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## 4.3 ENVIRONMENTAL MANAGEMENT

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### 4.3.1 WASTE MANAGEMENT

#### Control plan

Plan: Prepare a waste management control plan to minimise solid waste generated by construction activities and to dispose of the solid waste. Include the following details:

- Major waste streams.
- For each waste stream describe the following:
  - . Location.
  - . Disposal method.
  - . Transport method.
  - . Storage method.

### 4.3.2 WEED MANAGEMENT

#### Control plan

Plan: If required prepare a weed management control plan with the following details:

- Weed infestation zones within the work site and the investigation period.

### 4.3.3 AIR QUALITY

#### Control plan

Plan: Prepare an air quality control plan to protect adjoining owners, residents and the public from emissions of dust and exhaust gases. Include the following details:

- Dust control.
- Exhaust gases emission control.

#### Control measures

Requirement: Protect adjoining owners, residents and the public from emissions of dust and exhaust gases.

Dust control measures: Any activity required to control dust.

Prohibition: Do not light fires.

#### 4.3.4 WATER QUALITY

##### Control plan

Plan: Prepare a water quality control plan to keep earthworks free of water and to reduce impacts on groundwater and surface water. Include the following details:

- Dewatering system.
- Washout prevention.
- Cross connection prevention to public sewerage system.
- Water disposal.

##### Control measures

Requirement: Keep earthworks free of water and reduce impacts on groundwater and surface water and as follows:

- Provide and maintain slopes, crowns and drains for excavations and embankments, to make sure there is free drainage.
- Construct, including placing of fill, masonry, concrete and services, on ground where free water has been removed.
- Prevent water flow over freshly laid work.

Washout: Prevent washout from entering waterways or stormwater drains.

Cross connection: Prevent cross connections between stormwater and the public sewerage system.

Water disposal: Dispose off-site.

#### 4.3.5 NOISE CONTROL AND VIBRATION

##### Control plan

Plan: Prepare a noise and vibration control plan to protect adjoining owners, residents and the public from noise and vibration impacts. Include the following details:

- Noise control and vibration: To the recommendations of AS 2436.
- Maximum noise level at the site boundary.
- Noise control.
- Vibration assessment.
- Vibration control.

##### Control measures

Requirement: Protect adjoining owners, residents and the public from noise and vibration impacts.

Noise control and vibration: To the recommendations of AS 2436.

**Maximum noise level at the site boundary: As determined by the Local Authority**

Noise levels: Avoid excessive noise and long periods of elevated noise that is reasonably anticipated to annoy or adversely affect the adjacent community.

**Noise control measures: Any activity required to control noise**

Noise suppression: Minimise noise nuisance with measures including the following:

- Noisy equipment enclosure.
- Noise attenuation screens.
- Maintain plant in good working order.
- Effective residential class silencers to all engine exhausts.
- Fit engine covers to all plant.

Limits on ground vibration: Make sure ground vibration levels transmitted from operating items of plant near buildings do not exceed levels that are close to the lower level of human perception inside the premises or cause structural damage to the buildings and other structures.

Monitoring: Provide the following:

- Baseline condition measurements before commencement of the works.
- Progressive monitoring during the works to confirm conformance with approval conditions.

**5 ADHESIVES, SEALANTS AND FASTENERS****5.1 GENERAL****5.1.1 RESPONSIBILITIES****General**

Requirement: Provide adhesives, sealants and fasteners, as documented.

**Performance**

Requirements: Conform to the following:

- Fitness for purpose: Suitable for particular use, capable of transmitting imposed loads, sufficient to maintain the rigidity of the assembly, or integrity of the joint.
- Finished surface: That will not cause discolouration.
- Compatibility: Compatible with the products to which they are applied.
- Sealant replacement: Capable of safe removal without compromising the application of the replacement sealant for future refurbishment.
- Movement: If an adhered or sealed joint is subject to movement, select a system certified to accommodate the projected movement under the conditions of service.

**5.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**5.1.3 SUBMISSIONS****Products and materials**

Adhesives and sealants: Submit product data sheets.

**Samples**

Visible joint sealants: Submit colour samples.

**Warranties**

Manufacturer's warranty: Submit the manufacturer's published product warranties.

**5.2 PRODUCTS****5.2.1 ADHESIVES****Standards**

Gypsum plaster adhesive: To AS 2753.

**High strength adhesive tape**

General description: A foam of cross linked polyethylene or closed cell acrylic coated both sides with a high performance acrylic adhesive system, encased in release liners of paper or polyester.

Product classification: Select tape to suit substrate as follows:

- Firm high strength foam tapes: For high energy surfaces including most bare metals such as stainless steel and aluminium.
- Conformable high strength foam: For the following:
  - . Medium energy surfaces including many plastics and paints, and bare metals.
  - . Lower energy surfaces including many plastics, most paints and powder coatings, and bare metals.

Thickness: Select the tape to make sure a mismatch between surfaces does not exceed half the tape thickness under the applied lamination pressure.

**Total VOC limits**

Requirement: Conform to the following:

- General purpose adhesives: 50 g/L.
- Structural glazing adhesive, timber flooring and laminate adhesives: 100g/L.

### 5.2.1 SEALANTS

#### Standards

General: To ISO 11600.

#### External masonry joints

General: Provide sealant and bond breaking materials which are non-staining to masonry. Do not use bituminous materials with absorbent masonry units.

Bond breaking backing:

- Bond breaking materials: Non-adhesive to sealant, or faced with a non-adhering material.
- Foamed materials: Closed cell or impregnated, not water-absorbing.

#### Lightweight building element joints

Joints subject to rapid changes of movement: Provide sealants that accommodate the movement of the contact materials.

#### Floor control joints

General: Provide trafficable sealants.

Bond breaking backing:

- Bond breaking materials: Non-adhesive to sealant, or faced with a non-adhering material.
- Foamed materials: Closed cell or impregnated, not water-absorbing.

#### Total VOC limits

Requirement: Conform to the following:

- General purpose sealants: 50 g/L.
- Acoustic sealants, architectural sealants, waterproofing sealants: 250 g/L.
- Wood flooring and laminate sealant: 100 g/L.

### 5.2.2 FASTENERS

#### General

Masonry anchors: Proprietary expansion or bonded type anchors conforming to SELECTIONS, ANCHORS.

Plain washers: To AS 1237.1.

- Provide washers to the heads and nuts of bolts, and the nuts of coach bolts.

Plugs: Proprietary purpose-made plastic.

Stainless steel fasteners: To ASTM A240/A240M.

Steel nails: To AS 2334.

- Length: At least 2.5 times the thickness of the member being secured, and at least 4 times the thickness if the member is plywood or building board less than 10 mm thick.

Unified hexagon bolts, screws and nuts: To AS/NZS 2465.

Fasteners in CCA treated timber: Epoxy coated or stainless steel.

#### Bolts

Coach bolts: To AS/NZS 1390.

Hexagon bolts Grades A and B: To AS 1110.1.

Hexagon bolts Grade C: To AS 1111.1.

#### Corrosion resistance

Atmospheric corrosivity category: To *General requirements*.

Steel products: Conform to the **Corrosion resistance table** or provide proprietary products with metallic and/or organic coatings of equivalent corrosion-resistance.

#### Corrosion resistance table

Atmospheric corrosivity category to AS 4312	Threaded fasteners and anchors		Powder actuated fasteners
	Material	Minimum local metallic coating thickness (µm)	Material
C1 and C2	Electroplated zinc or Hot-dip galvanized	30	Stainless steel Type 316

Atmospheric corrosivity category to AS 4312	Threaded fasteners and anchors		Powder actuated fasteners
	Material	Minimum local metallic coating thickness (µm)	Material
C3	Hot-dip galvanized	50	Stainless steel Type 316
C4	Stainless steel Type 316	-	Stainless steel Type 316

Note: For categories C5, CX and T to the AS/NZS 2312 series, seek specialist advice.

### Finishes

Electroplating:

- Metric thread: To AS 1897.
- Imperial thread: To AS 4397.

Galvanizing:

- Threaded fasteners: To AS/NZS 1214.
- Other fasteners: To AS/NZS 4680.

Mild steel fasteners: Galvanize if:

- Embedded in masonry.
- In external timbers.
- Exposed to or in air spaces behind the external leaf of masonry walls.
- In contact with chemically treated timber other than CCA treated timber.

Epoxy coated: CCA treated timber.

### Nuts

Hexagon chamfered thin nuts Grades A and B: To AS 1112.4.

Hexagon nuts Grade C: To AS 1112.3.

Hexagon nuts Style 1 Grades A and B: To AS 1112.1.

Hexagon nuts Style 2 Grades A and B: To AS 1112.2.

### Screws

Coach screws: To AS/NZS 1393.

Hexagon screws Grades A and B: To AS 1110.2.

Hexagon screws Grade C: To AS 1111.2.

Hexagon socket screws: To AS 1420.

Self-drilling screws: To AS 3566.1.

Self-tapping screws:

- Cross-recessed countersunk (flat – common head style): To AS/NZS 4407.
- Cross-recessed pan: To AS/NZS 4406.
- Cross-recessed raised countersunk (oval): To AS/NZS 4408.
- Hexagon: To AS/NZS 4402.
- Hexagon flange: To AS/NZS 4410.
- Hexagon washer: To AS/NZS 4409.
- Slotted countersunk (flat – common head style): To AS/NZS 4404.
- Slotted pan: To AS/NZS 4403.
- Slotted raised countersunk (oval – common head style): To AS/NZS 4405.

### Blind rivets

Description: Expanding end type with snap mandrel.

Type: Closed end for external application, open end for internal application.

End material:

- Aluminium base alloy for metallic-coated or prepainted steel.
- Stainless steel for stainless steel sheet.

- Copper for copper sheet.

Size:

- For sheet metal to sheet metal: 3 mm.
- For sheet metal to supports, brackets and rolled steel angles: 4.8 mm.

### 5.3 EXECUTION

#### 5.3.1 ADHESIVES

##### General

Requirement: Install to the manufacturer's recommendations.

##### Preparation

Substrates: Conform to the following:

- Remove any deposit or finish which may impair adhesion.
- If framed or discontinuous, provide support members in full lengths without splicing.
- If solid or continuous, remove excessive projections.
- If previously painted, remove cracked or flaking paint and lightly sand the surface.

##### Contact adhesive

Precautions: Do not use contact adhesive if:

- A substrate is polystyrene foam.
- A PVC substrate may allow plasticiser migration.
- The adhesive solvent can discolour the finished surface.
- Dispersal of the adhesive solvent is impaired.

Two-way method: Immediately after application, press firmly to transfer adhesive and then pull both surfaces apart. Allow to tack off and then reposition and press firmly together. Tap areas in contact with a hammer and padded block.

One-way method: Immediately after application, bring substrates together and maintain maximum surface contact for 24 hours by clamps, nails or screws as appropriate. If highly stressed, employ permanent mechanical fasteners.

##### High strength adhesive tape

Preparation:

- Non-porous surfaces: Clean with surface cleaning solvents such as isopropyl alcohol/water, wash down and allow to dry.
- Porous surfaces: Prime the surface with a contact adhesive compatible with the tape adhesive system.

Application to copper, brass, plasticised vinyl and hydrophilic surfaces such as glass and ceramics in a high humidity environment: Conform to manufacturer's recommendations.

Applied lamination pressure: Make sure the tape experiences 100 kPa.

Application temperature: Generally above 10°C and to the manufacturer's recommendations.

Completion: Do not apply loads to the assembly for 72 hours at 21°C.

#### 5.3.2 JOINT SEALING

##### General

Requirement: Install to the manufacturer's recommendations.

##### Joint preparation

Cleaning: Cut flush joint surface protrusions and rectify if required. Mechanically clean joint surfaces free of any deposit or finish which may impair adhesion of the sealant. Immediately before sealant application, remove loose particles from the joint, using oil-free compressed air.

Bond breaking: Install bond breaking backing material.

Taping: Protect the surface on each side of the joint using 50 mm wide masking tape or equivalent means. On completion of sealant application, remove the tape and remove any stains or marks from adjacent surfaces.

Primer: Apply the recommended primer to the surfaces in contact with sealant materials.

##### Sealant joint proportions

General weatherproofing joints (width:depth):

- 1:1 for joint widths less than 12 mm.
- 2:1 for joint widths greater than 12 mm.

**Sealant application**

General: Apply the sealant to dry joint surfaces using a pneumatic applicator gun. Make sure the sealant completely fills the joint to the required depth, provides good contact with the full depth of the sides of the joint and traps no air in the joint. Do not apply the sealant outside the recommended working time for the material or the primer.

**Weather conditions**

Two pack polyurethanes: Do not apply the sealant if ambient conditions are outside the following:

- Temperature: Less than 5°C or greater than 40°C.
- Humidity: To the manufacturer's recommendations.

**Joint finish**

General: Force the sealant into the joint and finish with a smooth, slightly concave surface using a tool designed for the purpose.

Excess sealant: Remove from adjoining surfaces using cleaning material nominated by the sealant manufacturer.

**Protection**

General: Protect the joint from inclement weather during the setting or curing period of the material.

**Rectification**

General: Cut out and remove damaged portion of joint sealant and reinstall so repaired area is indistinguishable from undamaged portion.

**5.3.3 FASTENERS****General**

Requirement: Install to the manufacturer's recommendations.

**Fastening to wood and steel**

Timber substrates: To AS 1720.1 Section 4.

Self-drilling screws: To AS 3566.1 for timber and steel substrates.

**Masonry anchors**

Installation: To the manufacturer's recommendations.

**6 METALS AND PREFINISHES****6.1 GENERAL****6.1.1 RESPONSIBILITIES****General**

Requirements: Provide metal and prefinishes, as documented.

**Performance**

Requirement: Provide metals in sections of strength and stiffness suited to their required function, finish and method of fabrication.

**6.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**6.1.3 SUBMISSIONS****Samples**

Requirement: Submit samples of the following:

- Stainless steel: One sample of every documented surface finish.
- Anodising: One sample of every colour and finishing option.

**6.2 PRODUCTS****6.2.1 METALS****Aluminium and aluminium alloys**

Drawn pipe: To AS/NZS 1867.

Drawn rod, bar and strip: To AS/NZS 1865.

Extrusions: To AS/NZS 1866.

Plate and sheets: To AS/NZS 1734.

**Copper and copper alloys**

Casting: To AS 1565.

Plate, sheet and strip: To AS 1566.

Rods, bars and sections: To AS/NZS 1567.

Composition and designations: To AS 2738.

**Stainless steel**

Bars: To ASTM A276/A276M.

Plate, sheet and strip: To ASTM A240/A240M.

Welded pipe (plumbing applications): To AS 1769.

Welded pipe (round, square, rectangular): To ASTM A554.

**Steel**

Sheet: To AS/NZS 1595.

Structural bars and sections: To AS/NZS 3679.1.

Structural hollow sections: To AS/NZS 1163.

**Steel for prefinishes**

Cold rolled bar: Bright bars to AS 1443.

Cold rolled sheet: To AS/NZS 1595.

Electric resistance welded tube: To AS 1450.

## 6.3 EXECUTION

### 6.3.1 GENERAL

#### Metal separation

Incompatible sheet metals: Prevent direct contact between incompatible metals. Provide separation by one of the following:

- Apply an anti-corrosion, low moisture transmission coating such as alkyd zinc phosphate primer or aluminium pigmented bituminous paint to contact surfaces.
- Insert a concealed, non-metallic separation layer such as polyethylene film, adhesive tape, neoprene, nylon or bituminous felt.

Incompatible fixings: Do not use.

Incompatible service pipes: Install lagging or grommets. Do not use absorbent, fibrous or paper products.

#### Brazing

Lap-joints: Make sure brazed lap-joints have sufficient lap to provide a mechanically sound joint.

Butt joints: Do not use butt jointing for joints subject to load. If butt joints are used, do not rely on the filler metal fillet only.

Filler metal: To AS/NZS 1167.1.

#### Soldering

Lap-joints: Provide a mechanically sound soldered joint with sufficient lap for roofing, guttering, metalwork.

Pipes: Make a leakproof soldered joint using joiners for copper pipes.

Solder: To AS 1834.1.

#### Welding

Aluminium: To AS/NZS 1665.

Stainless steel: To AS/NZS 1554.6.

Steel: To AS/NZS 1554.1.

#### Finishing

Visible joints: Finish visible joints made by welding, brazing or soldering using methods appropriate to the class of work (including grinding or buffing) before further treatment such as painting, galvanizing or electroplating. Make sure self-finished metals are without surface colour variations after jointing.

#### Preparation

General: Before applying decorative or protective prefinishes to metal components, complete welding, cutting, drilling and other fabrication, and prepare the surface using a suitable method.

Standard: To AS 1627 series.

Priming steel surfaces: If site painting is documented to otherwise uncoated mild steel or similar surfaces, prime as follows:

- After fabrication and before delivery to the works.
- After installation, repair damaged priming and complete the coverage to unprimed surfaces.

### 6.3.2 FERROUS STEEL FINISHES

#### Metallic-coated steel

General: Steel coated with zinc or aluminium-zinc alloy as follows:

Electrogalvanized (zinc) coating on ferrous hollow and open sections: To AS 4750.

- Ferrous open sections by an in-line process: To AS/NZS 4791.
- Ferrous hollow sections by a continuous or specialised process: To AS/NZS 4792.
- Steel sheet and strip: To AS 1397.
- Steel wire: To AS/NZS 4534.

### 6.3.3 STAINLESS STEEL FINISHES

#### General

Requirement: Provide a surface finish to match the approved sample.

#### Pre-assembly

**Mechanically polished and brushed finishes:** Apply grit faced belts or fibre brushes that achieve uni-directional finishes with buffing, as required to provide the following:

- Finish designation: 4

#### Post-assembly pre-treatment

Heat discolouration: Remove by pickling.

Welds: Grind excess material, brush, and polish to match the pre-assembly finish.

#### Post-assembly finish

Mirror finish: Conform to the following:

- Pre-assembly finish: 2B cold-rolled finish.
- Post-assembly finish: Apply a polishing and buffing process to achieve a No. 8 mirror finish.

#### Completion

Cleaning: Clean and rinse to an acid free condition and allow to dry. Do not use carbon steel abrasives or materials containing chloride.

Protection: Secure packaging or strippable plastic sheet.

### 6.3.4 NON-FERROUS METAL FINISHES

#### Mechanical finishes

Bright finished copper alloy surfaces: For indoor applications, apply a clear lacquer protective coating.

### 6.3.5 ANODISED FINISHES

#### General

Standard: To AS 1231.

Thickness grade: To the recommendations of AS 1231 Appendix H.

Application: Refer to the drawing – other than aluminium windows and doors

### 6.3.6 METAL SPRAYED FINISHES

#### Metal spray

Standard: To ISO 2063-2.

Minimum thicknesses:

- Indoor applications: 125 µm.
- Outdoor applications: 175 µm.

Process: Electric arc.

Seal coat: Cover the metal spray finish with two coats of vinyl seal to a total dry film thickness of 80 µm.

### 6.3.7 PREPAINTED FINISHES

#### Air-drying enamel

Application: Spray or brush.

Finish: Full gloss.

General use:

- Primer: Two-pack epoxy primer to AS/NZS 3750.13.
- Top coats: 2 coats to AS 3730.6.

Oil resistant use:

- Primer: Two-pack epoxy primer to AS/NZS 3750.13.
- Top coats: 2 coats to AS/NZS 3750.22.

#### Equipment paint system

Description: Brush or spray application using paint as follows:

- Full gloss enamel finish coats, oil and petrol resistant: To AS/NZS 3750.22, two coats.
- Prime coat to metal surfaces generally: To AS/NZS 3750.19 or AS/NZS 3750.20.
- Prime coat to zinc-coated steel: To AS 3730.15 or AS/NZS 3750.16.
- Undercoat: To AS/NZS 3750.21.

#### Prepainted metal products

Standard: To AS/NZS 2728.

Product type: To AS/NZS 2728: Not lower than the type appropriate to the documented atmospheric corrosivity category.

Two-pack liquid coating

Application: Spray.

Finish: Full gloss.

Primer: Two pack epoxy primer to AS/NZS 3750.13.

Topcoat:

- Internal use: Proprietary polyurethane or epoxy acrylic system.
- External use: Proprietary polyurethane system.

### **6.3.8 COMPLETION**

#### **Damage**

Damaged prefinishes: Remove and replace items, including damage caused by unauthorised site cutting or drilling.

#### **Repair**

Anodising: Use sprayers or pens for minor scratches and mitre cuts as required.

Metallic-coated sheet: If repair is required to metallic-coated sheet or electrogalvanizing on inline galvanized steel products, clean the affected area and apply a two-pack organic primer to AS/NZS 3750.9.

#### **Cleaning**

Add details of cleaning and maintenance of finishes i.e. washing down frequently.

**7 TERMITE MANAGEMENT****7.1 GENERAL****7.1.1 RESPONSIBILITIES****General**

Requirement: Provide FMC HomeGuard Precision Termite Management Systems, as documented.

**Performance**

Objective: To achieve whole of building protection including to the following:

- Soil treatment under slabs.
- Perimeters of concrete slabs-on-ground.
- Control joints in concrete slabs.
- Service penetrations and other vulnerable areas.

**7.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**7.1.3 STANDARD****General**

Termite management systems: To AS 3660.1.

**7.1.4 MANUFACTURER'S DOCUMENTS****Technical manuals**

Materials and installation manuals: [www.fmcaustralasia.com.au/homeguard](http://www.fmcaustralasia.com.au/homeguard)

**7.1.5 INTERPRETATION****Definitions**

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

- Bifenthrin: A synthetic, broad-spectrum pyrethroid insecticide that affects the nervous system of insects.
- Chemical treated sheet material: A planar product impregnated with a termiticide tested in conformance with AS 3660.3 and registered with the pesticides registrar.
- Granular material: Termite resistant particles tested to AS 3660.3 and placed to form a termite management system. This includes physical termite management system of mineral granules and chemical termite management systems made of impregnated materials.

**7.1.6 SUBMISSIONS****Certification**

Certificate of installation: Submit certificate to AS 3660.1 Appendix A3.

**Operation and maintenance manuals**

Maintenance regime: For systems requiring post construction monitoring, provide a maintenance manual with the details of the following:

- Inspection frequency.
- Instructions for inspection of termite activity and treatment effectiveness.
- Contact details of installers and manufacturer's authorised supplier of replacement parts/components.
- Reapplication requirements.

**Products and materials**

Product data: For each product/material, submit manufacturer's data include the following:

- Construction details, material description and dimensions of individual components.
- Treatments and application procedures.

Type tests: Submit results, as follows:

- Termite management systems to AS 3660.3.

**Quality**

ITPs: Submit for each proposed type of installation.

Quality supervisor: Submit the name and record of experience of the person responsible for the implementation of the ITPs.

**Records**

General: Prepare and maintain records of all type of installation, as follows:

- Reference the relevant parts of the ITP and record conformance.
- Photographic records of the progress of each installation.

Completion: Submit record drawings identifying the locations of the installed system.

Management system report: At the end of the defects liability period, submit a report on the efficacy and status of the termite management system.

**Subcontractors**

General: Submit names and contact details of proposed active FMC HomeGuard accredited pest management company.

**Warranties**

Requirement: Submit FMC HomeGuard and the installer's warranty of the material, workmanship and application.

**7.1.7 INSPECTION****Notice**

Inspection: Give sufficient notice so that inspection may be made of the following:

- Completed earthworks or substrate preparation before system application/installation.
- The completed termite management system.

**7.2 PRODUCTS****7.2.1 GENERAL****Product substitution**

Other products: Conform to **SUBSTITUTIONS** in *General requirements*.

**Storage and handling**

Requirement: To FMC HomeGuard's recommendations. Do not store for prolonged periods in direct sunlight. Do not allow products to enter sewers, drains, creeks or other waterways.

**Product identification**

General: Deliver materials to the site in the manufacturer's original sealed containers or packing, legibly marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.
- Material composition and characteristics such as volatility, flash point, light fastness, colour and pattern.

**7.2.2 TERMITE MANAGEMENT SYSTEM****General**

Standard: To AS 3660.1 Section 5 and Section 6.

Certification: CodeMark Certificate of Conformity CM40175.

Type testing: To AS 3660.3. Section 4.

**HomeGuard TMB (termite moisture barrier)**

Description: A high impact 0.2 mm thick single polymer sheet, impregnated with bifenthrin termiticide and tested to AS 3660.3.

Standard: Vapour barrier and damp-proofing membrane to AS 2870 clause 5.3.3.2 and AS 2870 clause 5.3.3.3.

**HomeGuard DPC (damp proof course)**

Description: A 0.5 mm thick UV stabilised polymer sheet, impregnated with bifenthrin termiticide and tested to AS 3660.3.

Standard: Damp-proof course to AS/NZS 2904.

Certification: Certificate No. CMA-TT10051.

**HomeGuard PB (perimeter barrier)**

Description: A 0.3 mm thick, UV stabilised blue polymer sheet, impregnated with bifenthrin termiticide and tested to AS 3660.3.

**HomeGuard Collars**

Description: Preformed plastic collar, impregnated with bifenthrin termiticide, for preventing termite entry via service penetrations.

**HomeGuard Granular Termiticide (GT)**

Standard: To AS 3660.1 Section 6.

Description: A plastic granule formulation containing 1 g/kg of bifenthrin that is dispersed fully throughout the plastic granule.

**HomeGuard Protectacote Termite and Waterproofing Barrier**

Description: An acrylic polymer latex composition with a high loading of inorganic fillers that cures to form a termite resistant and waterproof film.

Certification: CodeMark Certificate of Conformity CM40156.

**7.3 EXECUTION****7.3.1 GENERAL****Installation**

Requirement: Conform to FMC HomeGuard recommendations, using FMC HomeGuard accredited pest management company.

**7.3.2 TERMITE MANAGEMENT SYSTEM****Pre-installation**

Site clearing: Before installation, remove all tree stumps, logs, roots, timber off-cuts, building debris, removable framework and other waste materials from the area where it is to be installed.

**Sheet material**

Standard: To AS 3660.1 Section 5.

Requirement: Install FMC HomeGuard Precision Termite Management Systems, as documented and to the manufacturer's recommendations, including the following:

- All edges, junction's penetrations, temporary block-outs, under door sills.
- All perimeter cavity wall lines around each of the new buildings.
- At the joints between new concrete slabs.
- At the junction between old and new concrete slabs and old brickwork and new slabs.
- Between flooring wall plates abutting existing concrete slabs/thickenings/existing structure.
- Under stud wall bottom plates and concrete/particleboard floors.
- All service penetrations through the slab floor to the new buildings.
- Other locations as required conforming to AS 3660.1.
- Joining sheets: Join sheets using Termiflex termiticidal adhesive sealant to FMC HomeGuard's recommendations.
- Minimum sheet overlap: 200 mm. Use cloth tape or Termiflex Sealant to seal overlaps and sheet joins.
- Prevent impairment of installed FMC HomeGuard sheet material from levelling pegs or formwork.

Repairing tears and gaps: Repair ripped or torn sheets by applying a piece of HomeGuard TMB, sufficiently sized to cover the gap or tear with a 200 mm minimum overlap. Bond together as for joining sheets.

Vertical penetrations: Install and FMC HomeGuard collar to all vertical penetrations. Conform to AS 3660.1 and FMC HomeGuard installation requirements.

**HomeGuard TMB**

Complete under slab installation: Install over the bedding sand before laying steel reinforcing mesh. Make sure there is sufficient overlap at the slab edge to allow full moisture and termite protection.

Retaining walls: Install HomeGuard TMB down to the base of the wall plus 200 mm across the footing, to cover the base course mortar joint, secure to the external masonry wall. Seal joints and edges with an adhesive or a bonding agent to FMC HomeGuard's recommendations.

Construction joints: If not installing HomeGuard TMB as a continuous barrier, install a minimum 300 mm wide strip under construction joints by adhering to the moisture membrane. Locate strip centred on of the construction joints. Extend the HomeGuard TMB 200 mm past the slab edge and pin to the outer wall of the formwork, allowing sufficient loose sheet to accommodate for the concrete pour.

New concrete to existing masonry or concrete joints: Fix one edge of HomeGuard TMB to the existing vertical edge surface using an adhesive or a bonding agent to FMC HomeGuard's recommendations. Start the sheet within 20 mm of the upper edge of the new concrete. Make sure the sheet bonded to the upper surface of the moisture membrane with an adhesive or a bonding agent to FMC HomeGuard's recommendations, and is continuous towards the footing and for at least 150 mm under the new slab.

**HomeGuard DPC and PB**

Extent: Extend HomeGuard Sheeting from the slab to the exterior surface of all perimeter cavity wall lines, around each of the new buildings so that it is visible at the exterior.

Infill slab: Secure HomeGuard DPC or HomeGuard PB to the outer edge of masonry wall, fold over and secure to the internal face of wall towards the footings. Secure in place with an adhesive or a bonding agent to FMC HomeGuard's recommendations before pouring slab.

Rebated slab edge: Secure HomeGuard DPC or HomeGuard PB to the slab edge below the (frame) bottom plate and the upper surface of the brickwork place with an adhesive or a bonding agent to FMC HomeGuard's recommendations.

Corners: Install HomeGuard DPC or HomeGuard PB at corners so that sheets are smooth and continuous. Allow folding at corners by making slits from the edge of the sheets to slab corners. Bond sheets together as for joining sheets.

**HomeGuard Collars**

Extent: Provide a collar to all service pipe or similar concrete slab penetrations.

Application: Only use HomeGuard Collars if a snug fit can be achieved. Install HomeGuard Collars to the requirements of the FMC HomeGuard Product Manual and AS 3660.1.

Installation: Position correctly sized collar, to form a snug fit, over the penetration.

Reinforcing mesh: Cut clear of penetration pipe so that the collar can be positioned entirely over the slab.

Multiple penetrations: Use HomeGuard Collars, to the FMC HomeGuard product manual.

**HomeGuard Granular Termiticide (GT)**

Standard: To AS 3660.1 Section 6.

Preparation: Make sure that the cavity is free from any large mortar 'dags' and other objects which may act as a bridge for the termites through or across the protection zone.

Installation:

- Provide a minimum 75 mm external masonry wall strip shielding height above finished ground level.
- Pour HomeGuard GT granules into the wall cavity to a minimum of 40 mm in height.
- Adhere a strip of HomeGuard PB to the course of bricks underneath the weep hole area, using either Termiflex or other adhesive, to manufacturer's recommendations. Define the inspection zone by extending the strip from the face of the brickwork and penetrate 35 mm to 50 mm into the granules.

**7.3.3 COMPLETION****Termite management system notice**

General: Permanently fix a durable notice in a prominent location to BCA B1.4(i)(ii) or BCA 3.1.4.4 and AS 3660.1 Appendix A.

**Waste materials**

Progressive cleaning: Make sure no waste materials which could attract termites remain on the site.

**Warranties**

Type: Renewable.

Minimum period: 1 year warranty renewal for 50 years or the design life of the structure.

Form of warranty: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the supplier and installer, against failure of materials and execution under normal environment and use conditions and conditional upon annual inspection of the property to AS 3660.2 by a HomeGuard accredited pest management company.

#### Certificate of installation

General: To AS 3660.1 Appendix A.

#### Completion inspection

Report: At the end of the defects liability period, inspect the termite management systems and prepare a report on their efficacy and status.

## 7.4 SELECTIONS

### 7.4.1 SCHEDULE

#### Termite management systems schedule

Property	TB1		
Location	Concrete slabs and footings on ground		
Under slabs	Homeguard TMB or a product equivalent in function and quality to the approval of the Superintendent's Representative		
Slab penetrations	Homeguard TMB and collars or a product equivalent in function and quality to the approval of the Superintendent's Representative		
Slab control joints and footing/slab joints	Homeguard TMB or a product equivalent in function and quality to the approval of the Superintendent's Representative		
Building perimeters	Homeguard PB or a product equivalent in function and quality to the approval of the Superintendent's Representative		

**8 SUNDRY ITEMS****8.1 GENERAL****8.1.1 RESPONSIBILITIES****General**

Requirement: Provide sundry items, as documented.

**Performance**

Requirements: Installation as follows:

- Undamaged and free of surface defects or distortions.
- Correctly located and aligned, plumb, level and straight.
- Fixed firmly in position.
- Connected to the nominated service(s).

**8.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**8.1.3 SUBMISSIONS****Operation and maintenance manuals**

Requirement: Submit a maintenance manual and, if required, an operation manual with the technical specification and manufacturer's recommendations for the item to be installed.

**Warranties**

Requirement: Submit a manufacturer's and/or installer's warranty.

**8.1.4 INSPECTION****Notice**

Inspection: Give notice so inspection can be made of the following:

- Set-out of item locations before fixing.

**8.2 PRODUCTS****8.2.1 GENERAL****Storage and handling**

General: Deliver, unload and store components and accessories in unbroken manufacturer's packaging.

**8.3 EXECUTION****8.3.1 PREPARATION****Substrates**

General: Prepare the substrate to receive the item.

**Protection**

General: Protect existing work from damage during the installation and rectify any damage. Provide temporary coverings if required.

**8.3.2 INSTALLATION****Accessories and trim**

Requirement: Provide accessories and trim necessary to complete the installation.

**8.3.3 COMPLETION****Cleaning**

Requirement: Remove packaging. Clean the completed assembly and surrounds. Wipe down appliances and fittings with a damp, soft, clean cloth.

**Warranties**

Requirement: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the supplier and the installer.

Form: Against failure of materials and execution under normal environment and use conditions.

Item: All items

Warranty terms: Manufacturers terms

Period: Manufacturers period

**8.4 SELECTIONS****8.4.1 ITEMS NOT CONNECTED TO SERVICES****UAT Grab Rails**

Manufacturer:	Bobrick or a product equivalent in function and quality to the approval of the Superintendent
Type:	concealed mounting with snap range covers
Size(mm):	32 OD
Configurations:	As shown on the drawings and in accordance with AS1428-.1 2009
Finish:	304 satin stainless steel
Location:	Refer to the drawings
Installation:	Fix to walls and partitions with suitably backed or framed to fully support, in accordance with manufacturer's instructions.

**Ambulant Grab Rails**

Manufacturer:	Bobrick or a product equivalent in function and quality to the approval of the Superintendent
Type:	concealed mounting with snap flange covers
Size(mm):	32 OD
Configurations:	As shown on the drawings and in accordance with AS1428.1 2009
Finish:	304 satin stainless steel
Location:	Refer to the drawings
Installation:	Fix to walls, and partitions with suitably backed or framed to fully support, in accordance with manufacturer's instructions.

**UAT Mirror - MIR - A**

Manufacturer:	Bobrick 1658 series or a product equivalent in function and quality to the approval of the Superintendent
Type:	tempered glass with single piece bright polished SS frame mirror vinyl backed accessible compliant
Size	refer to the drawings
Location:	Unisex disabled Toilet, Mounting height as shown on drawings (900 AFL maximum)
Installation	Fix to walls with concealed fixings suitably backed or framed to fully support, in accordance with manufacturer's instructions.

**Mirrors generally**

Manufacturer:	Bobrick 1658 series or a product equivalent in function and quality to the approval of the Superintendent
Type:	tempered glass with single piece bright polished SS frame mirror vinyl backed mirror
Size	refer to the drawings.
Location:	Refer to the drawings
Installation	Fix to walls with concealed fixings suitably backed or framed to fully support, in accordance with manufacturer's instructions.

**Shower seat**

Manufacturer:	Bobrick folding seat or a product equivalent in function and quality to the approval of the Superintendent
Type:	B819687
Size (mm):	406D x 990L
Location:	refer to the drawings
Installation:	Fix to walls and partitions with suitably backed or framed to fully support, in accordance with manufacturer's instructions.

**Toilet Roll Holders UAT and Ambulant**

Manufacturer:	Bobrick toilet roll holder or a product equivalent in function and quality to the approval of the Superintendent
Model:	Classic double toilet roll holder B2740 heavy duty cast aluminium with high impact plastic spindles and controlled delivery.
Size:	twin roll holder 120W x 375L x 125D
Finish:	satin finish stainless steel
Location:	refer to the drawings
Installation:	Fix to the walls and partitions with suitably backed or framed to fully support, in accordance with manufacturer's instructions.

**Toilet Roll Holders generally**

Manufacturer:	Bobrick toilet roll holder or a product equivalent in function and quality to the approval of the Superintendent
Model:	Classic Series surface mounted twin jumbo-roll toilet roll holder B2892 lockable heavy duty cast aluminium with high impact plastic spindles and controlled delivery.
Size:	twin jumbo roll holder
Finish:	satin finish stainless steel
Location:	refer to the drawings
Installation:	Fix to the walls and partitions with suitably backed or framed to fully support, in accordance with manufacturer's instructions.

**Paper Towel Dispensers**

Manufacturer:	Bobrick or a product equivalent in function and quality to the approval of the Superintendent
Type:	Classic B2620 lockable surface mounted paper towel dispenser with bin under
Size:	275 X 355 X 100 Deep
Finish:	satin stainless steel
Location:	surface mounted in locations shown on the drawings
Installation:	Fix to the walls and partitions with suitably backed or framed to fully support, in accordance with manufacturer's instructions.

**Soap Dispensers**

Manufacturer:	Bobrick 1.2 litres refillable or a product equivalent in function and quality to the approval of the Superintendent
Type:	Manual push button B-2111
Finish:	Satin stainless steel
Location:	surface mounted – vertically in locations shown on the drawings
Installation:	Fix to the walls, and partitions with suitably backed or framed to fully support, in accordance with manufacturer's instructions.

**Coat Hooks - UAT**

Manufacturer:	Bobrick or a product equivalent in function and quality to the approval of the Superintendent
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Type: B76717 concealed fixings Heavy duty coat hook  
 Finish: satin stainless steel  
 Location: UAT's  
 Installation: Fix to walls and partitions with suitably backed or framed to fully support, in accordance with manufacturer's instructions

**Coat Hooks - CHANGEROOMS**

Manufacturer: Devon or a product equivalent in function and quality to the approval of the Superintendent  
 Type: 273 coat hook  
 Finish: Brushed stainless steel  
 Location: Changerooms - Refer to the drawings  
 Installation: Fix to hardwood timber rail, in accordance with manufacturer's instructions.

**Baby Change Station**

Manufacturer: Kola Kare or a product equivalent in function and quality to the approval of the Superintendent  
 Type: KB100 - ST recess mounted, horizontal design  
 Colour: Cream  
 Location: Refer to the drawings - mounting height as per manufacturers recommendations.  
 Installation: Fix in the walls with suitably backed or framed to fully support, in accordance with manufacturer's instructions.

**Shower curtain track and Curtain**

Manufacturer: Alltrack Supplies M track complete with fittings and accessories required to achieve the documented configurations  
 Type: Monotrack 9100M  
 Track Size(mm): 25 x 20  
 Configuration: refer to the drawings  
 Curtain: Alltrack Supplies White box woven polyester of sizes to suit configuration  
 Finish: anodised aluminium  
 Location: Refer to the drawings  
 Installation: Fix through walls with suitably backed or framed to fully support, in accordance with manufacturer's instructions.

**Mop rack**

Manufacturer: JD MacDonald or a product equivalent in function and quality to the approval of the Superintendent  
 Type: 10 - 8215 stainless steel surface mounted with 5 hooks  
 Location: cleaners stores - Refer to the drawings  
 Installation: Fix through walls with suitably backed or framed to fully support, in accordance with manufacturer's instructions.

**Changeroom bench**

Manufacturer: Felton Industries or a product equivalent in function and quality to the approval of the Superintendent  
 Type: Double plank seat 517W x 458H with coloured end caps  
 Size(mm): refer to the drawings  
 Configuration: refer to the drawings  
 Finish: anodised aluminium  
 Location: Refer to the drawings  
 Installation: Fix into the floor, in accordance with manufacturer's instructions.

**Bench Seat**

Manufacturer:	Astra Street Furniture or a product equivalent in function and quality to the approval of the Superintendent
Type:	Barcelona bench seat
Size(mm):	1800L x 395W x 450H
Slat material:	Merbau hardwood
Slat profile(mm):	70W x 30H
Frame finish:	powdercoated
Location:	Refer to the drawings
Installation:	Fix in accordance with manufacturer's instructions.
Assembly:	allow for partial assembly

**8.4.2****8.4.3 KITCHEN AND BAR EQUIPMENT AND STAINLESS STEEL BENCHWORK**

Allow the PROVISIONAL SUM scheduled in the PRELIMINARIES for the supply and installation of bar equipment and stainless steel benchwork.

The PROVISIONAL SUM excludes the following Kitchen equipment which will be provided by the Principal allow to take delivery, install, test and commission. Connect to services as documented.

**Principal supplied kitchen equipment and shelving schedule**

Item	Quantity	Energy source	Remarks
Pie warmer	1	Electric	
Bain Marie	1	Electric	
Double stacked convection oven	1 of 2	Electric	
Fryer	1	Electric	
900 wide griddle	1	Electric	
6 burner range	1	Electric	
Pass through dishwasher	1	Electric	
Spray rinse tap set	1		
Double door display fridge	2	Electric	
Double door freezer	1	Electric	
Modular dishwasher exit bench	1		
Modular dishwasher inlet bench	1		

**9 BUILDING ACCESS SAFETY SYSTEMS****9.1 GENERAL****9.1.1 RESPONSIBILITIES****General**

Requirement: Provide building access safety systems, as documented.

**Performance**

Roofing and cladding: Maintain waterproofing integrity without damage or distortion. Maintain the structural integrity of the supporting elements.

**9.1.2 DESIGN****General**

Designer: Equipment supplier

**Requirements**

Responsibility: of design co-ordination

Performance requirements: Horizontal lifeline and rail systems to AS/NZS 1891.2 Section 4.

Authority requirements: Workplace Health and Safety (WHS) requirements

Access: Provide a system for two workers at any one time, to access the whole of the roof area of all buildings including the following:

- Full extent of gutters.
- Roof mounted plant and equipment.
- Roof areas within 2.5 m of fall hazards not otherwise protected by parapets or guard rails.
- External façade areas including glazing.
- External lighting.
- Aerials and telecommunications equipment.

**9.1.3 CROSS REFERENCES****General**

Requirement: Conform to the following other worksections as appropriate.

**9.1.4 STANDARDS****General**

Industrial fall-arrest system: To AS/NZS 1891.1, AS/NZS 1891.2, AS/NZS 1891.3 and AS/NZS 1891.4.

Industrial rope access system: To AS/NZS 4488.1 and AS/NZS 4488.2.

**9.1.5 INTERPRETATION****Abbreviations**

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

- PPE: Personal protective equipment.

**Definitions**

General: For the purposes of this worksection the definitions given in AS/NZS 1891.1 and AS/NZS 5532 apply.

**9.1.6 SUBMISSIONS****Certification**

General: Submit certification of installed system.

**Design documentation**

Safe work method statement (SWMS) for the designed system.

Calculations: Submit calculations by a professional engineer experienced in building access safety systems.

Certification: Submit certification by a professional engineer experienced in building access safety systems design as evidence of conformance to documented requirements.

Drawings: Submit the following drawings:

- Layout of anchors and system components in plan and elevation.
- Proposed methods of fixing to each substrate type in the building.

#### **Marking and labelling**

Requirement: Samples and schedules of proposed marking and labels for each system component.

Operation and maintenance manuals

General: Submit a manual describing the following:

- Limitations of the system.
- Operation procedures and methods.
- PPE user manuals.
- Care and maintenance requirements.

#### **Products and materials**

Manufacturers data: Submit manufacturer's data including the following:

- Product technical data sheets.
- Installation and maintenance recommendations.

Type tests: Submit results, as follows:

- Industrial fall arrest systems and devices.
- Industrial rope access systems.
- Fixed ladders.
- Single point anchors.

#### **Subcontractors**

General: Submit names and contact details of proposed suppliers and installers as recommended by the manufacturer.

#### **Tests**

Site tests: Submit results of proof load tests of drilled-in anchors.

#### **Warranties**

Requirement: Submit the warranties for each type of building access safety system, as documented.

## **9.2 PRODUCTS**

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### **9.2.1 GENERAL**

#### **Product identification**

General: Mark to show the following:

- Manufacturer's identification.
- Installer's contact details.
- Intended location.
- Load rating and direction.
- Current inspection/service date.
- Batch number or serial number of the components.

### **9.2.2 FALL PROTECTION SYSTEMS**

#### **Access safety system**

System: Anchorage devices

#### **Anchors**

Single point anchors: To AS/NZS 5532.

#### **Tests**

Industrial fall-arrest systems: Tested as follows:

- Horizontal lifeline and rail systems: To AS/NZS 1891.2.
- Fittings components and assemblies: To AS/NZS 1891.3 Section 3.

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## 9.3 EXECUTION

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### 9.3.1 INSTALLATION

#### Standards

Industrial fall arrest systems: To AS/NZS 1891.2.

#### Subcontractor

Installer: Registered installer, approved by the manufacturer.

#### Labels and signage

General: To AS/NZS 1891.4 clause 2.2.9.

### 9.3.2 TESTING

#### Proof load test for anchors

Standard: To AS/NZS 4488.2 clause 5.3.

Drilled-in anchors: Load test drilled-in anchors used in shear and not in axial tension (direct pull-out) before use.

### 9.3.3 TRAINING

#### General

Responsibilities: Coordinate the training of owner's facilities management personnel in conformance with *General requirements*.

Training records: Video record all training sessions. Catalogue and include recordings with the operation and maintenance manuals.

### 9.3.4 COMPLETION

#### Reinstatement

Extent: Repair or replace damage to the roofing and rainwater system. If the work cannot be repaired satisfactorily, replace the whole area affected.

Touch up: If it is necessary to touch up minor damage to prepainted metal roofing, do not overspray onto undamaged surfaces.

#### Cleaning

Roofing and rainwater drainage system: Remove debris, metal swarf, solder, sealants and unused materials.

#### Warranties

Requirement: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the supplier and installer.

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: As offered by the supplier/manufacturer.

### 9.3.5 MAINTENANCE

#### General

Preventative and mandatory system maintenance: By an Accredited Height Safety Inspector/Certifier, in conformance with AS/NZS 1891.4 Section 9 and manufacturer's maintenance/recertification recommendations.

Checklist for all inspections: To AS/NZS 1891.2 Supp 1 Table 8, and AS/NZS 1891.4 Section 9 and Appendices C and D.

The installer/competent person: To AS/NZS 1891.2 clause 1.2.1.

#### Regular scheduled periodic inspections

Standard: To AS/NZS 1891.2 clause 9.2.

Completion certificate:

- Provide inspection, testing and certification by an Accredited Installer and/or Accredited Height Safety Inspector:
  - . Upon completion of the installation at the date for practical completion.
  - . Upon the expiry of the defects liability period or 12 months after completion of the installation whichever is the lesser, and valid for a further 12 months period.
- Record the date of the next system inspection and period of validity and display the certificate at the access points of the work area or on the individual system components where provision is made.

Inspection after a fall or other event

Standard: To AS/NZS 1891.2 Supp 1 clause 9.3.

**Proof testing of drilled-in anchorages**

Standard: To AS/NZS 1891.2 Supp 1 clause 9.4.

**On-going maintenance**

Certificate: Submit the completion certificates and notify the proprietor of the requirement for continued interval testing.

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## 9.4 SELECTIONS

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### 9.4.1 FALL PROTECTION SYSTEMS

**General**

Type: Fall arrest system and translucent sheet signage and line marking.

**Anchorage device**

Product: Stainless steel eyelet fixed to the roof structure complete with dektite flashing.

Roof type: Profiled metal sheet

Profile: Refer to the roofing worksection

Colour: To match the roof sheeting

**Single point anchors**

The roof fall arrest system single point anchors will be accessed an eaves bracket.

The roof access bracket must be located in a position to the approval of the Superintendent.

Design the roof fall arrest system to suit the roof access point location.

**10 DEMOLITION****10.1 GENERAL****10.1.1 RESPONSIBILITIES****General**

Requirement: Carry out demolition, as documented.

**10.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**10.1.3 STANDARDS****General**

Demolition: To AS 2601.

**10.1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection, the following definitions apply:

- Demolition: The complete or partial dismantling of a building or structure, by pre-planned and controlled methods or procedures.
- Dilapidation record: The photographic or video and written record of the condition of the portion of the existing building retained, adjacent buildings, and other relevant structures or facilities, before the start of demolition work.
- Dismantle: The reduction of an item to its components in a manner to allow re-assembly.
- Recover: The disconnection and removal of an item in a manner to allow re-installation.

**10.1.5 SUBMISSIONS****Authority approvals**

Evidence of compliance: Before starting demolition, submit evidence of the following:

- Requirements of authorities relating to the work under the contract have been obtained.
- A permit to demolish has been obtained from the appropriate authority.
- A scaffold permit has been obtained from the appropriate authority (if scaffolding is proposed to be used).
- Certification that each person having access to the construction site has completed site-specific WHS induction training.
- Precautions necessary for protection of persons and property have been taken and suitable protective and safety devices have been provided to the approval of the relevant authority.
- Treatment for rodent infestation has been carried out and a certificate has been obtained from the appropriate authority.
- Fees and other costs have been paid.

**Execution details**

Requirement: Submit the following, as documented:

- Hazardous Substances Management Plan including laboratory analysis of hazardous substance.
- Investigation and work plan.

Off-site disposal locations: Submit details of the proposed locations for the disposal of material required to be removed from the site, and evidence of conformance with the requirements of relevant authorities.

Recycling: Submit details of the proposed recycling facility.

- Certification: Submit evidence of disposal of recycled materials.
- Concrete crushing: If proposed on site, submit details of plant and environmental controls.

Stockpile locations: Submit details of the proposed locations of on-site stockpiles for demolished materials for recycling in the works. Coordinate with the locations for storage of other waste streams, and prevent mixing or pollution.

### Records

Dilapidation record:

- Before demolition: Submit to each owner of each adjacent property, a copy of the part of the record relating to that property and obtain their written agreement to the contents.
- Rectification work: Submit written acceptance of rectification works from the owner of each adjoining property affected.

### Tests

Requirement: Submit test results of compliance tests for building service components to be re-used.

## 10.1.6 INSPECTION

### Notice

Inspection: Give notice so that inspection may be made of the following:

- Adjacent structures before starting and at completion of demolition.
- Services before disconnection or diversion.
- Trees documented to be retained, before starting demolition.
- Contents of building before starting demolition.
- Structure after stripping and removal of roof coverings and external cladding.
- Underground structures after demolition above them.
- Excavations remaining after removal of underground work.
- Site after removal of demolished materials.
- Services after reconnection or diversion.

## 10.2 PRODUCTS

### 10.2.1 DEMOLISHED MATERIALS

#### Demolished material classes table

Class	Requirement	Ownership
Recovered items for re-use in the works	Recover without damage items identified in the <b>Recovered items for re-use in the works schedule</b>	Principal/proprietor
Recovered items for delivery to the principal	Recover without damage items identified in the <b>Recovered items for delivery to the principal schedule</b>	Principal/proprietor
Demolished material for recycling in the works	Stockpile material identified in the <b>Demolished material for recycling in the works schedule</b>	Contractor
Demolished material for recycling off-site	Demolish and deliver for recycling material identified in the <b>Demolished material for recycling off-site schedule</b>	Contractor
Dismantle for relocation as part of the works	Dismantle without damage and store items identified in the <b>Dismantle for relocation schedule</b>	Principal/proprietor
Demolish for removal	Remove from the site demolished materials identified in the <b>Demolish for removal schedule</b> . Do not burn or bury on site	Contractor

Class	Requirement	Ownership
	Transit: Prevent spillage of demolished materials in transit	

### 10.3 EXECUTION

#### 10.3.1 HAZARDOUS SUBSTANCES

##### Identified hazardous substances

Register: No hazardous substances have been identified as present on site.

##### Audit

Requirement: Prepare a Hazardous Substances Management Plan to AS 2601 clause 1.6.1. Include the following:

- Asbestos or material containing asbestos.
- Flammable or explosive liquids or gases.
- Toxic, infective or contaminated materials.
- Radiation or radioactive materials.
- Noxious or explosive chemicals.
- Tanks or other containers which have been used for storage of explosive, toxic, infective or contaminated substances.

##### Removal of hazardous substances

Standard: To AS 2601 clause 1.6.2.

**Procedure for asbestos removal:** In accordance with Worksafe WA requirements.

##### General

Requirement: Before demolition or stripping work, prepare the work plan to AS 2601 Section 2. Include the check list items appropriate to the project from AS 2601 Appendix A, and the following:

- Method of protection and support for adjacent property.
- Locations and details of service deviations and terminations.
- Sequence of work.
- If the demolition program results in components temporarily cantilevered, provide a certificate from a professional engineer.
- Proposals for the safe use of mobile plant on suspended structural members including provisions for the protection of lower floors in the event of structural failure.
- If implosion methods are proposed, provide a separate report of methods and safeguards.
- Wheel loads of tipping or loading vehicles.

#### 10.3.2 SUPPORT

##### Temporary support

General: If temporary support is required, certification for its design and installation is required from a professional engineer engaged by the contractor.

Existing buildings: Until permanent support is provided, provide temporary support for sections of existing buildings which are to be altered and which normally rely for support on work to be demolished.

Ground support: Support excavations for demolition of underground structures.

Adjacent structures: Provide supports to adjacent structures where necessary, sufficient to prevent damage resulting from the works.

- Lateral supports: Provide lateral support equal to that given by the structure to be demolished.
- Vertical supports: Provide vertical support equal to that given by the structure to be demolished.

##### Permanent supports

General: If permanent supports for adjacent structures are necessary and are not documented, give notice and obtain instructions.

**10.3.3 PROTECTION****Encroachment**

General: Prevent the encroachment of demolished materials onto adjoining property, including public places.

**Weather protection**

General: If walls or roofs are opened for alterations and additions or the surfaces of adjoining buildings are exposed, provide temporary covers to prevent water penetration. Provide covers to protect existing plant, equipment and materials intended for re-use.

**Dust protection**

General: Provide dustproof screens, bulkheads and covers to protect existing finishes and the immediate environment from dust and debris.

**Security**

General: If walls or roofs are opened for alterations or additions, provide security against unauthorised entry to the building.

**Temporary screens**

General: Fill the whole of designated temporary openings or other spaces using dustproof and weatherproof temporary screens, fixed securely to the existing structure, and installed to shed water to avoid damage to retained existing elements or adjacent structures and contents.

Type: Timber framed screens sheeted with 12 mm plywood and painted. Seal the junctions between the screens and the openings.

**Temporary access**

General: If required, provide a substantial temporary doorset fitted with a rim deadlock, and remove on completion of demolition.

**Exposed surfaces**

General: Where necessary, protect and weatherproof the surfaces of adjacent structures exposed by demolition.

**Existing services**

Location: Before starting demolition, locate and mark existing underground services in the areas which will be affected by the demolition operations.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

Excavation: Do not excavate by machine within 1 m of existing underground services.

**Recovered items**

General: If items are documented for recovery and re-use, minimise damage during removal and recover all associated components required for their re-use.

**10.3.4 DEMOLITION – BUILDING WORKS****Encroachment**

General: If encroachments from adjacent structures are encountered and are not documented, give notice and obtain instructions.

**Sequence**

*Sequence of demolition: the building to be demolished will remain in operation and be occupied until an occupancy certificate has been obtained for the new building and the building to be demolished has been evacuated of all items required by the occupant. Once the documented actions have been completed the building can be demolished*

**Concrete slabs**

General: Using a diamond saw, neatly cut back or trim to new alignment with a clean true face existing concrete slabs to be partially demolished or penetrated. Do not overcut at corners.

**Material below grade**

Extent: Demolish the following:

- Footings, redundant services, sub-base down to sub-grade to all paved areas, fence footings and other footings to framed structures and elements connected to above ground structures nominated to be demolished or removed. Sub-base down to sub-grade of playground pit including all landing material.
- Disconnect and remove back to point of connection to point of supply, redundant in ground services.
- Trees – complete root network

Remaining voids: Stabilise and provide barriers.

**Explosives**

General: Do not use explosives.

**10.3.5 DEMOLITION – BUILDING SERVICES**

**General**

Requirement: Decommission, isolate, demolish and remove from the site all equipment and associated components that become redundant as a result of the demolition.

Breaking down: Disassemble or cut up equipment where necessary to allow removal.

**Demolition of refrigeration systems**

Standard: To AS/NZS 5149.4.

**Components for re-use**

General: Before returning to service, clean components and test for conformance to Australian Standards, as required.

**10.3.6 COMPLETION**

**Notice of completion**

General: Give at least 5 working days' notice of completion of demolition so that adjacent structures may be inspected following completion of demolition.

**Reinstatement**

Assessment of damage: Use the dilapidation record to assess the damage and rectification work arising from the demolition work.

Rectification: Repair damage arising out of demolition work. Obtain written acceptance from the owner of each adjoining property of the completeness and standard of the rectification work.

**Temporary support**

General: Remove at completion of demolition.

**10.4 SELECTIONS**

**10.4.1 DEMOLITION**

**Demolish for removal schedule**

Item
All items not nominated to be recovered, reused or relocated.

**11 SITE PREPARATION****11.1 GENERAL****11.1.1 RESPONSIBILITIES****General**

Requirement: Provide site preparation, as documented.

**Performance**

Areas for protection: All areas not forming part of the works

**11.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**11.1.3 INTERPRETATION****Definitions**

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

- Authority: Any organisation with statutory authority relating to the project, including clearances.
- Clearances: A formal certificate, approval or condition issued by a statutory authority allowing work in a particular area.

**11.1.4 SUBMISSIONS****Certification**

Vermin: Submit pest exterminator's certification as evidence that the completed site works are free from vermin.

**Execution details**

Requirement: Submit details of methods and equipment proposed for the following:

- Clearing and grubbing.
- Protecting ground within and adjacent to tree driplines from compaction by proposed earthworks machinery.

**11.1.5 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Interior and exterior of existing building prior to commencing demolition.

**11.2 EXECUTION****11.2.1 COMMUNITY LIAISON****Notification**

General: Notify residents about construction activities which will affect access to, or disrupt the use of, their properties.

Notice: Minimum 5 working days, unless the work is of an urgent nature with safety implications.

Notification content:

- Description of the work.
- The reason for the work.
- The expected duration.
- Changes to traffic arrangements and property access.
- The 24-hour contact number of the representative responsible.

**11.2.2 EXISTING SERVICES****General**

Requirement: Before starting earthworks, locate and mark existing underground services in the areas affected by the earthworks operations including clearing, excavating and trenching.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

Excavation: Do not machine excavate within 1000 mm of existing services.

Existing service lines: If required, divert services detected during excavation, clear of the building, and reconnect to the utility service provider requirements.

### 11.2.3 SITE CLEARING

#### Extent

Requirement: Clear only areas occupied by works such as structures, paving, excavation, regrading and landscaping or other areas documented for clearing.

Contractor's site areas: If not included within the areas documented above, clear only to the extent necessary for the performance of the works.

#### Clearing and grubbing

Clearing: Remove everything on or above the site surface, including rubbish, scrap, grass, vegetable matter and organic debris, scrub, trees, timber, stumps, boulders and rubble.

Grubbing: Grub out stumps and roots over 75 mm diameter to a minimum depth as follows:

- Below subgrade under buildings, embankments or paving: 500 mm.
- Below finished surface in unpaved areas: 300 mm.

Backfilling: Fill holes remaining after grubbing with sand material to prevent ponding of water.

Compact the material to the relative density of the existing adjacent ground material.

Redundant/decommissioned works: Remove works no longer required, including slabs, foundations, paving, drain, and access chambers and covers within the works zone.

#### Batters

Temporary protection: If the change in level between crest and toe is more than 1500 mm, protect from erosion with geofabric, hessian and tar or heavy duty black polythene sheet cover. Securely fix down at crest and toe.

#### Surplus material

Topsoil and excavated material: Remove unwanted stripped soil and other material from the site as the work proceeds, including any material dropped on footpaths or roadways.

### 11.2.4 STORMWATER AND SEDIMENT CONTROL

#### General

Erosion and sediment control measures: To *Environmental management*.

#### Waterways and drains

Waterways: If required, temporarily divert ditches, field drains and other waterways affected by excavation and reinstate on completion.

Stormwater drains: Divert drains detected during excavation, clear of the building, and reconnect as documented or obtain approval.

### 11.2.5 EXISTING WORKS TO REMAIN

#### Marking

Requirement: Identify existing works to remain with 1000 mm high, 50 x 50 mm timber stakes connected by yellow plastic tape to prevent accidental damage.

### 11.2.6 TREE REMOVAL

#### Designation

Marking: Identify trees and shrubs for removal by tagging 1000 mm above ground level.

Extent: refer to the drawings

### 11.2.7 TREE PROTECTION

#### General

Warning signs: In a prominent position at each entrance to the site, display warnings that trees and plantings require protection during the contract. Remove on completion.

Lettering: Road sign type sans serif letters, 100 mm high to AS 4970 Appendix C.

Protection measures: Provide before starting the earthworks.

#### Trees to remain

Extent: Trees not marked for removal.

**Tree protection**

Tree protection zone (TPZ): To AS 4970 Section 3.

Tree protective measures: To AS 4970 Section 4.

Monitoring and certification: To AS 4970 Section 5.

**Work near trees**

Materials placement: Conform to the following:

- Keep the area within the dripline of trees free of sheds and paths, construction material and debris.
- Do not place bulk materials and harmful materials within the dripline of trees.
- Do not place spoil from excavations against tree trunks.
- Prevent wind-blown materials such as cement from harming trees and plants.

Damage: Prevent damage to tree bark. Do not attach stays, guys and similar material to trees.

Work under trees: Do not remove topsoil from, or add topsoil to, the area within the dripline of the trees.

Excavation: If excavation is required near trees, give notice. Minimise period and extent of excavation within the dripline.

Hand methods: Use hand methods to locate, expose and cleanly remove the roots on the line of excavation. If excavation is required within the dripline, use hand methods so that root systems remain intact and undamaged.

Roots: Do not cut tree roots exceeding 50 mm diameter. If required to cut tree roots, use cutting methods that do not excessively disturb the remaining root system. Immediately after cutting, water the tree and apply a liquid rooting hormone to stimulate the growth of new roots.

Backfilling: Backfill excavations around tree roots. Place the backfill in layers of 300 mm maximum depth and compact to a dry density similar to that of the original or surrounding soil. Do not backfill around tree trunks to a height greater than 200 mm above the original ground surface. Immediately after backfilling, thoroughly water the root zone surrounding the tree.

Backfill material:

- Mix proportions (topsoil: well-rotted composts) by volume: 3:1.
- Neutral pH value.
- Free from weed growth and harmful materials.

Compacted ground: Do not compact the ground or use skid-steer vehicles under the tree dripline. If compaction occurs, give notice.

Compaction protection: Protect ground adjacent to the tree dripline.

Watering: Water trees as necessary, including where roots are exposed at ambient temperature more than 35°C.

Mulching: Spread 100 mm thick organic mulch to the whole of the area within the dripline of all existing trees to remain.

**11.2.8 COMPLETION****Temporary works**

Remove at completion.

**Site restoration**

Requirement: Reinstatement undeveloped ground surfaces to the condition existing at the commencement of the contract, including the reinstatement of irrigation and supply and installation of roll on turf where required.

**Clean up**

Progressive cleaning: Keep the works clean and tidy, and regularly remove from the site, waste and surplus material arising from execution of the work.

Waste disposal: To *Environmental management*.

**Vermin management**

Requirement: Employ a suitably qualified pest exterminator to remove vermin found during site preparation.

**12 EARTHWORK****12.1 GENERAL****12.1.1 RESPONSIBILITIES****General**

Requirement: Provide earthworks to the dimensions and tolerances, as documented including the engagement of a Geotechnical consultant to inspect and report on the foundation excavations.

**12.1.2 DESIGN****General**

Geotechnical and environmental reports provided: Douglas Partners Report on Geotechnical Investigation project ref 209069.00 Rev 0 dated November 2021

**12.1.3 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**12.1.4 STANDARDS****General**

Earthworks: Conform to the recommendations of those parts of AS 3798 that are referenced in this worksection.

Description and classification of soils: To AS 1726.

**12.1.5 INTERPRETATION****Abbreviations**

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

- GITA: Geotechnical inspection and testing authority.
- GTA: Geotechnical testing authority.

**Definitions**

General: For the purposes of this worksection the definitions given in AS 3798 and the following apply:

- Bad ground: Ground unsuitable for the works, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground that is, or becomes, soft, wet or unstable.
- Rock: Monolithic material with volume greater than 0.3 m<sup>3</sup> that cannot be removed until broken up by rippers or percussion tools.
- Site topsoil: Natural soil, excavated from the site, that contains organic matter, supports plant life, conforms generally to the fine-to-medium texture classification to AS 4419 and is free from the following:
  - . Stones more than 25 mm diameter.
  - . Clay lumps more than 50 mm diameter.
  - . Weeds and tree roots.
  - . Sticks and rubbish.
  - . Material toxic to plants.
- Subgrade: The trimmed or prepared earth material on which the pavement, footing or slab is constructed. Generally taken to relate to the upper line of the earth material.
- Zone of influence: A foundation zone bounded by planes extending downward and outward from the bottom edge of a footing, slab or pavement and defining the extent of foundation material having influence on the stability or support of the footings, slab or pavement.

**12.1.6 TOLERANCES****General**

Finish: Finish the surface to the required level, grade and shape within the following tolerances:

- Under building slabs and load bearing elements: + 0, - 25 mm.
- Pavement subgrades: + 0, - 40 mm.

- Batters: No steeper than the slope shown on the drawings. Make sure flatter slopes do not impact on boundaries or required clearances to buildings, pavements or landscaping.
- Other ground surfaces:  $\pm 50$  mm, provided the area remains free draining and matches adjacent construction where required. Provide smoothness as normally produced by a scraper blade.

### 12.1.7 SUBMISSIONS

#### Design documentation

Calculations: Submit calculations by a professional engineer showing the stability and safety of proposed excavations and temporary supports, including supports required for adjacent structures.

#### Execution details

Report: Submit a time-based schedule detailing the methods and equipment proposed for the earthworks, including the following:

- Dewatering and groundwater control and disposal of surface water.
- Excavation methods, stages, clearances, batters and temporary supports.
- Stockpiles and borrow pits.
- Placing and compaction methods and stages.

Geotechnical site investigations: Provide a geotechnical report supporting the methods proposed for excavation.

Disposal location: Submit details of the locations and evidence of compliance with the appropriate authority requirements for the disposal of material requiring removal from site.

Temporary shoring: Submit a proposal for any temporary shoring required, including the progressive removal.

Proof rolling: Submit details of proposed method and equipment for proof rolling.

Records of measurement: Submit a certified copy of the agreed records of measurement.

Site records: Submit the following to AS 3798 clause 3.4 and Appendix B:

- Geotechnical site visit record.
- Earthworks summary report or daily geotechnical reports.

#### Products and materials

Imported fill: Submit certification or test results by a GTA registered laboratory of the imported fill as evidence of conformity with the contract, including the source.

#### Tests

Compaction: Submit certification and/or test results in conformance with the documented level of inspection and testing to AS 3798.

### 12.1.8 INSPECTION

#### Notice

Inspection: Give notice so that inspection may be made of the following:

- Items to be measured as listed in **RECORDS OF MEASUREMENT**.
- Areas to be cleared and/or stripped of topsoil.
- Areas stripped of topsoil.
- Excavation completed to contract levels or founding material.
- Proof rolled subgrade before placing fill.
- Filling completed to contract levels.
- Stockpiled topsoil before spreading.

## 12.2 PRODUCTS

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### 12.2.1 FILL MATERIALS

#### General

Suitable material: To AS 3798 clause 4.4 including inorganic, non-perishable material suitably graded and capable of compaction to the documented density.

Unsuitable materials: To AS 3798 clause 4.3.

Sulfur content: Do not provide material with sulfur content exceeding 0.5% within 500 mm of cement bound elements (for example concrete structures or masonry) unless the elements are protected by impermeable membranes or equivalent means.

Re-use of excavated material: Only re-use suitable material to AS 3798 clause 4.4.

### **Stockpiles**

General: Segregate the earth and rock material and stockpile for re-use in backfilling operations.

Location: Do not stockpile excavated material against tree trunks, buildings, fences or obstruct the free flow of water along drainage channels.

### **12.2.2 BORROW OR IMPORTED FILL**

#### **General**

Borrow or imported material: Use only when suitable excavated material from site is not available.

- Suitable material: To AS 3798 clause 4.4.

Material conforming to the following: To the Geotechnical report

### **12.2.3 GEOTEXTILE**

#### **General**

Material: UV stabilised, permeable, polymeric, woven or non-woven textile material used in contact with soil/rock material.

Identification and marking: To AS 3705.

## **12.3 EXECUTION**

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### **12.3.1 SITE PREPARATION**

#### **General**

**Refer to the Geotechnical Report and carry out the site preparation described in the report.**

#### **Erosion and sedimentation control**

Requirement: To *Environmental management*.

### **12.3.2 GEOTECHNICAL**

#### **General**

Refer to the Geotechnical Report.

#### **As found site conditions**

General: If the following are encountered, give notice and obtain instructions before carrying out any further work in the affected area:

- Bad ground.
- Discrepancy in expected conditions.
- Rock.
- Springs, seepages.
- Topsoil more than 100 mm deep.

#### **Inspection and testing**

Frequency of testing: To AS 3798 Table 8.1.

### **12.3.3 RECORDS OF MEASUREMENT**

#### **Excavation and backfilling**

Agreed quantities: If a schedule of rates applies, provisional quantities are documented, or there are variations to the contract levels or dimensions of excavations, do not backfill or place permanent works in the excavation until the following have been agreed and recorded:

- Depths of excavations related to the datum.
- Final plan dimensions of excavations.
- Quantities of excavations in rock.

Method of measurement: By registered surveyor.

#### **Rock**

Level and class: If rock is measured for payment purposes, either as extra over excavation of material other than rock or for adjustment of provisional measurements, do not remove the rock until the commencing levels and the classes of rock have been determined.

**12.3.4 REMOVAL OF TOPSOIL****General**

Extent: Areas of cut or fill and areas occupied by structures, pavements and embankments.

Maximum depth: 200 mm.

Disposal: Remove topsoil unsuitable for re-use from the site to AS 3798 clause 6.1.8.

**Topsoil stockpiles**

General: Stockpile site topsoil intended for re-use.

Stockpile maximum height: 1.5 m.

Identification: Mark and label stockpiles of different soil types.

Vegetation: Do not burn off or remove plant growth that occurs during storage.

Protection: Conform to the following:

- Provide drainage and erosion protection.
- Do not allow traffic on stockpiles.
- If a stockpile is to remain for more than four weeks, sow with temporary grass.
- Protect the topsoil stockpiles from contamination by other excavated material, weeds and building debris.

**12.3.5 EXCAVATION****Extent**

Site surface: Excavate the site to the levels and profiles required for the documented structures, pavements, filling and landscaping. Make allowance for compaction, settlement or heaving.

Footings, pits, wells and shafts: Excavate to the required sizes and depths. Confirm that the foundation conditions meet the design bearing capacity.

**Bearing surfaces**

Requirement: Provide even plane bearing surfaces for loadbearing elements including footings. Step to accommodate level changes. If supporting masonry, make the steps appropriate to the courses.

**Rock**

General: Do not use explosives.

**Existing footings**

Requirement: If excavation is required within the zone of influence of an existing footing, provide supports to the footing sufficient to prevent damage arising from the works. Use methods including temporary shoring or underpinning.

**Existing services**

Location: Before starting earthworks, locate and mark existing underground services in the areas that will be affected by the earthworks operations including clearing, excavating and trenching.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

Excavation: Do not excavate by machine within 1000 mm of existing services.

**Proof rolling**

Extent: Proof roll excavations for pavements, filling and non-spanning slabs on ground to determine the presence of bad ground.

Proof rolling method and equipment: To AS 3798 clause 5.5.

Requirement: If excessive settlement, rebound or heaving is encountered, provide test pits or trenching to determine the extent of bad ground.

**Disposal of excess excavated material**

General: Remove excess excavated material from site not required or unsuitable for fill.

Standard: To AS 3798 clause 6.1.8.

**12.3.6 REINSTATEMENT****Deterioration of bearing surfaces**

Requirement: If the bearing surface deteriorates because of water or other cause, excavate to a sound surface before placing the loadbearing element.

**Subgrades affected by moisture**

Requirement: If, due to high moisture content the subgrade cannot support construction equipment or the overlying pavement cannot be compacted, perform one or more of the following:

- Allow the subgrade to dry until it provides support for equipment and allows compaction.
- Scarify the subgrade to a depth of 150 mm, work as necessary to accelerate drying, and recompact when the moisture content is satisfactory.
- Excavate the wet material and remove to spoil, and backfill excavated areas.

**Over excavation**

Requirement: If excavation exceeds the required depths, reinstate to the correct depths, levels and bearing capacity.

Zone of influence: Within the zone of influence of footings, beams, or other structural elements, use concrete of strength equal to the structural element, minimum 15 MPa. Make sure that remedial concrete does not create differential bearing conditions.

Below slabs or pavements: Rectify the over excavation as follows:

- Generally: Provide selected fill compacted to the documented density.
- Less than 100 mm: Do not backfill. Increase the thickness of the layer above.

Rock depressions and subsoil drains: Backfill rock depressions and over excavation of subsoil drains using coarse subsoil filter.

**12.3.7 SUPPORTING EXCAVATIONS****Removal of supports**

General: Remove temporary supports progressively as backfilling proceeds.

**Voids**

General: If voids occur outside sheeting or sheet piling, fill and compact voids to a dry density similar to that of the surrounding material.

**12.3.8 ADJACENT STRUCTURES****Temporary supports**

General: If required, provide supports to adjacent structures, sufficient to prevent damage arising from the works.

Lateral supports: Provide lateral support with shoring.

Vertical supports: If required, provide vertical support with piling or underpinning or both.

**Permanent supports**

General: If permanent supports for adjacent structures are required and are not documented, give notice and obtain instructions.

**Encroachments**

General: If encroachments from adjacent structures are encountered and are not documented give notice and obtain instructions.

**Zone of influence**

Angle from horizontal: 30 degrees

**12.3.9 PREPARATION FOR FILLING****Preparation**

Stripping: Prepare the ground surface before placing fill (including topsoil fill), ground slabs or load bearing elements to AS 3798 clause 6.1.5. Remove material that inhibits or prevents satisfactory placement of fill layers, loose material, debris and organic matter.

Foundation preparation: To AS 3798 clause 6.1.7.

Compaction: Compact the ground exposed after stripping or excavation, to a minimum depth of 150 mm, to the minimum relative compaction in AS 3798 Table 5.1.

Ground treatment or improvement methods:

- Scarify method: Loosen exposed excavation by scarifying to a minimum of 150 mm, moisture-condition and compact to AS 3798 Section 5.
- Impact roller and impact compaction: Use an approved method.

Slope preparation: If fill is placed on a surface steeper than 4:1 (horizontal:vertical), bench the surface to form a key for the fill. As each layer of fill is placed, cut the existing ground surface progressively to form a series of horizontal steps more than 1 m in width and more than 100 mm deep. Recompact the excavated material as part of the filling. Shape to provide free drainage.

**Under slabs, paving and embankments**

General: If required, loosen the ground to a depth of more than 200 mm and adjust the moisture content before compaction to a density consistent with subsequent filling.

**12.3.10 PLACING FILL****General**

Extent: Place fill to the documented dimensions, levels, grades, and cross sections so that the surface is always self-draining.

Layers: Place fill in near-horizontal layers of uniform thickness, deposited systematically across the fill area.

Edges: At junctions of fill and existing surfaces, do not feather the edges.

Mix: Place fill in a uniform mixture.

Previous fill: Before placing subsequent fill layers, make sure that previously accepted layers still conform to requirements, including moisture content.

Protection: Protect the works from damage due to compaction operations. If required, limit the size of compaction equipment or compact by hand.

Protective covering to membranes: Do not disturb or damage during backfilling.

**Placing at structures**

Fill adjacent structures and trenches: To AS 3798 clause 6.2.6.

Requirement: Place and compact fill in layers simultaneously on both sides of structures, culverts and pipelines to avoid differential loading. Commence compacting each layer at the structure and proceed away from structure.

Over the top of structures: Carefully place first layers of fill.

Retaining walls: Do not place fill against concrete retaining walls until the concrete has been in place for 28 days unless the structure is supported by struts.

**Compaction**

General: Compact the subgrade and each layer of fill to the required depth and density, as a systematic construction operation. Shape surface to provide drainage and prevent ponding.

Maximum rock and lump size in layer after compaction: To AS 3798 clause 6.2.2.

Fill batter faces: Either compact separately, or overfill and cut back. Form roughened surfaces to the faces.

Minimum relative compaction: To AS 3798 Table 5.1.

**12.3.11 PLACING TOPSOIL****Stockpiled topsoil**

Cultivation: Rip subgrade to a depth of 100 mm or to the depth of rippable subgrade if less. Cultivate around services and tree roots by hand. Trim to allow for the required topsoil depth.

Herbicide: Apply before placing topsoil.

Placing: Spread and grade evenly.

Compaction: Lightly compact topsoil so that the finished surface is smooth, free from lumps of soil, at the required level, ready for cultivation and planting.

Edges: Finish topsoil flush with abutting kerbs, mowing strips and paved surfaces. Feather edges into adjoining undisturbed ground.

**Disposal of excess topsoil**

On-site: Dispose of surplus topsoil remaining on site by spreading evenly over the areas already placed.

Off-site: Remove excess topsoil from the site and dispose of legally.

**12.3.12 FILL MOISTURE CONTROL****General**

Moisture content: Adjust the moisture content of fill during compaction within the range of 85% to 115% of the optimum moisture content determined by AS 1289.5.1.1 or AS 1289.5.2.1, as appropriate, to achieve the required density.

**12.3.13 COMPACTION TESTS****Compaction control tests**

Compaction control tests: To AS 1289.5.4.1 or AS 1289.5.7.1.

**Compaction control test frequency**

Standard: To AS 3798 Table 8.1.

Confined operations: 1 test per 2 layers per 50 m<sup>2</sup>.

**12.3.14 COMPLETION****Grading**

External areas: Grade to give falls away from buildings, minimum 1:100.

**Site restoration**

Requirement: If variation of existing ground surfaces is not required as part of the works, restore surfaces to the condition existing at the commencement of the contract.

**13 LANDSCAPE WALLING - STONE MASONRY****13.1 GENERAL****13.1.1 RESPONSIBILITIES****General**

Requirement: Provide stone masonry elements, as documented and as follows:

- Of uniform quality within any grade.
- Sound and free from defects liable to affect its strength, appearance and durability under the intended conditions of use.
- Construct retaining walls to the details in location shown on the drawings.

**13.1.2 CROSS REFERENCES****General**

Requirement: Conform to other worksections as appropriate.

**13.1.3 STANDARD****General**

Masonry: To AS 3700.

**13.2 PRODUCTS****13.2.1 RECONSTITUTED LIMESTONE****Source of stone supply****Colour:**

Type 1 - Earth blocks.

Type 2 – limestone to match existing

Size: 1000 x 350 x 350 (main face size) and as required to achieve retaining wall details.

**13.2.2 MORTAR****Mortar materials**

Cement type to AS 3972: GP.

Masonry cement: To AS 1316.

Lime: To AS 1672.1.

Sand: Fine aggregate with no clay content, free from efflorescing salts and selected for colour and grading.

**Sand for facework:**

- Colour: As required to match existing mortar colour

Admixtures: Do not provide admixtures.

Pigment: To BS EN 12878, and as follows:

- Integral pigment mix proportion: ≤ 10% by weight of cement.
- For light colours: Use off white cement in the mix.
- Colour: to match existing

**Water**

General: Clean and free from any deleterious matter.

**Mortar mix**

Batching: Batch by weight and machine mix.

Mix compressive strength: Not more than compressive strength of the stone bedded on it.

Mix permeability: More than stone permeability.

Preparing lime putty:

- Using hydrated lime: Add lime to water in a clean container and stir to a thick creamy consistency. Leave undisturbed for at least 16 hours. Remove excess water and protect from drying out.

- Using quicklime: Run to putty as soon as possible after receipt of quicklime. Partly fill clean container with water, add lime to half the height of the water, then stir and hoe ensuring that no lime remains exposed above the water. Continue stirring and hoeing for at least 5 minutes after all reaction has ceased, then sieve into a maturing bin. Leave undisturbed for at least 14 days. Protect from drying out. Take appropriate safety measures.

**Sand stockpile**

General: Before commencing stonework, stockpile sand sufficient for the whole of the works. Keep stockpiled sand dry.

Standard: To AS/NZS 2904.

**13.3 EXECUTION****13.3.1 GENERAL****Storing**

General: Protect masonry materials and components from ground moisture and contamination.

**Cutting**

General: Perform the necessary cutting and shaping of stone to designated profiles including weathering, jointing, chasing, forming grooves and drilling for handling and fixing. Work the bed, face and back joints of the stone square and true.

**Rate of construction**

General: Regulate the rate of construction to eliminate joint deformation, slumping or instability.

**Weather protection**

General: Cover the top surface of stonework to prevent the entry of rainwater.

**13.3.2 LAYING UNITS****Bedding**

General: Remove dust and foreign material from the bedding surfaces. If necessary adjust the moisture content of the stone units so that adverse effects, such as reduced bond, are kept within acceptable limits. Where possible, bed and joint the stone in one operation. Lay each stone on a full bed of mortar. Solidly fill vertical joints, joggles and cramps as the work proceeds. Point up joints around flashings as necessary.

**Stonework**

Bond: *Stretcher*

**13.3.3 JOINTING AND POINTING****General**

General: Carry out jointing and pointing simultaneously to form a homogeneous bed.

**Joints**

Size (mm): *10*

**13.3.4 COMPLETION****Cleaning**

Cleaning: Leave the stonework clean on completion.

**14 LANDSCAPE – FENCES AND BARRIERS****14.1 GENERAL****14.1.1 RESPONSIBILITIES****General**

Requirement: Provide fences and barrier systems, as documented.

**Performance**

Requirements:

- Complete for their function.
- Conforming to the detail and location drawings.
- Firmly fixed in position.

**14.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**14.1.3 SUBMISSIONS****Products and materials**

Requirement: Submit the manufacturer's standard drawings and details showing methods of construction, assembly and installation; with dimensions and tolerances.

**Warranties**

Requirements: Submit the manufacturer's published product warranties.

**14.1.4 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Set-out before construction.
- Foundation conditions after excavation.

**14.2 PRODUCTS****14.2.1 GENERAL****Storage and handling**

General: Deliver, unload and store components and accessories in unbroken manufacturer's packaging.

**14.2.2 STEEL****Steel tubes**

Posts, rails, stays and pickets: To AS/NZS 1163.

- Grade: C350L0.

Post and rail finish: Hot-dip galvanized.

**Fencing wire**

Chain wire, cable wire, tie wire and barbed wire: To AS 2423.

Coating: PVC

**14.2.3 CONCRETE****General**

Standard: To AS 1379.

Exposure classification: To AS 3600 Table 4.3.

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**14.3 EXECUTION**

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**14.3.1 CONSTRUCTION GENERALLY****Set-out**

General: Set out the fence line and mark the positions of posts, gates and bracing panels.

Property boundaries: Confirm by survey.

**Clearing**

Fence line: Except for trees or shrubs to be retained, clear vegetation within 1 m of the fence alignment. Grub out the stumps and roots of removed trees and shrubs, and trim the grass to ground level. Do not remove the topsoil.

**Excavation**

Posts: Excavate post holes so that they have vertical sides and a firm base. Spread surplus material on the principal's side of the fence.

**Concrete footings**

In ground: Place mass concrete around posts to protect posts from waterlogged conditions and finish with a weathered top falling 25 mm from the post to ground level.

On slabs: Provide welded and drilled post base flanges for fixing with masonry anchors to the concrete.

**Erection**

Line and level: Erect posts vertically. Set heights to follow the contours of natural ground, unless documented otherwise.

**14.3.2 GATES****Hardware**

General: Provide the following:

- Drop bolt and ferrule to each leaf of double gates.
- Latch to one leaf of double gates.
- Provision for locking by padlock.
- Hinges with smooth operation and adjustment for future sagging.

**Hand access**

Requirement: Where required, provide hand holes to give access from outside to reach locking provision.

**14.3.3 CHAIN LINK FABRIC FENCING****Netball and tennis court fencing**

General: As documented.

Standard: To AS 1725.2.

Design options:

- Type A: Top and bottom pipe rail. – to internal linkmesh partitions
- Type C: Bottom rail only – to exterior of courts.
- Type D: Rail-less with 5 cables – to interior fences dividing courts.

Gate frames: To AS 1725.2 Appendix D.

Bracing stays and backstays: To AS 1725.2 Appendix E.

Base plates: To AS 1725.1 Appendix F.

**14.3.4 COMPLETION****Cleaning**

Requirement: Remove excess debris, metal swarf and unused materials. Clean all visible metal surfaces with soft clean cloth or brush and clean water or approved cleanser, finishing with a clean cloth. Do not use abrasive or alkaline materials.

Powder coated aluminium architectural applications: Clean completed assembly to AS 3715 Appendix C.

Powder coated metal, other than aluminium, architectural applications: Clean completed assembly to AS 4506 Appendix D.

Protection: Remove protective coatings using methods required by the manufacturer after completion.

**Warranties**

Requirement: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the manufacturer and the installer.

**14.4 SELECTIONS****14.4.1 CHAIN LINK FABRIC FENCING****Netball and tennis court fencing**

<b>Properties</b>	<b>Netball and tennis fence</b>		
Location	Refer to the drawing - dashed line		
Fence type	C and D		
Chain link fabric service duty – clause 3.5.4 AS1725.2	Heavy duty		
Height (mm)	3600		
Selvedge	Knuckled top and bottom (KK)		
Application	Sports fence		
Chain link fabric colour	Green		
Wire thickness	3.15 (3.95 coated thickness)		
Fabric pitch (mm)	45		
Coating of steel frames including gates	Powdercoated		
Pipe class	Class 1 medium quality		

**15 LANDSCAPE – COMBINED****15.1 GENERAL****15.1.1 RESPONSIBILITIES****General**

Requirement: Provide landscaping, as documented.

**15.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**15.1.3 INTERPRETATION****Definitions**

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

- Imported topsoil: Similar to local natural soil, suitable for the establishment and ongoing viability of the selected vegetation, free of weed propagules and of contaminants, and classified by texture to AS 4419 Appendix K Table K1, as follows:
  - . Fine: Clay loam, fine sandy clay loam, sandy clay loam, silty loam, loam.
  - . Medium: Sandy loam, fine sandy loam.
  - . Coarse: Sand, loamy sand.
- Plant establishment period: The period between the date of practical completion and the end of the defects liability period.
- Site rock: Rocks selected for salvage.
- Site topsoil: Natural soil, excavated from the site, that contains organic matter, supports plant life, conforms generally to the fine-to-medium texture classification to AS 4419 and is free from the following:
  - . Stones more than 25 mm diameter.
  - . Clay lumps more than 50 mm diameter.
  - . Weeds and tree roots.
  - . Sticks and rubbish.
  - . Material toxic to plants.
- Soil blend: A landscape soil derived from the blending of two or more of sand, natural soil material or organic materials, and with a bulk density and organic matter content to meet site specific requirements.
- Top dressing: A soil which is suitable for surface application to turf and lawns.
- Topsoil: Includes landscape soil, low density soils and soils for turf and lawns.

**15.1.4 SUBMISSIONS****Subcontractors**

General: Submit names and contact details of proposed suppliers and evidence of the following, if appropriate:

- Experience in the required type of work.
- Production capacity for material of the required type, sizes and quantity.
- Lead times for delivery of materials to the site.

**15.1.5 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Subgrades cultivated or prepared for placing topsoil.
- Topsoil spread before planting.
- Grassing bed prepared before turfing, seeding, or temporary grassing.
- Grassing or turfing completed.

**15.2 PRODUCTS****15.2.1 TOPSOIL****Standard**

Site and imported topsoil: To AS 4419.

**Source**

General: If the topsoil of documented quality cannot be provided from material recovered from site, provide imported topsoil.

**Imported topsoil**

Requirement: Imported topsoil to AS 4419 Tables 1, 2 and 3, and as documented.

**Imported topsoil particle size table (% passing by mass)**

Sieve size (mm)	Soil textures		
	Fine	Medium	Coarse
2.36	100	100	100
1.18	90 – 100	90 – 100	90 – 100
0.60	75 – 100	75 – 100	70 – 90
0.30	57 – 90	55 – 85	30 – 46
0.15	45 – 70	38 – 55	10 – 22
0.075	35 – 55	25 – 35	5 – 10
0.002		2 – 15	2 – 8

**Imported topsoil nutrient level table**

Nutrient	Unit	Sufficiency range
Nitrate-N (NO <sub>3</sub> )	mg/kg	> 25
Phosphate-P (PO <sub>4</sub> ) – P tolerant	mg/kg	43 - 63
Phosphate-P (PO <sub>4</sub> ) – P sensitive	mg/kg	< 28
Phosphate-P (PO <sub>4</sub> ) – P very sensitive	mg/kg	< 6
Potassium (K)	mg/kg	178 - 388
Sulfate-S (SO <sub>4</sub> )	mg/kg	39 - 68
Calcium (Ca)	mg/kg	1200 - 2400
Magnesium (Mg)	mg/kg	134 - 289
Iron (Fe)	mg/kg	279 - 552
Manganese (Mn)	mg/kg	18 - 44
Zinc (Zn)	mg/kg	2.6 - 5.1
Copper (Cu)	mg/kg	4.5 - 6.3
Boron (B)	mg/kg	1.4 - 2.7

**Method References**

pH in H<sub>2</sub>O (1:5), pH in CaCl<sub>2</sub> (1:5) and Electrical Conductivity (EC) by Rayment & Higginson (1992) method 4A2, 4B2, 3A1.

Soluble Nitrate-N by APHA 4500.

Soluble Chloride by Rayment and Lyons 2011 modified method 5A2.

Extractable P by Mehlich 3 – ICP.

Exchangeable cations – Ca, Mg, K, Na by Mehlich 3 – ICP.

Extractable S by Mehlich 3 – ICP.

Extractable trace elements (Fe, Mn, Zn, Cu, B) by Mehlich 3 - ICP.

**Site topsoil**

Requirement: Site topsoil, as documented.

Soil blend: If required, stripped natural soil with sand and/or organic matter and recommended ameliorants.

### 15.2.2 GRASS

#### Turf

Description: Cultivated turf of even thickness, free from weeds and other foreign matter.

Supplier: A specialist grower of cultivated turf.

### 15.2.3 FERTILISER

#### General

Description: Proprietary fertilisers, delivered to the site in the manufacturer's labelled and unopened bags or containers.

Application rate: Vary the application rate to allow for the plant-available immediate fertiliser equivalence value of the soil conditioning compost.

### 15.2.4 IRRIGATION

#### General

Requirement: Provide automatically controlled, fixed irrigation systems, as documented.

Requirement: Provide automatically controlled, fixed irrigation systems, connected to existing irrigation system. Obtain details of the existing system from the Shire of Chittering and liaise with the Shire for any additional information required to provide a complete extension of the existing on site irrigation system to provide complete coverage of the new works. Sprinkler design and placement must provide effective coverage and overlap without overspray onto pavement and the building. Submit an irrigation design and obtain approval from the Superintendent prior to proceeding

- Pipework: rigid PVC with solvent joints.
- System type: fully automatic to lawn areas, provide protective sleeves to sprinklers in lawn areas.
- Sprinklers: Toro 570 series sprays and nozzles or similar approved.
- Control: connect the existing bore and control via a new automatic controller or controlled by an existing redundant station.
- Extent: all new lawn areas other than playing surfaces.

#### Irrigation controllers

Type: Automatic controllers that are easily programmed and include the following:

- Manual cycle and individual control valve operation.
- Manual on/off operation of irrigation without loss of program.
- $\geq 4$  on/off cycles per day.
- Day omit.
- 240 V input and 24 V output capable of operating 2 control valves simultaneously.
- $\geq 24$  hour battery program backup.
- Power surge protection.
- Mounted in a lockable cabinet of minimum IP 54 to AS 60529 in external locations.

#### Fittings

Type: Barbed fittings rated for the pressure class of the pipe, fastened with ratchet type clamps.

#### Valve boxes

Requirement: Provide the following in each valve box:

- Automatic control valve.
- Isolating valve.
- Filter:
  - . Micro-irrigation systems: 200  $\mu\text{m}$ .
  - . Drip irrigation systems: 100  $\mu\text{m}$ .
- Pressure-reducing valve with 170 kPa outlet pressure.

Construction: UV-resistant high impact plastic with high impact snap lock plastic cover and adequately sized for clear access.

## 15.3 EXECUTION

### 15.3.1 PREPARATION

#### Weed eradication

Herbicide: Eradicate weeds using environmentally acceptable methods, such as a non-residual glyphosate herbicide in any registered formulae, at the recommended maximum application rate.

Manual weeding: Regularly remove weed growth by hand throughout grassed, planted and mulched areas. Remove weed growth from an area of 750 mm diameter around the base of the trees in grassed areas. Continue weeding throughout the course of the works and during the planting establishment period.

#### Vegetative spoil

Disposal: Remove vegetative spoil from site. Do not burn.

### 15.3.2 TOPSOIL

#### Placing topsoil

Spreading: Spread the topsoil on the prepared subsoil and grade evenly, making allowances, if appropriate, for the following:

- Required finished levels and contours after light compaction.
- Grassed areas finished flush with adjacent hard surfaces such as kerbs, paths and mowing strips.

Steep batters: If using a chain drag for spreading, make sure there is no danger of batter disturbance.

Finishing: Feather edges into adjoining undisturbed ground.

#### Consolidation

General: Compact lightly and uniformly in 150 mm layers. Avoid differential subsidence and excess compaction and produce a finished topsoil surface which has the following characteristics:

- Finished to design levels.
- Smooth and free from stones or lumps of soil.
- Graded to drain freely, without ponding, to catchment points.
- Graded evenly into adjoining ground surfaces.
- Ready for planting.

#### Topsoil depths

General: Spread topsoil to the following typical depths:

- Excavated planting areas:
  - . For organic mulch: 225 mm.
  - . For gravel mulch: 250 mm.
- Irrigated grassed areas generally: 150 mm.
- Irrigated grassed areas, heavy use (e.g. playing fields, playgrounds and public parks): 200 mm.
- Non-irrigated grass areas: 100 mm.
- Earth mounds:
  - . Mass planted surfaces: 300 mm.
  - . Grassed surfaces: 100 mm.
- Top dressing: 10 mm.

#### Surplus topsoil

General: Spread surplus topsoil on designated areas on-site or dispose off-site.

**Designated areas: on site where directed by the Superintendent**

### 15.3.3 TURFING

#### Supply

Elapsed time: Deliver the turf within 24 hours of cutting, and lay within 36 hours of cutting. Prevent turf from drying out between cutting and laying. If not laid within 36 hours of cutting, roll turf out on a flat surface with the grass up, and water as required to maintain a healthy condition.

#### Application

Method: Lay the turf as follows:

- Stretcher bond pattern with the joints staggered and close butted.
- Parallel with the long sides of level areas, and with contours on slopes.

- Finish flush, after tamping, with adjacent finished surfaces of ground, paving edging, or grass seeded areas.

Laying: Close butt the end joints and space the turf strips 300 mm apart. Lay top dressing between the turf strips. Finish with an even surface.

Tamping: Lightly tamp to an even surface immediately after laying. Do not use a roller.

Stabilising on steep slopes: Peg the turf to prevent downslope movement. Remove the pegs when the turf is established.

### **Watering**

General: Water immediately after laying until the topsoil is moistened to its full depth. Maintain moisture to this depth.

### **Initial establishment**

General: Maintain turfed areas until there is a dense continuous sward of healthy grass over the whole turfed area, evenly green and of a consistent height.

Failed turf: Lift failed turf and replace with new turf.

Levels: If levels have deviated from the design levels after placing and watering, lift turf and regrade topsoil to achieve design levels.

Top dressing: Mow the established turf and remove cuttings. Lightly top dress to a depth of 10 mm. Rub the dressing into the joints and correct any unevenness in the turf surface.

## **15.3.4 IRRIGATION**

### **Valve box installation**

Requirement: Install with top of box flush with the surface.

Clearance: Allow 100 mm minimum clearance from filters and 50 mm min clearance from valves.

Base: Concrete plinth or crushed rock.

## **15.3.5 ESTABLISHMENT**

### **Grass surfaces**

Preparation: Remove litter and fallen branches before mowing.

Mowing:

- Grass height: Consistent with the growth habit of the grass variety and maintained at 25 mm to 40 mm throughout the year. Do not remove more than one-third of the grass height at any one time.
- Program: Weekly during the mowing season, November to March, and at fortnightly intervals from April to October. Do not mow during wet conditions. Carry out last mowing not more than 7 days before end of plant establishment period.
- Clippings: Remove grass clippings from the site after each mowing.
- Raking: Once every month before mowing during the mowing season, rake the grass with a flexible rake. On alternate mowings, adopt a north-south and east-west pattern.

Weeding: Remove unwanted broadleaf plants and grasses considered invasive to the locality.

- Program: Quarterly, and as required to maintain the general lawn condition.

Edge trimming: At the same time as mowing, trim lawn edges to plant beds, pathways, base of trees and other obstacles. Do not damage trees and shrubs.

Top dressing for established lawns: Weed-free imported sandy topsoil to a depth of 5 mm.

- Program: The spring following initial establishment.

Application of fertiliser: Apply lawn fertiliser at the completion of the first and last mowings of the plant establishment period, and at other times as required to maintain healthy grass cover.

## **15.3.6 COMPLETION**

### **Irrigation**

Requirement: On completion of the irrigation system, carry out the following:

- Flush system thoroughly. Check heads, sprays and drippers and clean if blocked.
- Clean strainers.
- Adjust for even distribution with no dry areas.

### **Cleaning**

Stakes and ties: Remove those no longer required at the end of the planting establishment period.

Temporary fences: Remove temporary protective fences at the end of the planting establishment period.

**15.4 SELECTIONS**

**15.4.1 TOPSOIL**

**Imported topsoil schedule**

Provide a layer of 100 thick Soils aint Soils screened topsoil to all new turfed areas

**15.4.2 GRASSING**

**Turfing schedule**

Location	Refer to the drawings		
Species or variety	Kikuyu		
Minimum thickness (mm)	25		
Roll size (mm)	Standard		

**16 PAVEMENT BASE AND SUBBASE****16.1 GENERAL****16.1.1 RESPONSIBILITIES****General**

Requirement: Provide base and subbase courses as documented.

**Performance**

Surface level: Provide a finished surface level which is free draining and evenly graded between level points.

**16.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**16.1.3 INTERPRETATION****Definitions**

General: For the purposes of this worksection, the following definitions apply:

- Base: One or more layers of material, forming the uppermost structural element of a pavement and on which the surfacing may be placed.
- Subbase: Material laid on the subgrade below the base either for the purpose of making up additional pavement thickness required, to prevent intrusion of the subgrade into the base, or to provide a working platform.

**16.1.4 TOLERANCES****Surface level**

Subbase: + 10 mm, - 25 mm.

Base: + 10 mm, - 5 mm.

Base abutting gutters:  $\pm 5$  mm from the level of the lip of the gutter, minus the design thickness of the wearing course.

**Surface deviation**

Base:  $\leq 5$  mm from a 3 m straightedge laid on the surface.

**16.1.5 SUBMISSIONS****Execution details**

General: Submit details of the proposed work methods and equipment for each pathway and roadworks operation, including the following:

- Staging of the work, access and traffic control methods.
- Disposal of surface water, control of erosion, contamination and sedimentation of the site, surrounding areas and drainage systems.

Compaction: If a layer is proposed to exceed 200 mm in thickness, submit evidence that the proposed compaction equipment can achieve the required density throughout the layer.

**Products and materials**

Source of material: Submit the supplier name, material type (crushed rock, natural gravel, recycled concrete aggregate) and source quarry or recycling site.

Conformance: Submit type test results for each material listed in the **Base material properties and test methods table** and **Subbase material properties and test methods table** from an Accredited Testing Laboratory as evidence of material conformance.

Alternative materials: If proposed, submit type test results for the relevant properties listed in the **Base material properties and test methods table** and **Subbase material properties and test methods table** from an Accredited Testing Laboratory as evidence of material conformance.

**Tests**

Compaction tests: Submit results of compaction testing to **TESTING, Site tests**.

**16.1.6 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Prepared subgrade.
- Proof rolling of subbase before spreading of base.
- Proof rolling of base before sealing.

**16.2 PRODUCTS****16.2.1 BASE AND SUBBASE MATERIAL****Granular material**

Requirement: Provide unbound granular materials, including blends of two or more different materials, which when compacted develop structural stability and are uniform in grading and physical characteristics.

**Crushed rock**

Requirement: Provide crushed rock as follows:

- Base: 20 mm nominal.
- Subbase: 40 mm nominal.

**Recycled materials**

Requirement: Provide recycled materials as follows:

- Base and subbase: Conform to the **Limits on use of recycled and manufactured materials as constituent materials table** and the **Undesirable material properties table**.

**Natural gravel**

Requirement: Provide unbound natural gravel materials as follows:

- Base: 20 mm nominal.
- Subbase: 40 mm nominal.

**Subbase material properties and test methods table**

Property and test method	Differentiating criteria	Material requirements	
		Crushed rock	Natural gravel
Particle size distribution or grading (% passing through sieve) to AS 1289.3.6.1	<b>Sieve size (mm)</b>	—	—
	53.0	100	100
	37.5	90 - 100	95 - 100
	26.5	74 - 96	80 - 97
	19.0	62 - 86	—
	13.2	—	—
	9.5	42 - 66	48 - 85
	4.75	28 - 50	35 - 73
	2.36	20 - 39	25 - 58
	0.425	8 - 21	10 - 33
0.075	3 - 11	3 - 21	
Liquid limit ( $w_L$ ) to AS 1289.3.1.1	—	max 25%	max 25%
Plasticity index ( $I_p$ ) to AS 1289.3.3.1	—	max 12%	max 12%
Linear shrinkage ( $LS$ ) to AS 1289.3.4.1	<b>Rainfall</b>	—	—
	Areas with annual rainfall > 500 mm	max 4.5%	max 4.5%
	Areas with annual rainfall < 500 mm	max 6.0%	max 6.0%
Maximum dry compressive strength on fraction passing	—	min 1.0 MPa	min 1.0 MPa

Property and test method	Differentiating criteria	Material requirements	
		Crushed rock	Natural gravel
19 mm sieve (only applies if plasticity index is less than 1) to AS 1141.52			
Particle shape by proportional calliper - % misshapen (2:1) to AS 1141.14	—	max 35%	—
Aggregate wet strength* to AS 1141.22	—	min 50 kN	—
Wet/dry strength variation* (dry - wet)/dry to AS 1141.22	—	max 40%	—
Los Angeles value to AS 1141.23	—	max 40%	—
4 day soaked CBR (98% modified compaction) to AS 1289.6.1.1	—	min 30%	min 30%

\*Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 to 9.5 mm. For blended materials, also test the fraction 9.5 to 4.75 mm. Test any other fraction where there is risk of failing.

#### Limits on use of recycled and manufactured materials as constituent materials table

Recycled material	Unbound or modified base and subbase	Bound base and subbase
Iron and steel slag	100%	100%
Crushed concrete*	100%	100%
Brick	20%	10%
RAP	40%	40%
Fly ash**	10%	10%
Furnace bottom ash	10%	10%
Crushed glass fines	10%	10%

Notes:

\* For pavements using high percentages of crushed concrete, take into account the amount of available cement which will rehydrate when subjected to moisture to create rigid or semi-rigid pavement and result in subsequent shrinkage cracking.

\*\* For pavements using fly ash, take into account the possibility of hydration and binding when subject to moisture to create rigid or semi-rigid pavement and result in subsequent shrinkage cracking.

#### Undesirable material properties table

Property and test method	Differentiating criteria	Material requirements		
		Crushed rock	Recycled material	Natural gravel
Undesirable constituent materials (% retained on a 4.75 mm sieve) to RMS T276	<b>Material type</b>	—	—	—
	Type I - Metal, glass, stone, ceramics and slag	—	max 2.0 %	—
	Type II - Plaster, clay lumps and other friable material	—	max 0.5%	—
	Type III - Rubber, plastic, paper, cloth, paint, wood and other vegetable matter	—	max 0.1%	—

Base material properties and test methods table

Property and test method	Differentiating criteria	Material requirements		
		Crushed rock	Recycled material	Natural gravel
Particle size distribution or grading (% passing through sieve) AS 1289.3.6.1	<b>Sieve size (mm)</b>	—	—	—
	26.5	100	100	100
	19.0	95 - 100	95 - 100	93 - 100
	13.2	77 - 93	78 - 92	—
	9.5	63 - 83	63 - 83	71 - 87
	4.75	44 - 64	44 - 64	47 - 70
	2.36	29 - 49	30 - 48	35 - 56
	0.425	13 - 23	13 - 21	14 - 32
	0.075	5 - 11	5 - 9	6 - 20
Liquid limit ( $w_L$ ) to AS 1289.3.1.1	—	max 25%	max 30%	max 25%
Plasticity index ( $I_p$ ) to AS 1289.3.3.1	<b>Rainfall</b>	—	—	—
	All areas	—	—	—
	Areas with annual rainfall > 500 mm	max 6%	max 6%	max 6%
	Areas with annual rainfall < 500 mm	max 10%	max 10%	max 10%
Linear shrinkage ( $LS$ ) to AS 1289.3.4.1	<b>Rainfall</b>	—	—	—
	All areas	—	—	—
	Areas with annual rainfall > 500 mm	max 2.0%	max 2.0%	max 2.0%
	Areas with annual rainfall < 500 mm	max 4.0%	max 4.0%	max 4.0%
For materials with plasticity index less than 1: Maximum dry compressive strength to AS 1141.52	—	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa
Particle shape by proportional caliper (% misshapen for 2:1 caliper ratio) to AS 1141.14	—	max 35%	max 35%	—
Aggregate wet strength* to AS 1141.22	—	min 80 kN	min 80 kN	—
Wet/dry strength variation* to AS 1141.22	—	max 35%	max 35%	—
Los Angeles value (% loss or abrasion) to AS 1141.23	—	max 35%	max 40%	—
CBR (98% modified compaction) to AS 1289.6.1.1	—	min 80%	min 80%	min 80%
Unconfined compressive strength to AS 5101.4	—	max 1.0 MPa	max 1.0 MPa	—
NOTES: *Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 to 9.5 mm. For blended materials, also test the fraction 9.5 to 4.75 mm. Test any other fraction where there is risk of failing.				

**Tests**

Material property testing: Conform to the **Base material properties and test methods table** and the **Subbase material properties and test methods table**.

Frequency of material property tests: Not less than the following:

- Particle size distribution: 1 per 1000 t (or part of).
- Liquid limit: 1 per 1000 t (or part of).
- Plasticity index: 1 per 1000 t (or part of).
- Linear shrinkage: 1 per 1000 t (or part of).
- Foreign materials content: 1 per 1000 t (or part of).
- Maximum dry compressive strength: 1 per 5000 t (or part of).
- Particle shape: 1 per 1000 t (or part of).
- Los Angeles value: 1 per 1000 t (or part of).
- Aggregate wet strength: 1 per 5000 t (or part of).
- Wet/dry strength variation: 1 per 5000 t (or part of).

**16.3 EXECUTION****16.3.1 SUBGRADE PREPARATION****General**

Requirement: Prepare the subgrade to *Earthwork*.

**16.3.2 PLACING BASE AND SUBBASE****General**

Weak surfaces: Do not place material on a surface that is weakened by moisture and is unable to support, without damage, the construction plant required to perform the works.

Spreading: Spread material in uniform layers without segregation.

Moisture content: Maintain wet mixed materials at the required moisture content before and during spreading. Add water to dry mixed materials through fine sprays to the entire surface of the layer after spreading, to bring the material to the required moisture content.

Compacted layer thickness: 200 mm maximum and 100 mm minimum. Provide layers of equal thickness in multilayer courses.

**Joints**

General: Plan spreading and delivery to minimise the number of joints. Offset joints in successive layers by a minimum of 300 mm.

Start of shift: Remix last 2 m of previous days' work for continuity of compaction.

**Final trimming**

General: Trim and grade the base course to produce a tight even surface with no loose stones or slurry of fines.

**16.3.3 BASE AND SUBBASE COMPACTION****General**

Construction operation: Compact each layer of fill to the required depth and density, as a systematic construction operation.

Unstable areas: If unstable areas develop during rolling or are identified by proof rolling, open up, dry back and recompact, to the requirements of this worksection. If dry back is not possible, remove for the full depth of layer, dispose of and replace with fresh material.

**Minimum relative compaction table**

Item description	Minimum dry density ratio (modified compaction) to AS 1289.5.2.1
Subbase	95%
Base	98%

**Compaction requirements**

General: Apply uniform compactive effort over the whole area to be compacted, until the required density is achieved or until failure is acknowledged. If failure is acknowledged, conform to

**Rectification.**

Equipment: Use rollers appropriate to the materials and compaction requirements documented.

**Moisture content**

General: During spreading and compaction, maintain material moisture content within the range of -2% to +1% from the optimum moisture content (modified compaction).

Spraying: Use water spraying equipment to distribute water uniformly, in controlled quantities, over uniform lane widths.

Dry back: Allow materials to dry to 60 to 80% of the optimum moisture content before applying the seal or wearing course.

**Rectification**

General: If a section of the pavement material fails to meet the required density or moisture content after compaction, remove the non-conforming material, dispose of off-site or rectify for re-use, replace with fresh material, re-compact and test.

**Level corrections**

General: Rectify incorrect levels as follows:

- High areas: If the area can be rectified by further trimming to produce a uniform, hard surface by cutting without filling, trim so that the rectified area conforms to **TOLERANCES**.
- Low areas and high areas not rectifiable by further trimming: Remove layers to a minimum depth of 75 mm and replace with new material and re-compact.

**16.3.4 TESTING****Site tests**

Compaction control tests: To AS 1289.5.4.1 and AS 1289.5.4.2.

Frequency of compaction control tests: Not less than the following (whichever requires the most tests):

- 1 test per layer per 100 lineal metres for two-lane roads.
- 1 test per layer per 2000 m<sup>2</sup> for carparks.
- 3 tests per layer.
- 3 tests per visit.

**17 CONCRETE PAVEMENT****17.1 GENERAL****17.1.1 RESPONSIBILITIES****General**

Requirement: Provide concrete pavement as documented.

**17.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**17.1.3 STANDARDS****Concrete**

Specification and supply: To AS 1379.

Materials and construction: To AS 3600.

Residential pavements: To AS 3727.1.

**Slip resistance**

Classification: To AS 4586.

**17.1.4 INTERPRETATION****Definitions**

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

- Ambient temperature: The air temperature at the time of mixing and placing of concrete.
- Concrete class – normal: Concrete that is specified primarily by a standard compressive strength grade up to 50 MPa and otherwise in conformance with AS 1379 clause 1.5.3.
- Concrete class – special: Concrete that is specified to have certain properties or characteristics different from, or additional to, those of normal-class concrete and otherwise in conformance with AS 1379 clause 1.5.4.
- Weather – cold: Ambient shade temperature less than 10°C.
- Weather – hot: Ambient shade temperature greater than 30°C.

**17.1.5 TOLERANCES****General**

Surface abutting gutters:  $\pm 5$  mm from the level of the gutter edge.

Rigid pavement surface:

- From design level: + 10 mm, - 0 mm.
- From a 3 m straightedge placed anywhere on surface: 5 mm.

Horizontal position of outer concrete edge: 30 mm from documented position.

Joint locations in plan : 10 mm from documented position.

**17.1.6 SUBMISSIONS****Certification**

Test certificates and records: Submit test certificates and also retain results on site.

Compliance certificate: If product testing is not proposed, submit a manufacturer's certificate together with results of recent tests undertaken by the manufacturer, showing compliance with test criteria.

**Execution details**

Concrete: Submit proposals for mixing, placing, finishing and curing concrete including the following:

- Addition of water on site.
- Changes to the concrete mix.
- Temperature control, curing and protection methods.
- Cutting or displacing reinforcement.
- Handling, placing, compaction and finishing methods and equipment, including pumping.
- Sequence, size and times of concrete pours, and construction joint locations and relocations.

Cores, fixings and embedded items: If required, submit shop drawings showing the proposed locations, clearances and cover, and indicate any proposed repositioning of reinforcement.

Cutting or coring: If cutting or coring of hardened concrete is proposed, provide details.

Sawn joints: Submit proposed methods, timing and sequence of sawing joints.

Damaged galvanizing: If repair is required, submit proposals to AS/NZS 4680 Section 8.

Splicing: If undocumented splicing is proposed, submit details.

Welding: If welding of reinforcement is proposed, provide details and give notice before welding reinforcement.

Joint sealants: Submit proposals for installation methods and sealant performance.

Crack assessment: If unplanned cracks occur in the finished pavement, submit proposals for investigation.

Surface repair method: If required, submit details of the proposed method before commencing repairs.

Trial section: Submit proposal for trial pavement.

### Products and materials

Aggregates: Nominate the source for all aggregates.

Reinforcement: Submit the manufacturer's certificate of compliance with AS/NZS 4671, or submit test certificates from an Accredited Testing Laboratory.

Liquid curing compounds: Submit certified test results, including the application rate and the efficiency index to AS 3799 Appendix B.

Curing by covering: Submit details of the proposed covering material.

Repair materials: Submit proposals for epoxy resin/grout and elastomeric sealant.

Concrete: Submit the concrete supply delivery dockets.

Trial mix design report: Six weeks before commencing production, submit a report for each mix design containing the information required in AS 1012.2, the individual and combined aggregate particle size distribution, and the records and reports for the tests.

### Subcontractors

Pre-mixed supply: Submit names and contact details of proposed pre-mixed concrete suppliers, and alternative source of supply in the event of breakdown of pre-mixed or site mixed supply.

### Tests

Site tests: Submit results, as follows:

- Slip resistance test of completed installations.

## 17.1.7 INSPECTION

### Notice

Inspection: Give notice so that inspection may be made of the following:

- Base or subgrade before covering.
- Membrane or film underlay installed on the base or subgrade.
- Concrete formwork, reinforcement and dowels in position.
- Commencement of concrete placing.
- Completion of concrete placing.
- Evaluation of surface finish.

## 17.2 PRODUCTS

### 17.2.1 REINFORCEMENT

#### Steel reinforcement

Standard: To AS/NZS 4671.

**Reinforcement: SL62 mesh (top) with 30 cover**

Surface condition: Free of loose mill scale, rust, oil, grease, mud or other material that may reduce the bond between the reinforcement and concrete.

#### Protective coatings

Requirement: For concrete containing protective coated reinforcement, provide the same coating type to all reinforcement and embedded ferrous metal items, including tie wires, stools, spacers, stirrups, plates and ferrules.

Epoxy coating: Provide high build, high solids chemically resistant coating to AS/NZS 3750.14.

- Thickness: 200 µm minimum.

Galvanizing: To AS/NZS 4680, as follows:

- Sequence: If fabricating after galvanizing, repair damaged galvanizing and coat cut ends.
- Zinc-coating (minimum): 600 g/m<sup>2</sup>.

#### **Fibre reinforcement**

Steel fibres: To AS 3600 clause 16.7.1.

Steel fibre content: 45 to 75 kg/m<sup>3</sup> and the steel fibre manufacturer's recommendations.

Synthetic fibres: To EN 14889-2.

#### **Accessories**

Reinforcement supports: To AS/NZS 2425.

Tie wire: Galvanized annealed steel 1.25 mm diameter minimum.

#### **Dowels**

General: Provide each dowel in one piece, straight, cut accurately to length with ends square and free from burrs.

Standard: To AS/NZS 4671.

Grade: 250R steel bars 450 mm long.

#### **Tie bars**

Type: Deformed bar, 12 mm diameter, grade 500N, 1 m long.

### **17.2.2 AGGREGATE**

#### **Characteristics**

Standards: AS 2758.1.

Durability: Tested to AS 1141.22:

- Wet strength not less than 80 kN.
- 10% Fines Wet/Dry Variation not to exceed 35%.

Recycled concrete aggregate (RCA): If blending coarse RCA with natural aggregates, make sure substitution rates are below 30%.

### **17.2.3 CEMENT**

#### **General**

Standard: To AS 3972.

Type: Portland

Moisture: Protect from moisture until used. Do not use caked or lumpy cement.

Age: Less than 6 months old.

Storage: Store cement bags under cover and above ground.

#### **Supplementary cementitious materials**

Fly ash: To AS/NZS 3582.1.

Slag: To AS 3582.2.

Amorphous silica: To AS/NZS 3582.3.

### **17.2.4 WATER**

#### **General**

Quality: Drinking water free from materials harmful to concrete or reinforcement, and not salty or brackish.

Limits: Not containing more than:

- 600 parts per million of chloride ion, tested to AS 3583.13.
- 400 parts per million of sulfate ion, tested to AS 1289.4.2.1.

### **17.2.5 ADMIXTURES**

#### **General**

Standard: Chemical admixtures to AS 1478.1, used to the manufacturer's recommendations.

Quality: Free from calcium chloride, calcium formate, or triethanolamine or any other accelerator. Do not use admixtures or combinations of admixtures without prior written approval.

Dosage: Vary the dosage of chemical admixture to account for factors such as air temperature, setting time and cement content to the manufacturer's recommendations.

#### Types of admixtures

Air entraining agent: Adjust mix for workability allowing up to 5% air entrainment.

Warm season retarder: During the warm season, (October to March inclusive), use a lignin or lignin-based (ligpol) set-retarding admixture (Type Re or Type WRRe) if required to control slump within the limits stated in Concrete mix, properties.

Cool season accelerator: During the cool season, (April to September inclusive), use only a lignin or lignin based set-retarding admixture, if required, containing not more than 6% reducing sugars (Type Ac or Type WRAc to AS 1478.1).

### 17.2.6 CURING COMPOUNDS

#### General

Curing compounds: To AS 3799 and AS 1160, Type 2.

Sheet material covering: To ASTM C171, white opaque or clear polyethylene film, or white burlap-polyethylene sheet, or equivalent material.

### 17.2.7 OTHER MATERIALS

#### Tactile ground surface indicators

Standard: To AS/NZS 1428.4.1.

## 17.3 EXECUTION

### 17.3.1 GENERAL

#### Traffic control

Traffic restriction: Do not allow traffic or construction plant other than that associated with testing, sawcutting, cleaning or joint sealing on pavement for minimum 10 days after placing, or when the concrete has reached a compressive strength of at least 20 MPa, and joints have been completely sealed.

### 17.3.2 SUBGRADE

#### Preparation

Conformance: Prepare subgrade to *Earthwork*.

Extent: Prepare a uniform subgrade for the full pavement formation, extending at least to the back of kerbs or at least 300 mm beyond each side of the carriageway if kerbs are not proposed.

Reinstatement: Make sure of uniformity for backfilling of any utility trenches.

### 17.3.3 SUBBASE

#### Thickness

Subbase thickness: 100 minimum

#### Width

Subbase width: Extend the subbase at its full depth to at least the back of kerbs or other edge stops before their installation.

No integral kerbs: Extend granular unbound subbase at least 300 mm beyond each side of the carriageway.

#### Tolerance

Subbase finished surface level: + 0 mm, - 10 mm.

#### Placement

Bound and unbound subbase materials and placement: To *Pavement base and subbase*.

#### Friction reduction

Requirement: Provide 200 µm thick polyethylene sheeting with 200 mm taped minimum laps and/or a 20 mm thick layer of sand (silt and clay material less than 5%) directly beneath the concrete pavement.

**17.3.4 TRIAL PAVEMENT****General**

Requirement: Provide a trial section of pavement to demonstrate that the proposed method of placement produces a conforming pavement. Remove test sections that do not comply with requirements.

Minimum area of test section: a full panel from joint to joint

Location: as agreed with the Superintendent

**17.3.5 CONCRETE MIX****Standard**

Concrete mix and supply: To AS 3600 clause 17.1 and AS 1379.

**Properties**

Concrete pavement thickness: 100 minimum

Concrete pavement strength: 25 mpa

Slump: Maximum 100 mm.

Drying shrinkage: Maximum 450 µε after 21 days of air drying.

**Special class concrete additional properties**

Colour: CON 02 - Concrete Colour Systems – Limestone

Colour: CON 01- Light Grey

**Elapsed delivery time**

General: Make sure that the elapsed time between the wetting of the mix and the discharge of the mix at the site is in conformance with the **Elapsed delivery time table**. Do not discharge at ambient temperature below 10°C or above 30°C unless approved heating or cooling measures are taken to deliver concrete within the range 5°C to 35°C.

**Elapsed delivery time table**

Concrete temperature at time of discharge (°C)	Maximum elapsed time (minutes)
5 – 24	120
24 – 27	90
27 – 30	60
30 – 35	45

**Site mixed supply**

Emergencies: If mixing by hand, provide details.

Plant: Mix concrete in a plant located on the construction site.

**Pre-mixed supply**

Addition of water: Do not add water.

Transport: Make sure the mode of transport prevents segregation, loss of material and contamination of the environment, and does not adversely affect placing or compaction.

Concrete delivery docket: For each batch, provide a docket listing the information required by AS 1379 clause 1.7.3, and the following information:

- Any binders or additives.
- Method of placement and climate conditions.
- Name of concrete delivery supervisor.
- The concrete element or part of the works for which the concrete was ordered, and where it was placed.

**17.3.6 TESTING****Standards**

Sampling, identification, testing and recording: To the AS 1012 series.

Specimens: Sample the concrete on-site, at the point of discharge from the agitator.

Type and frequency: To AS 1379.

Testing authority: Concrete supplier or Accredited Testing Laboratory.

**Concrete testing methods**

Slump: To AS 1379 clause 5.2.

Compressive strength: Test to AS 1012.8.1 and AS 1012.9.

Drying shrinkage: Test to AS 1012.8.4 and AS 1012.13.

Flexural strength: Test to AS 1012.8.2 and AS 1012.11.

Acceptance criterion for strength: The average strength of any set of 3 consecutive project samples must be equal to or greater than the specified minimum value.

Sampling frequency: Provide a minimum of one sample from each 50 m<sup>3</sup> of concrete.

### 17.3.7 INSTALLATION

#### Junctions with existing pavements

Trimming: If new pavement is to be joined to an existing pavement, trim the edge of the existing pavement to create a neat vertical edge for its full depth before placing new pavement material.

#### Fixed formwork

Description:

- Steel forms.
- Seasoned, dressed timber planks, free of warps, bends or kinks.

Depth: Equal to the edge thickness of the slab and in one piece.

Tolerances on position:

- Level of top of form: - 0 mm, + 10 mm from pavement surface design level.
- Horizontal tolerance: 10 mm (maximum departure from a plane surface).
- Verticality: 3 mm departure from vertical.

Staking: Stake forms in position using at least 3 steel stakes per form, not more than 1.5 m apart. Lock joints between form sections to prevent movement.

Release agent: Before placing reinforcement, apply a release agent compatible with the contact surfaces, to the interior of the formwork, except where the concrete is to receive an applied finish for which there is no compatible release agent.

Re-use: Clean and recoat the forms each time before placing concrete.

Keyways: Form the keyways of keyed construction joints using steel or timber form strips accurately located at the mid-depth of the slab and securely fastened flush against the formwork face.

#### Reinforcement

Tolerances in fabrication and fixing: To AS 3600.

Locate reinforcement: Place reinforcement in the top half of the pavement.

Minimum cover to reinforcement: 30 mm.

Splicing mesh: Overlap a minimum of 2 crosswires.

Supports: Provide reinforcement supports as follows:

- Able to withstand construction and traffic loads and maintain the concrete cover, as documented.
- With a protective coating if they are ferrous metal extending to the surface of the concrete.
- Use plastic or concrete supports with galvanized or zinc-coated reinforcement.
- Spacing:
  - . Bars:  $\leq 60$  diameters.
  - . Mesh:  $\leq 600$  mm.
- Supports over membranes: Prevent damage to waterproofing membranes or vapour barriers. If appropriate, place a metal or plastic plate under each support.

Projecting reinforcement: If starter or other bars extend beyond reinforcement mats or cages, through formwork or from cast concrete, provide a plastic protective cap to each bar until it is cast into later work.

Tying: Secure the reinforcement against displacement at intersections with either wire ties, or clips. Bend the ends of wire ties away from nearby faces of formwork or unformed faces to prevent the ties projecting into the concrete cover.

Mats: For bar reinforcement in the form of a mat, secure each bar at alternate intersections.

#### Cores, fixings and embedded items

Position: Fix cores and embedded items to prevent movement during concrete placing. In locating cores, fixings and embedded items, displace but do not cut reinforcement, and maintain cover to reinforcement.

Isolation: Isolate embedded items to prevent water tracking to concrete providing minimum cover to reinforcement.

### 17.3.8 CONCRETE PLACING AND COMPACTION

#### Concrete placing

General: Place concrete uniformly over the width of the slab or lane and so that the face is generally vertical and normal to the direction of placement. Hand spread concrete using shovels, not rakes.

Ponding: Remove any water ponding on the base or subbase before starting placement.

Placing sequence: Commence from one corner (usually the lowest point) and proceed continuously out from that point.

Weather: Do not place concrete in ambient temperatures above 30°C or below 10°C, without adequate precautions.

#### Compaction

Thickness 100 mm or less: Compact by placing, screeding and finishing processes. If required use a hand-held vibrating screed at the surface. Do not use immersion vibrators.

Thickness more than 100 mm and downturns: Use an immersion vibrator.

#### Placing records

Log book: Keep on site and make available for inspection a log book recording each placement of concrete, including the following:

- Date.
- Specified grade and source of concrete.
- Slump measurements.
- The portion of work.
- Volume placed.

#### Rain

Protection: During placement and before setting, protect surface from damage.

#### Concrete placing in cold weather

Cement: Do not use high alumina cement.

Temperature limits: Maintain the following:

- Freshly mixed concrete:  $\geq 5^{\circ}\text{C}$ .
- Formwork and reinforcement before and during placing:  $\geq 5^{\circ}\text{C}$ .
- Water: Maximum 60°C when placed in the mixer.

High early strength cement: If deteriorating weather conditions are predicted, use high early strength cement.

Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary so that the temperature of the placed concrete is  $\geq 5^{\circ}\text{C}$ .

Admixtures: Do not use calcium chloride, salts, chemicals or other material in the mix to lower the freezing point of the concrete.

Frozen materials: Do not allow frozen materials or materials containing ice to enter the mixer, and keep free of frost and ice any formwork, materials, and equipment coming in contact with the concrete.

Placed concrete: Prevent from freezing, without using salts or chemicals.

#### Concrete placing in hot weather

Handling: Prevent premature stiffening of the fresh mix and reduce water absorption and evaporation losses.

Hot weather placing: Maintain concrete at a temperature  $\leq 35^{\circ}\text{C}$ .

Formwork and reinforcement: Before and during placing maintain temperature  $\leq 35^{\circ}\text{C}$ .

Severe weather: If ambient shade temperature more than 38°C, do not mix concrete.

Temperature control: Select one or more of the following methods of maintaining the specified temperature of the placed concrete:

- Cool the concrete using liquid nitrogen injection before placing.
- Cover the container in which the concrete is transported to the forms.
- Spray the coarse aggregate using cold water before mixing.
- Use chilled mixing water or ice.

Evaporation control barriers: Erect barriers to protect freshly placed concrete from drying winds.

### 17.3.9 CONCRETE FINISH

#### General

Commencement: Immediately after placement, spreading and compaction of the concrete, start initial finishing procedures to achieve the documented finish.

Final finishing: Do not commence final finishing until all bleed water has evaporated from the surface after initial finishing procedures.

#### Unformed surfaces

General: Strike off, screed and level slab surfaces to finished levels, to the tolerance class and finish documented.

#### Formed surfaces

Damage: Do not damage concrete works through premature removal of formwork.

Curing: If forms are stripped when concrete is at an age less than the minimum curing period, commence curing exposed faces as soon as the stripping is completed.

#### Finishing methods - primary finish

Steel trowel finish:

- After levelling, consolidate the surface using a steel hand float.
- Cut and fill and refloat immediately to a uniform, smooth, granular texture.

Wood float finish: After machine floating use wood or plastic hand floats to produce the final consolidated finish free of float marks and uniform in texture and appearance.

#### Finishing methods - supplementary finish

Exposed aggregate finish - Washed: While the concrete is green, wet the surface and scrub with stiff fibre or wire brushes, flushing continuously with clean water, until the aggregate is uniformly exposed. Do not use acid etching. Rinse the surface with water.

#### Surface repairs

Method: If surface repairs are required, detail proposals.

### 17.3.10 CONCRETE CURING

#### General

Curing: Commence curing as soon as possible after finishing, when the concrete has set sufficiently not to be damaged by the curing process, and extend for a minimum period of 7 days.

End of curing period: Prevent rapid drying out at the end of the curing period.

Protection: Maintain at a reasonably constant temperature with minimum moisture loss, during the curing period.

#### Cold weather curing

General: Maintain concrete surface temperatures above 5°C for the duration of the curing period.

#### Hot weather curing

Requirement: If the concrete temperature exceeds 25°C, or the ambient shade temperature exceeds 30°C, protect from drying winds and sun by using an evaporative retarder until curing is commenced.

#### Curing methods

Covering sheet method: Cover concrete using damp hessian or cotton mats overlapped at least 150 mm and anchored against displacement by wind or other interference. Keep the mats continuously damp until covered by the covering sheet material. Repair tears immediately.

Moist curing method: Keep the concrete surface continuously damp by ponding or spraying constantly with water, fog, or mist, using suitable spraying equipment. Continue wetting for the curing period.

Curing compound: Provide a uniform continuous flexible coating to AS 3799, without visible breaks or pinholes. Make sure coating remains unbroken at least for the required curing period after application. Respray defective areas within 30 minutes. Respray within 3 hours after heavy rain.

Self-levelling toppings: If used also as curing compounds, conform to AS 3799.

Coloured concrete: Do not cure with plastic sheeting, damp sand or wet hessian. Use only chemical curing compounds compatible with the sealer or a sealer to the manufacturer's recommendations.

### 17.3.11 JOINTS

#### General

Requirement: Construct expansion, contraction and construction joints straight and plumb. Make transverse joints normal to longitudinal joints. Extend transverse expansion and contraction joints continuously from edge to edge of the pavement through interconnected slabs.

Joint layout: Install joints as documented.

Joint spacings: Refer to the drawings

### Contraction joints

Installation: Construct transverse and longitudinal contraction joints by early power sawing at an appropriate time, tooling or by placing an insert in the fresh concrete.

### Dowelled joints

Requirement: Place dowels as documented, orthogonal to the joint direction and parallel to the pavement surface, accurate alignment is critical.

Dowel assembly: Use a dowel-assembly support frame firmly secured to the subbase during concrete placement. Prevent the dowel assembly support frame from passing through the joint. Do not insert dowels during the placement of concrete.

Debond dowel: Provide a proprietary sleeve or coat with a debonding coating to 0.5 length + 25 mm. Embed the unsleeved or unpainted half of the dowels in the slab placed first.

Dowelled expansion joints: Cap dowels at one end with a compressible material.

Movement: Do not distort or displace beyond the alignment tolerances under testing or during construction. Do not remove and replace dowels in preformed holes.

Dowel tolerances:

- Alignment: 1:150.
- Location:  $\pm$  half the diameter of the dowel.

### Tie bar joints

Longitudinal contraction joints: Place tie bars at 800 mm centres. Alignment accuracy of tie bars is not critical.

### Construction joints

Installation: Place header board on the subbase or subgrade at right angles to the pavement centre line.

Planned location: Terminate each day's placing operation at a transverse construction joint located to coincide with a planned contraction or expansion joint.

Unplanned joints: If placement is interrupted for 30 minutes or longer, form a tied transverse construction joint within the middle third of the distance between planned joints but no closer than 1.5 m to the nearest planned joint. If necessary remove placed concrete back to the required location.

### Expansion joints

Joint filling: Fill with jointing materials as documented. Finish visible jointing material neatly flush with adjoining surfaces.

Jointing materials: Provide jointing materials compatible with each other, and non-staining to concrete in visible locations.

Foamed materials (in compressible fillers): Closed-cell or impregnated, with tear off strip, not water absorbing.

### Isolation joints

Requirement: Provide formed full depth joints around structures and features which project through, into or against the pavement, and elsewhere as required.

### Formed joints

Full depth joints: Form the edge of the concrete placed first to provide a smooth, vertical face. After stripping and cleaning fix the joint filler with a suitable waterproof adhesive to the face of the slab, and place the adjoining concrete after the adhesive has set.

Weakened plane joint: Cut a crack-inducing groove by using a suitable tool into the plastic concrete during finishing of the concrete surface. Compact and refinish the plastic concrete around the groove after forming the joint.

Rebated groove joints: Form the rebate by securely fixing removable steel or timber form strips to the form or forms on the slab which is placed first, so that the top of the strip is flush with the top of the form. After stripping and cleaning, fix the joint filler in the rebate after placing the adjoining concrete.

### Sawn joints

Weakened plane joint: Saw the hardened concrete to depth at least  $\frac{1}{4}$  to  $\frac{1}{3}$  of the pavement thickness and to a uniform width in the range of 3 to 5 mm as follows:

- Timing: Commence sawing, regardless of time or weather conditions, as soon as the concrete has hardened sufficiently to permit cutting with only minor raveling of the edges of the saw cut.  
Complete sawing no later than 24 hours after concrete placement.

- Sequence: If possible, saw every third transverse joint initially, then saw the intermediate joints. Start where concrete placement commenced.
  - Cracking: If the concrete has already cracked near the location chosen for a joint, do not saw a joint in that location. If a crack develops ahead of the saw cut, discontinue sawing and submit proposals for extra sawn joints.
  - Stand-by machines: Provide one stand-by sawing machine for each machine planned to be used.
  - Cleaning and protection: Immediately after each joint is sawn, flush the saw cut and adjacent concrete surface using water, until the waste from sawing is removed from the joint.
- Rebated groove joints: Saw straight, parallel sided grooves for joint seals on top of and centred on the sawn weakened plane joints.
- Timing: Commence sawing after the curing period has ended, immediately before joint sealing. Saw during daylight hours.

**Preparing joints**

Stripping time: At least 12 hours.

Clean: Immediately before installation of the sealer, make sure the joint space is dry, clean and free from loose material. Remove laitance, curing compound and protrusions of hardened concrete from the sides and upper edges of the joint.

**Joint sealing**

Sealant type: Provide silicone sealant in conformance with the manufacturer's recommendations.

Backing rod: Compressible closed cell polyethylene foam with a bond breaking surface and tear off strip.

**17.3.12 SURFACE SEALERS****General**

Sealer: Crommelins water based paving sealer

Application: Apply surface sealer after the curing period and when concrete has dried to allow the sealer to penetrate into the concrete surface.

Curing sealer compound: If using the sealer as a curing compound, apply directly after finishing.

**17.3.13 TESTING****Site tests**

Slip resistance of completed installation: To AS 4663.

**17.3.14 COMPLETION****Rectification**

Reinstating adjacent surfaces: Reinstatate surfaces next to new pavements and associated elements. If an existing road pavement has been disturbed, trim back to a straight, neat and undisturbed edge, parallel to the new concrete for the full depth of the slab.

Concrete pavement: If pavement does not conform to the tolerances, submit rectification proposal.

Unplanned cracking:

- Maximum 0.4 mm wide crack is acceptable.
- > 1 mm must be assessed, detail a proposal for possible cause and rectification processes.

**Cleaning**

Excavated material: Remove from site.

**17.4 SELECTIONS****17.4.1 SCHEDULES****Unformed surface finishes schedule**

	CON 01	CON 02	
Location	Refer to the drawings	Refer to the drawings	
Primary finish	Steel trowel		
Supplementary finish	Washed	Wood float pattern to Superintendents approval	



**18 CONCRETE – COMBINED****18.1 GENERAL****18.1.1 RESPONSIBILITIES****General**

General: Provide cast concrete, as documented and as follows:

- Conforming to the design details and performance criteria.
- Satisfying quality and inspection requirements.
- Compatible with documented finishes.

**Design**

Formwork: The design of formwork, other than profiled steel sheeting composite formwork, is the contractor's responsibility. Allow for dimensional changes, deflections and cambers resulting from the following:

- Imposed actions.
- Concrete shrinkage and creep.
- Temperature changes.

Structural design: To AS 3600.

**18.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**18.1.3 STANDARDS****General**

Formwork design and construction, formed surfaces: To AS 3610 and AS 3610.1.

Plywood formwork: To AS 6669.

Specification and supply of concrete: To AS 1379.

Concrete materials and construction: To AS 3600.

Residential ground slabs and footings: To AS 2870.

Strand, bar and wire: To AS/NZS 4672.1.

**18.1.4 INTERPRETATION****Definitions**

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

- Ambient temperature: The air temperature at the time of mixing and placing of concrete.
- Average ambient temperature: Average value of the daily maximum and minimum ambient temperatures over the relevant period at a site.
- Batch: A quantity of concrete containing a fixed quantity of ingredients and produced in a discrete operation.
- Concrete class:
  - . Normal: Concrete which is specified primarily by a standard compressive strength grade and otherwise conforming to AS 1379 clause 1.5.3.
  - . Special: Concrete which is specified to have certain properties or characteristics different from, or additional to, those of normal-class concrete and otherwise conforming to AS 1379 clause 1.5.4.
- Early age strength: A mean compressive strength at 7 days exceeding the values shown in AS 1379 Table 1.2.
- Green concrete: Concrete which has set but not appreciably hardened.
- Production assessment: An assessment procedure for concrete specified by strength grade, carried out by the supplier on concrete produced by a specific supplying plant and based on the statistical assessment of standard compressive strength tests on concrete.

- Project assessment: An assessment procedure for concrete specified by strength grade, specified at the customer's option, which provides additional test data for the statistical assessment of concrete supplied to a specific project.
- Sample: A portion of the material used in the works, or to take such a sample.
- Specimen: A portion of a sample which is submitted for testing.
- Weather:
  - . Cold: Ambient shade temperature < 10°C.
  - . Hot: Ambient shade temperature > 30°C.

#### 18.1.5 INSPECTION

##### Notice

Inspection: Give notice so that inspection may be made of the following:

- Base or subgrade before covering.
- Membrane or film underlay installed on the base or subgrade.
- Completed formwork and reinforcement, cores, fixings and embedded items fixed in place.
- Used formwork, after cleaning and before re-use.
- Concealed surfaces or elements before covering.
- Commencement of concrete placing.
- Evaluation of the off-form finishes.
- Evaluation of surface finish.

#### 18.1.6 TOLERANCES

##### Formwork

Plumb of elements > 8 m high: 1:1000.

Plumb of elements ≤ 8 m high: To AS 3610.1.

Position: Construct formwork so that finished concrete conforms to AS 3600 clause 17.5.

##### Reinforcement

Fabrication and fixing: To AS 3600 clause 17.2.

Reinforcement position: To AS 3600 clause 17.5.3.

##### Finishes

Formed surfaces quality of surface finish: To AS 3610.1 Table 3.3.2.

Unformed surfaces flatness: To the **Flatness tolerance class table**, for the documented class of finish, using a straightedge placed anywhere on the surface in any direction.

##### Flatness tolerance class table

Class	Measurement	Maximum deviation (mm)
A	2 m straightedge	4
B	3 m straightedge	6
C	600 mm straightedge	6

#### 18.1.7 SUBMISSIONS

##### Calculations

Formwork calculations: If requested by the superintendent, submit calculations by a professional engineer experienced in formwork design to show that allowable concrete stresses will not be exceeded and formwork capability will be maintained for the following:

- Proposed formwork procedures or loadings which differ from those documented.
- Undocumented formwork shoring or stripping procedures or allowable loadings from stacked materials.

##### Certification

Formwork design certification. If requested by the superintendent, submit certification by a professional engineer experienced in formwork design verifying conformance of the design.

Formwork execution certification: If requested by the superintendent, submit certification by a professional engineer experienced in formwork design and construction verifying conformance of the completed formwork, including the suitability of the formwork for the documented surface finish class.

**Design**

Loading: Submit details of proposed construction systems, loads and procedures, including propping and re-shoring.

**Execution details**

Surface repair method: Submit details of any proposed surface repair method before starting repairs.

Concrete: Submit proposals for mixing, placing, finishing and curing concrete including the following:

- Changes to the concrete mix.
- Curing and protection methods.
- Curing period for low-pressure steam curing.
- Cutting or displacing reinforcement, or cutting or coring hardened concrete.
- Handling, placing, compaction and finishing methods and equipment, including pumping.
- Sequence and times for concrete placement, and construction joint locations and relocations.
- Site storage, mixing and transport methods and equipment, if applicable.
- Temperature control methods.
- Sequence of concrete placement: Submit details of any proposed If sequential placement of slab segments.
- Sawn joints: Submit details of proposed methods, timing and sequence of sawing joints.

Reinforcement: Submit the following:

- General: Details of any proposed changes to documented reinforcement.
- Damaged galvanizing: Details of proposed repair to AS/NZS 4680 Section 8.
- Mechanical bar splices Details and test certificates for each size and type of bar to be spliced.
- Provision for concrete placement: Details of spacing or cover to reinforcement that does not conform to AS 3600.
- Splicing: Details of any proposed changes to documented requirements.
- Welding: Details of any proposed welding of reinforcement.

Pre-mixed supply delivery docket: For each batch, submit a docket listing the information required by AS 1379, and the following:

- For special class performance concrete: Documented performance and type of cement binder.
- For special class prescription concrete: Details of mix, additives, and type of cement binder.
- Method of placement and climate conditions during pour.
- Name of concrete delivery supervisor.
- Project assessment carried out each day.
- The concrete element or part of the works for which the concrete was ordered, and where it was placed.
- The total amount of water added at the plant and the maximum amount permitted to be added at the site.

**Materials**

Product conformity: Submit current assessments of conformity, as appropriate, as follows:

- Certificate of conformity by a JAS-ANZ accredited third party.
- Report by a NATA accredited laboratory describing tests and giving results which demonstrate that the product conforms.

Concrete mixes: Submit details, for each grade and type of concrete including any proposed use of special-purpose cement types.

Curing compounds: Submit details of any proposed liquid membrane-forming curing compound, including the following:

- Certified test results for water retention to AS 3799 Appendix B.
- Evidence of compatibility with concrete, and with applied finishes including toppings and render, if any, including methods of obtaining the required adhesion.
- For visually important surfaces, evidence that an acceptable final surface colour will be obtained.

Admixtures: Submit details of any proposed admixtures, including the following:

- Brand name.
- Place of manufacture.

- Basic chemical composition.

Reinforcement strength and ductility: Submit type-test reports to verify conformance to AS 3600 Table 3.2.1 for each reinforcement type.

#### **Samples**

Coloured concrete: Submit sample blocks of coloured concrete produced using the proposed mix and method before casting final concrete as follows:

- Number: 4.
- Size (nominal): 300 x 300 x 50 mm.

#### **Shop drawings**

Cores, fixings and embedded items: Submit the proposed locations, clearances and cover and show any proposed repositioning of reinforcement.

#### **Subcontractors**

Pre-mixed supply: Submit names and contact details of proposed pre-mixed concrete suppliers and alternative source of supply in the event of breakdown of pre-mixed or site mixed supply.

#### **Tests**

Site tests: Submit results, as follows:

- Site slip resistance test of completed installation to AS/NZS 4663.
- Concrete compressive strength test results to AS 1012.9.

## **18.2 PRODUCTS**

### **18.2.1 MATERIALS**

#### **Aggregates**

Standard: To AS 2758.1.

#### **Cement**

Standard: To AS 3972.

Age: Less than 6 months old.

Storage: Store cement bags under cover and above ground.

#### **Water**

Standard: To AS 1379 clause 2.4.

Requirement: Clean, free from oil, acid, alkali, organic or vegetable matter and including not more than 500 mg/l of chloride ions.

#### **Polymeric film underlay**

Vapour barriers and damp-proofing membranes: To AS 2870 clause 5.3.3.

#### **Chemical admixtures**

Standard: To AS 1478.1.

Contents: Free of chlorides, fluorides and nitrates.

#### **Curing compounds**

Curing compounds: To AS 3799.

### **18.2.2 CONCRETE**

#### **Properties**

Concrete mix and supply: Conform to the following:

- Normal-class: To AS 1379 clause 1.5.3.
- Special-class: To AS 1379 clause 1.5.4.

#### **Coloured concrete**

Standard: To AS 3610.1.

### **18.2.3 TESTING**

#### **General**

Test authority: Concrete supplier or NATA registered laboratory.

Reports and records of test results: To the relevant parts of the AS 1012 series. Keep results on site.

#### **Assessment process of test results**

Standard: To AS 1379.

Method of assessment: Project assessment.

### Sampling

Method of sampling: AS 1012.1.

Sampling locations: To AS 1012.1 and the following:

- Slump tests: On site, at the point of discharge from the agitator.
- Compressive strength tests: Spread the site sampling evenly throughout the pour.

Frequency of sampling: To AS 1379 Sections 5 and 6 and the following:

- Slump tests: Take at least one sample from each batch.
- Compressive strength tests: To the **Project assessment strength grade sampling table**.

### Project assessment strength grade sampling table

Number of batches for each type and grade of concrete per day	Minimum number of samples: Columns and load bearing wall elements (per batch)	Minimum number of samples: Other elements (per day)
1	1	1
2-5	1	2
6-10	1	3
11-20	1	4
each additional 10	1	1 additional

### Making and curing of specimens

General: To AS 1012.8.1 and AS 1012.8.2.

Specimens for compressive strength tests: Make and cure at least two specimens from the sample of each grade.

Specimen size:

- Aggregate size ≤ 20 mm: Nominally 200 x 100 mm diameter.
- Aggregate size > 20 mm: Nominally 300 x 150 mm diameter.

### Test methods

General: To the relevant parts of the AS 1012 series.

Slump tests: Assess slump for every batch. Perform slump test on each strength sample.

Drying shrinkage at 56 days: To AS 1012.13.

### Embedded pressure pipes

General: Complete leak tests before embedding pipes.

## 18.2.4 FORMWORK

### General

Form linings, facings and release agents: Compatible with finishes applied to concrete.

### Plywood formwork

Material: Plywood sheeting to AS 6669.

Grade: Use appropriate grade for the documented design dimensions, loading and surface quality

Joints: Seal the joints consistent with the documented surface finish class.

Tolerances: To AS 3610.1 Section 3.

## 18.2.5 REINFORCEMENT

### Steel reinforcement

Standard: To AS/NZS 4671.

Ductility class: as noted on the structural drawings

Strength grade and ductility class: as noted on the structural drawings

Surface condition: Free of loose mill scale, rust, oil, grease, mud or other material which would reduce the bond between the reinforcement and concrete.

### Protective coating

Standard: To AS 3600 clause 17.2.1.2.

General: For concrete elements containing protective coated reinforcement, provide the same coating type to all that element's reinforcement and embedded ferrous metal items, including tie wires, stools, spacers, stirrups, plates and ferrules, and protect other embedded metals with a suitable coating.

Epoxy coating: High build, high solids, chemically resistant coating.

- Thickness: 200 µm minimum.

Galvanizing: To AS/NZS 4680, as follows:

- Sequence: If fabricating after galvanizing, repair damaged galvanising and coat cut ends.

- Zinc-coating (minimum): 600 g/m<sup>2</sup>.

#### **Tie wire**

General: Annealed steel 1.25 mm diameter (minimum).

External and corrosive applications: Galvanized.

### **18.2.6 MISCELLANEOUS**

#### **Surface hardeners, sealants and protectors**

Supply: If documented, provide proprietary products conforming to the manufacturer's recommendations.

#### **Slip resistance treatment**

Slip resistance classification: To AS/NZS 4586.

## **18.3 EXECUTION**

### **18.3.1 POLYMERIC FILM UNDERLAY**

#### **Location**

General: Under slabs on ground, including integral ground beams and footings, provide a vapour barrier or, in areas prone to rising damp or salt attack, a damp-proofing membrane.

#### **Base preparation**

General: Conforming to base type, as follows:

- Concrete working base: Remove projections above the plane surface, and loose material.
- Graded prepared subgrade: Blind with sufficient sand to create a smooth surface free from hard projections. Lightly wet the sand just before laying the underlay.

#### **Installation**

Standard: To AS 2870 clause 5.3.3.

General: Lay underlay over the base as follows:

- Lap joints at least 200 mm and seal the laps and penetrations with waterproof adhesive tape.
- Face the laps away from the direction of concrete pour.
- Continue up vertical faces past the damp-proof course where applicable, and tape fix at the top.
- Patch or seal punctures or tears before placing concrete.
- Cut back as required after concrete has gained strength and formwork has been removed.

### **18.3.2 FORMWORK**

#### **General**

Requirement: To AS 3610 and AS3610.1

#### **Preparation**

Cleaning: Before placing concrete, remove free water, dust, debris and stains from the formwork and the formed space.

#### **Bolt holes**

Removable bolts: Remove tie bolts without damaging the concrete.

Formwork tie bolts left in the concrete: Position more than 50 mm from the finished surface.

Bolt hole filling: Provide material with durability and colour matching the concrete.

Recessed filling: Fill or plug the hole to 6 mm below the finished surface.

#### **Corners**

Work above ground: Fillet at re-entrant angles, and chamfer at corners.

Face of bevel 25 mm.

**Embedments**

Fixing: Fix embedments through formwork to prevent movement, or loss of slurry or concrete, during concrete placement.

**Openings**

Inspection: In vertical formwork provide openings or removable panels for inspection and cleaning, at the base of columns, walls and deep beams.

**Release agents**

Application: Before placing reinforcement, apply a release agent to linings and facings.

**Steel linings**

Rust: Clean off any rust and apply rust inhibiting agent before re-use.

**Visually important surfaces**

Surface finish classes 1, 2 or 3: Set out the formwork to give a regular arrangement of panels, joints, bolt holes, and similar visible elements in the formed surface.

**18.3.3 REINFORCEMENT****Dowels**

Fixing: If a dowel has an unpainted half, embed in the concrete placed first.

Tolerances:

- Alignment: 1:50.
- Location:  $\pm$  half the diameter of the dowel.

Grade: 250 N.

**Cover**

Concrete cover generally: To AS 3600 clause 4.10.

Concrete cover for structures for retaining liquids: To AS 3735.

Concrete cover for residential ground slabs and footings: To AS 2870.

**Supports**

Proprietary concrete, metal or plastic supports: Provide chairs, spacers, stools, hangers and ties, as follows:

- Able to withstand construction and traffic loads.
- With a protective coating if they are ferrous metal, located within the concrete cover zone, or are used with galvanized or zinc-coated reinforcement.

Spacing:

- Bars:  $\leq$  60 diameters.
- Mesh:  $\leq$  800 mm.

Supports over membranes: Prevent damage to waterproofing membranes or vapour barriers. If appropriate, place a metal or plastic plate under each support.

**Projecting reinforcement**

Protection: If starter or other bars extend beyond reinforcement mats or cages, through formwork or from cast concrete, provide a plastic protective cap to each bar until it is cast into later work.

**Tying**

General: Secure the reinforcement against displacement at intersections with either wire ties, or clips. Bend the ends of wire ties away from nearby faces of formwork or unformed faces to prevent the ties projecting into the concrete cover.

Beams: Tie stirrups to bars in each corner of each stirrup. Fix other longitudinal bars to stirrups at 1 m maximum intervals.

Bundled bars: Tie bundled bars in closest possible contact. Provide tie wire of at least 2.5 mm diameter and spaced not more than 24 times the diameter of the smallest bar in the bundle.

Columns: Secure longitudinal column reinforcement to all ties at every intersection.

Mats: For bar reinforcement in the form of a mat, secure each bar at alternate intersections.

**18.3.4 CONCRETE****General**

Performance properties: As documented

**Elapsed delivery time**

General: Make sure the elapsed time between the wetting of the mix and the discharge of the mix at the site conforms to the **Elapsed delivery time table**. Do not discharge at ambient temperature below 10°C or above 30°C unless approved heating or cooling measures are taken to deliver concrete within the range 5°C to 35°C.

**Elapsed delivery time table**

Concrete temperature at time of discharge (°C)	Maximum elapsed time (minutes)
10 – 24	120
24 – 27	90
27 – 30	60
30 – 32	45

**Pre-mixed supply**

Addition of water: To AS 1379 clause 4.2.3.

Transport method: Prevent segregation, loss of material and contamination of the environment, and do not adversely affect placing or compaction.

**Site mixed supply**

Emergencies: If mixing by hand, provide details.

Plant: Mix concrete in a plant located on the construction site.

**18.3.5 CORES, FIXINGS AND EMBEDDED ITEMS****Adjoining elements**

Fixings: Provide fixings for adjoining elements. If required, provide temporary support to the adjoining elements during concreting, to prevent movement.

**Protection**

General: Grease threads. Protect embedded items against damage.

Compatibility: Provide inserts, fixings and embedded items that are compatible with each other, with the reinforcement and with the documented concrete mix and the documented surface finish.

Corrosion: In external or exposed locations, galvanize anchor bolts and embedded fixings.

**Structural integrity**

Position: Fix cores and embedded items to prevent movement during concrete placing. In locating cores, fixings and embedded items, displace but do not cut reinforcement, and maintain cover to reinforcement.

Isolation: Isolate embedded items to prevent water tracking to concrete providing minimum cover to reinforcement.

**Tolerances**

General: Maximum deviation from correct positions:

- Anchor bolt groups for structural steel: To AS 4100.
- Cores and embedded items generally: 10 mm.
- Other fixing bolts: 3 mm.

**18.3.6 CONCRETE WORKING BASE****Finish**

Membrane support: Wood float finish or equivalent.

**Installation**

General: Lay over the base or subgrade and screed to the required level.

**Surface tolerance**

Deviation: Flatness tolerance Class B.

**18.3.7 PLACING AND COMPACTION****Placing**

Horizontal transport: Use suitable conveyors, clean chutes, troughs, hoppers or pipes.

Methods: Avoid segregation and loss of concrete, and minimise plastic settlement. Maintain a nominally vertical and plastic concrete edge during placement.

Layers: Place concrete in layers not more than 300 mm thick. Compact the following layer into previous layer before previous layer has taken initial set.

### Compaction

Methods: Use immersion and screed vibrators accompanied by hand methods as appropriate to remove entrapped air and to fully compact the mix.

Vibrators: Do not allow vibrators to contact set concrete, reinforcement or items including pipes and conduits embedded in concrete. Do not use vibrators to move concrete along the formwork. Avoid causing segregation by over-vibration.

### Placing records

Log book: Keep on site and make available for inspection a log book recording each placement of concrete, including the following:

- Date.
- Specified grade and source of concrete.
- Slump measurements.
- The portion of work.
- Volume placed.

### Rain

Protection: During placement and before setting, protect the surface from damage.

### Vertical elements

Placement: Limit the free fall of concrete to maximum of 2000 mm.

### Placing in cold weather

Cement: Do not use high alumina cement.

Placing concrete: Maintain temperature of the freshly mixed concrete at 5°C or more.

Formwork and reinforcement: Before and during placing maintain temperature at 5°C or more.

Severe weather: If severe weather conditions are predicted, use high early strength cement.

Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary so that the temperature of the placed concrete is within the documented limits.

Admixtures: Do not use calcium chloride, salts, chemicals or other material in the mix to lower the freezing point of the concrete.

Frozen materials: Do not allow frozen materials or materials containing ice to enter the mixer, and keep free of frost and ice any formwork, materials, and equipment coming in contact with the concrete.

Maximum temperature of water: 60°C when placed in the mixer.

Freezing: Prevent concrete from freezing.

### Placing in hot weather

Handling: Prevent premature stiffening of the fresh mix and reduce water absorption and evaporation losses. Mix, transport, place and compact the concrete conforming to the **Elapsed delivery time table**.

Placing concrete: Maintain the temperature of the freshly mixed concrete conforming to the **Hot weather placing table**.

Evaporation control barriers: Erect barriers to protect freshly placed concrete from drying winds.

Formwork and reinforcement: Before and during placing, maintain temperature at 35°C or less.

Temperature control: Select one or more of the following methods of maintaining the temperature of the placed concrete at 35°C or less:

- Cool the concrete using liquid nitrogen injection before placing.
- Cover horizontal transport containers.
- Spray the coarse aggregate using cold water before mixing.
- Use chilled mixing water.

### Hot weather placing table

Concrete element	Temperature limit
Normal concrete in footings, beams, columns, walls and slabs	35°C
Concrete in sections 1 m or more in all dimensions except for concrete of strength 40 MPa or more, in sections exceeding 600 mm in thickness	27°C

**Placing under water**

General: Do not place under water unless conditions prevent dewatering.

Minimum cement content for the mix: Increase by 25%.

**18.3.8 CURING****General**

Requirements: Taking into account the average ambient temperature at site over the relevant period affecting the curing, adopt procedures to make sure of the following:

- Curing: Cure continuously from completion of finishing until the total cumulative number of days or fractions of days, during which the air temperature in contact with the concrete is above 10°C, conforms to the following, unless accelerated curing is adopted:
  - . Fully enclosed internal surfaces/Early age concrete: 3 days.
  - . Other concrete surfaces: 7 days.
- End of curing period: Prevent rapid drying out at the end of the curing period.
- Protection: Maintain at a reasonably constant temperature with minimum moisture loss, during the curing period.

**Curing compounds**

Application: Provide a uniform continuous flexible coating without visible breaks or pinholes, which remains unbroken at least for the required curing period after application.

Substrates: Do not use wax-based or chlorinated rubber-based curing compounds on surfaces forming substrates to applied finishes, concrete toppings and cement-based render.

Self-leveling toppings: If used also as curing compounds, conform to AS 3799.

Visually important surfaces: Apply curing compounds to produce uniform colour on adjacent surfaces.

**Cold weather curing**

Temperature: Maintain concrete surface temperatures above 5°C for the duration of the curing period.

**Hot weather curing**

Curing compounds: If curing compounds are proposed, provide details.

Protection: Select a protection method from the following:

- If the concrete temperature is more than 25°C or if not protected against drying winds, protect the concrete using a fog spray application of aliphatic alcohol evaporation retardant.
- If ambient shade temperature is more than 35°C, protect from wind and sun using an evaporative retarder until curing is commenced.
- Immediately after finishing, either cover exposed surfaces using an impervious membrane or hessian kept wet until curing begins, or apply a curing compound.

**Water curing**

Method: Select a method of ponding or continuously sprinkling to prevent damage to the concrete surface during the required curing period.

**18.3.9 JOINTS****Construction joints**

Location: Do not relocate or eliminate construction joints unless approved in writing by the structural engineer, or form undocumented construction joints. If emergency construction joints are made necessary by unforeseen interruptions to the concrete pour, submit a report on the action taken.

Finish: Butt join the surfaces of adjoining pours. In visually important surfaces make the joint straight and true, and free from blemishes impermissible for its surface finish class.

Preparation: Roughen and clean the hardened concrete joint surface. Remove loose or soft material, free water, foreign matter and laitance. Dampen the surface just before placing the fresh concrete and coat with a neat cement slurry.

**Expansion joints**

Joint filling: Fill with jointing materials as documented. Finish visible jointing material neatly flush with adjoining surfaces.

Preparation: Before filling, dry and clean the joint surfaces, and prime.

Watertightness: Apply the jointing material so that joints subject to ingress of water are made watertight.

Jointing materials: Provide jointing materials compatible with each other, and non-staining to concrete in visible locations.

Bond breaking: Provide back-up materials for sealants, including backing rods, which do not adhere to the sealant.

Foamed materials (in compressible fillers): Closed-cell or impregnated, not water absorbing.

#### **Slip joints**

Requirement: If concrete slabs are supported on masonry, provide proprietary slip joints.

### **18.3.10 FORMED SURFACES**

#### **General**

Surface finish: Class 3: Generally unless noted otherwise

Class 5: Formed surfaces below ground level

Damage: Do not damage concrete works through premature removal of formwork.

#### **Curing**

General: If formwork is stripped before the minimum curing period, for the concrete has elapsed, continue curing the exposed faces as soon as the stripping is completed.

#### **Surface repairs**

Method: If surface repairs are required, submit proposals.

### **18.3.11 UNFORMED SURFACES**

#### **General**

Surface finish: As documented – refer architectural drawings.

Finished levels: Strike off, screed and level slab surfaces to finished levels and to the flatness tolerance class documented.

#### **Surface repairs**

Method: If surface repairs are required, submit proposals.

#### **Finishing methods – primary finish**

Machine float finish:

- After levelling, consolidate the surface using a machine float.
- Cut and fill and refloat immediately to a uniform, smooth, granular texture.
- Hand float in locations inaccessible to the machine float.

Steel trowel finish: After machine floating finish, as follows:

- Use power or hand steel trowels to produce a smooth surface relatively free from defects.
- When the surface has hardened sufficiently, re-trowel to produce the final consolidated finish free of trowel marks and uniform in texture and appearance.

Burnished finish: Continue steel trowelling until the concrete surface attains a polished or glossy finish, uniform in texture and appearance, and free of trowel marks and defects.

Wood float finish: After machine floating, use wood or plastic hand floats to produce the final consolidated finish free of float marks and uniform in texture and appearance.

Broom finish: After machine floating and steel trowelling use a broom or hessian belt drawn across the surface to produce a coarse even-textured transverse-scored surface.

Scored or scratch finish: After screeding, use a stiff brush or rake drawn across the surface before final set, to produce a coarse scored texture.

Sponge finish: After machine floating and steel trowelling, use a damp sponge to wipe the surface to produce an even textured sand finish.

### **18.3.12 COMPLETION**

#### **Formwork removal**

Extent: Remove formwork, other than lost formwork, including formwork in concealed locations.

Timing: Do not disturb formwork until concrete is hardened enough to withstand formwork movements and removal without damage.

Stripping:

- General: To AS 3600 where it is more stringent than AS 3610.1.
- Vertical formwork: To AS 3610.1 Appendix B Table B1.

**Protection**

General: Protect the concrete from damage due to construction loads, physical and thermal shocks, and excessive vibrations, particularly during the curing period.

Surface protection: Protect finished concrete surfaces and applied finishes from damage.

**19 CONCRETE FINISHES****19.1 GENERAL****19.1.1 RESPONSIBILITIES****General**

Requirement: Provide finishes to formed and unformed concrete surfaces, as documented.

**Performance**

Requirement: Compatible with documented applied finishes.

**19.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**19.1.3 STANDARDS****General**

Formed surfaces: To AS 3610.1.

**Slip resistance**

Classification: To AS 4586.

**19.1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the following definition applies:

- Green concrete: Concrete which has recently set but has not achieved any design strength.

**19.1.5 TOLERANCES****Formed surfaces**

Form face deflections: To AS 3610.1 Table 3.3.4.1.

Straight elements: To AS 3610.1 Table 3.3.5.1.

**Unformed surfaces**

Flatness: To the **Flatness tolerance class table**, using a straightedge placed anywhere on the surface in any direction, for the documented class of finish.

**Flatness tolerance class table**

Class	Measurement	Maximum deviation (mm)
A	2 m straightedge	4
B	3 m straightedge	6
C	600 mm straightedge	6

**19.1.6 SUBMISSIONS****Execution details**

Surface repairs: If surface repairs are required, submit proposed methods.

**Prototypes**

Test panels: Provide test panels to AS 3610.1 clause 3.7 and as documented in the **Test panels schedule**.

Manufacture: Cast the panels using the form, concrete, compaction equipment, form release agents, curing and formwork removal methods which are to be used in the final work.

Storage: Once accepted, maintain the panels on site undamaged and protected from the weather, as reference prototypes for evaluation of completed work.

Surface treatment: Do not proceed with the related work until the acceptable range of surface treatments has been determined.

**Tests**

Site tests: Submit test results, as follows:

- Slip resistance test of completed installations.

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### 19.1.7 INSPECTION

#### Notice

Inspection: Give notice so that inspection may be made of the following:

- Completed formwork with all dust and debris removed from forms.
- Evaluation of the off-form finishes.
- Evaluation of surface finish.

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## 19.2 PRODUCTS

### 19.2.1 MATERIALS

#### Surface modifiers

Hardeners, sealants and protectors: If documented, proprietary products conforming to the manufacturer's recommendations.

Slip resistance treatment: If documented, proprietary products conforming to the manufacturer's recommendations.

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## 19.3 EXECUTION

### 19.3.1 SURFACE MODIFIERS

#### General

Application: Apply to clean surfaces, to the manufacturer's recommendations.

### 19.3.2 FORMED SURFACES

#### General

Surface finish: To AS 3610.1 Table 3.3.3.1 and as documented in the **Surface finish class schedule** and the **Formed surface finishes schedule**.

Damage: Do not damage concrete works through premature removal of formwork.

#### Curing

Requirement: If formwork is stripped before the minimum curing period for the concrete has elapsed, continue curing the exposed faces as soon as the stripping is completed.

#### Evaluation of formed surfaces

General: If evaluation of formed surface is required, complete the evaluation before surface treatment.

#### Finishing methods

Requirement: If soffits of horizontal concrete elements or faces of vertical concrete elements are to have a finish other than an off-form finish, provide finishes as documented.

Form removal: If vertical face formwork needs to be removed for finishing methods, while the concrete is green, make sure the concrete has sufficiently set to prevent slump.

Exposed aggregate finish: While the concrete is green, wet the surface and scrub with stiff fibre or wire brushes, flushing continuously with clean water, until the aggregate is uniformly exposed. Do not use acid etching. Rinse the surface with water.

Floated finishes:

- Sand floated finish: While the concrete is green, wet the surface and rub using a wood float. Rub fine sand into the surface until a uniform colour and texture are produced.
- Grout floated finish: While the concrete is green, dampen the surface and spread a slurry, using hessian pads or sponge rubber floats. Remove surplus slurry and work until a uniform colour and texture are produced.

Smooth rubbed finish: While the concrete is green, wet the surface and rub using a carborundum or similar abrasive brick until a uniform colour and texture are produced.

### 19.3.3 UNFORMED SURFACES

#### General

Surface finish: As documented in the **Unformed surface finishes schedule**.

Finished levels: Strike off, screed and level slab surfaces to finished levels and to the flatness tolerance class documented.

**Finishing methods – primary finish**

Machine float finish:

- After levelling, consolidate the surface using a machine float.
- Cut and fill and refloat immediately to a uniform, smooth, granular texture.
- Hand float in locations inaccessible to the machine float.

Steel trowel finish: After machine floating, finish as follows:

- Use power or hand steel trowels to produce a smooth surface relatively free from defects.
- When the surface has hardened sufficiently, re-trowel to produce the final consolidated finish free of trowel marks and uniform in texture and appearance.

Exposed aggregate finish: After floating and when concrete has stiffened, wet the surface and scrub with stiff fibre or wire brushes, flushing continuously with clean water, until the aggregate is uniformly exposed. Rinse the surface with water.

**19.3.4 TESTING****Site tests**

Slip resistance of completed installation: To AS 4663.

**19.4 SELECTIONS****19.4.1 SCHEDULES****Unformed surface finishes schedule**

Property	Type		
	Floors with sealer applied	Floors with carpet finish	Floors with vinyl applied
Location	Refer to the drawings	Refer to the drawings	Refer to the drawings
Flatness tolerance class	A	B	A
Primary finish	Steel trowel	Steel trowel	Steel trowel
Supplementary finish	N/A	N/A	N/A

**20 STRUCTURAL STEEL****20.1 GENERAL****20.1.1 RESPONSIBILITIES****General**

Requirement: Provide structural steelwork, as documented and provide for the fixing of adjoining building elements that are to be connected to or supported on the structural steel.

**20.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**20.1.3 STANDARDS****General**

Materials, construction, fabrication and erection: To AS 4100.

Cold-formed steel: To AS/NZS 4600.

**20.1.4 INTERPRETATION****Abbreviations**

AESS: Architecturally Exposed Structural Steel.

ILAC: International Laboratory Accreditation Cooperation.

**20.1.5 INSPECTION****Notice – off site**

Inspection: Give notice so that inspection may be made of the following:

- Materials including welding consumables before fabrication.
- Submission of the proposed welding procedure to prevent distortion and non-ductile welds in tension zones.
- Testing of welding procedures and welder qualification tests.
- Commencement of shop fabrication.
- Commencement of welding.
- Before placement of root runs of complete penetration butt welds.
- Completion of fabrication before surface preparation.
- Surface preparation before shop painting.
- Completion of protective coating before delivery to site.

**Notice – on site**

Inspection: Give notice so that inspection may be made of the following:

- Steelwork on site before erection.
- Anchor bolts in position before casting in.
- Steelwork and column bases erected on site, before grouting, encasing, site painting or cladding.
- Tensioning of bolts in categories 8.8/TB and 8.8/TF.
- Reinforcement and formwork in place before any encasement.
- Completed grouting, encasement, fire protection or site painting.

**20.1.6 SUBMISSIONS****Anchors**

Concrete or masonry anchors: If masonry anchors other than as shown on the drawings are required or proposed for the support or fixing of structural steel, submit evidence of the anchor capacity to carry the load.

**Bolts**

Compliance: Submit a manufacturer's compliance/test certificate from an ILAC accredited testing organisation confirming conformance with AS/NZS 1252.

Independent certification: Provide a local NATA-accredited laboratory independent compliance certificate based on appropriate testing and verification.

**Execution**

Anchor bolts: If anchor bolts do not meet specified location tolerances, submit proposals that will allow steel erection to proceed.

Splicing: If splicing of structural members is intended, submit proposals.

Welding procedures: Submit details of proposed welding procedures, using the WPS form in Appendix C of AS/NZS 1554.1.

Identification marks: If members and/or connections are to be exposed to view submit details of proposed marking.

Distortions: Submit proposals for preventing or minimising distortion of galvanized components, welded components or welded and galvanized components; and proposals for restoration to design shape.

**Record drawings**

General: Supply as-built structural and shop drawings.

**Shop drawings**

General: Submit shop drawings showing the following information:

- Relevant details of each assembly, component and connection.
- Information relative to fabrication, surface treatment, transport and erection.

Specific requirements: Include the following information:

- Marking plans.
- Identification.
- Steel type and grade.
- Dimensions of items.
- Required camber, where applicable.
- Fabrication methods including, where applicable, hot or cold forming and post weld heat treatment.
- Location, type and size of welds and/or bolts and bolt holes.
- Weld categories and bolting categories.
- Orientation of members.
- Surface preparation methods and coating system if shop applied.
- Best practice details in relation to application of protective coatings.
- Breather holes for hollow sections (with seal plates) being hot-dip galvanized.
- Procedures necessary for shop and site assembly, and erection.
- Location of and preparation for site welds.
- Temporary works such as lifting lugs, support points, temporary cleats and bracing which are required for transport and erection of the structural steelwork, and the procedure for final removal.
- Required fixings for adjoining building elements.

Substitution: If alternative sections or connections are proposed, provide details.

Purlins and girts: If it is proposed to support anything other than cladding on or from purlins and girts, provide details.

Splices: If variations to documented splice locations or additional splices are proposed, submit details.

**Subcontractors**

General: Submit names and contact details of proposed fabricator and installer.

**Tests**

Steel properties: Submit evidence that the steel used in the work conforms to the cited material standards.

Bars and sections: Submit results of all non-destructive tests.

Plates: Submit results of all ultrasonic tests.

Welds: Submit results of all non-destructive examinations.

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**20.2 PRODUCTS**

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**20.2.1 STEEL TYPE AND GRADE****Material**

Steel members and sections: Conform to the **Steel grade (minimum) table**.

**Steel grade (minimum) table**

Type of steel	Grade
Universal beams and columns, parallel flange channels, large angles to AS/NZS 3679.1	300
Flat, small angles, taper flange beams and columns to AS/NZS 3679.1	250
Welded sections to AS/NZS 3679.2	300
Hot rolled plates, floor plates and slabs to AS/NZS 3678	250
Hollow sections to AS/NZS 1163: Circular sections less than 165 mm nominal outside diameter	C250
Hollow sections to AS/NZS 1163 : Sections other than the above	C350
Cold formed purlins and girts to AS 1397	G450 Z350 or Z450

**Steel certification**

Acceptable evidence: Certified mill test reports, or test certificates issued by the mill in conformance with AS/NZS 1163 clause 13.2.2 for cold formed hollow sections, AS/NZS 3679.1 clause 11.2.2 for hot rolled bars or sections or AS/NZS 3679.2 clause 10.2.3 for welded I sections.

Alternative: Have the steel tested by an independent NATA or ILAC accredited testing authority for compliance with the chemical composition and mechanical test requirements of the cited material standard.

Test certificates must be written in alphanumeric English, completed by a NATA or ILAC accredited laboratory and include all the requirements listed in AS/NZS 3679.1 clause 11.2.2. Certificates must include the chemical composition of the steel.

**20.2.2 BOLTS****Bolts, nuts and washers**

Finish: Hot-dip galvanized, corrosion-free, and in serviceable condition.

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**20.3 EXECUTION**

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**20.3.1 FABRICATION AND ERECTION****General**

Care: Shop detail and fabricate members so that they can be properly erected.

Substitution: If substitution of members is proposed, provide details.

**Beam camber**

General: If beam members have a natural camber within the straightness tolerance, fabricate and erect them with the camber up.

**Straightening**

Care: If correcting distorted members, conform to the submitted procedures and avoid damage.

**Site work**

General: Other than work shown on the shop drawings as site work, do not fabricate, modify or weld structural steel on site.

**Identification marks**

General: Provide marks or other means of identifying each member compatible with the finish, for the setting out, location, erection and connection of the steelwork in conformance with the marking plans.

High strength bolting: If the work includes more than one bolting category, mark high-strength structural bolted connections with a 75 mm wide flash of colour, clear of holes.

Cold formed members: Clearly mark material thickness.

Monorail beams: Identify and mark rated capacity in conformance with AS 1418.18 clause 5.12.6.

### Tolerances

Measurement: Check tolerances by measurement after fabrication and application of corrosion protection.

Conformance: To AS 4100 clause 14.4.

## 20.3.2 WELDING

### General

Standard: To AS/NZS 1554.1.

### Weld category

Weld categories not shown on the drawings: Category GP.

### Weld type

Weld type not shown on the drawings: Submit proposals for weld type and electrodes.

### Non-destructive weld examination

Standard: To AS/NZS 1554.1.

Methods: Conform to the **Non-destructive weld examination (NDE) table**.

Radiographic and ultrasonic examination: By an independent testing authority.

Repairs: Repair welds revealed as faulty by non-destructive examination and repeat the examination.

### Non-destructive weld examination (NDE) table

Type of weld and category	Examination method	Extent (% of total length of weld type)
Shop fillet welds	Visual means	100
Site fillet welds	Visual means	100
Butt welds, GP	Visual means	100
Butt welds, SP	Visual means	100
Fillet and butt welds, SP	Radiographic or ultrasonic examination	10

## 20.3.3 BOLTING

### General

Standards: To AS 1110.1, AS 1111.1 and AS/NZS 1252.

### Connections

Connection type: For connections not documented, submit proposals.

Bolting category 8.8/TF contact surfaces: Clean, as rolled and free from applied finishes.

### Anchor bolts

General: Provide each anchor bolt with 2 nuts and 2 oversize washers and provide sufficient thread to permit the levelling nut and washer to be set below the base plate.

Galvanizing: Galvanize all components.

Hexagonal bolts: To AS 1111.1.

Hexagonal nuts: To AS 1112.3.

Plain washers: To AS 1237.1.

Set out: Set out bolt groups using templates and subject to survey check.

### Lock nuts

General: Provide lock nuts for bolts in moving parts or parts subject to vibration and for vertical bolts in tension.

### Tensioning of bolting categories 8.8/TB and 8.8/TF

Method: Use part-turn-of-nut or load indicating washers.

### Permanent bolting

Completion: Bolt only when correct alignment and preset or camber has been achieved.

## 20.3.4 ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

### Fabrication

Welds: Make intermittent welds appear continuous, either with additional welding, caulking or filler.

Corners and edges: Grind fair those corners and edges, which are sharp, marred, or roughened.

Rough surfaces: Deburr and ground smooth.

### 20.3.5 SURFACE PREPARATION AND TREATMENT

#### General

General: Conform to the notes documented on the Structural Steel drawings and *Steel – protective paint coatings* worksection as appropriate.

### 20.3.6 ERECTION

#### General

Standard: To AS 3828.

Execution: Make sure that every part of the structure has sufficient design capacity and is stable under construction loads produced by the construction procedure or as a result of construction loads, which are applied.

Calculations: If required to justify the adequacy of the structure to sustain any loads and/or procedures, which may be imposed, provide calculations.

#### Temporary work

General: Provide all necessary temporary bracing or propping.

Temporary connections: If required cleats are not shown on shop drawings, submit details.

Temporary members: If temporary members are required, fix so as not to weaken or deface permanent steelwork.

#### Hand cutting

General: If hand cutting of bolt holes appears to be necessary, submit a report and proposed alternative options.

#### Cold-formed purlins

Trimming members: Provide to support edges of roof sheeting along hips, valleys and roof penetrations.

#### Movements

General: Allow for thermal movements during erection.

#### Site welds

Completion: Weld only when correct alignment and preset or camber have been achieved.

Overhead welding: If overhead welding is required, submit proposals.

#### Anchor bolts

General: For each group of anchor bolts, provide a template with setting out lines clearly marked for positioning the bolts when casting in.

#### Grouting at supports

Preparation: Before grouting steelwork to be supported by concrete or masonry, set steelwork on packing or wedges.

- Permanent packing or wedges: Form with solid steel or grout of similar strength to the permanent grout.
- Temporary packing or wedges: Remove before completion of grouting.

Timing: Grout at supports before the construction of any supported floors, walls, roofing, wall cladding or precast.

Temperature: Do not grout if the temperature of the base plate or the footing surface exceeds 35°C.

#### Handling

Care: Handle members or components without overstressing or deforming them.

Protection: Wrap or otherwise protect members or components to prevent damage to surface finishes during handling and erection.

#### Drifting

Limitation: Use drifting only to bring members into position, without enlarging holes or distorting components.

### 20.3.7 REPAIRS

#### General

General: Repair finishes to restore the full integrity of each phase and each coating.

### **20.3.8 COMPLETION**

#### **Tolerances**

Conformance: After erection is complete confirm conformance with AS 4100 clause 15.3.

#### **Temporary connections**

General: Remove temporary cleats on completion and restore the surface.

**21 LIGHT STEEL FRAMING****21.1 GENERAL****21.1.1 RESPONSIBILITIES****General**

Requirement: Provide light steel floor, wall, roof and truss framing, as documented.

**Performance**

Requirements:

- Suitable for having flooring, linings, cladding and roofing fixed to it.
- Conforming to the documented performance criteria.
- Conforming to the requirements of NASH-1 or NASH-2.
- Independently designed and documented.
- Independently certified by a professional engineer for the design and the erected framing with and including linings and cladding as documented.

**21.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**21.1.3 STANDARDS****General**

Design, materials and protection: To AS/NZS 4600.

Residential and Low-rise steel framing: To NASH-1 (National Association of Steel Housing) and NASH-2.

**21.1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given in the NASH-1 and NASH-2 Standards apply.

**21.1.5 TOLERANCES****General**

Manufacturing, assembly and installation tolerances: To NASH-1 Appendix D and NASH-2 Appendix A.

**21.1.6 SUBMISSIONS****Certification**

Erected frame: Submit certification that the erected frame conforms to the documented project requirements.

**Design documentation**

General: Where the structural documentation defines performance criteria, submit, as follows:

- Design to AS/NZS 4600 or NASH-1: Independent design, documentation and certification from a professional engineer.
- To NASH-2: Certification of conformance to the requirements of NASH-2.

Reactions: Submit the location and magnitude of reactions that are to be accommodated by the support structure.

Floor and wall frame member sizes: Submit a schedule of proposed member sizes, certified as meeting stated project, and AS/NZS 4600 or NASH-2 requirements for span, spacings and loadings.

**Shop drawings**

General: Submit shop drawings, to a scale that best describes the detail, requirements for the documented configurations and loadings.

Prefabricated wall frames: Include the following:

- Plan: Wall layout.

- Elevation: Arrangement of members, and size and section type of each member.
- Method of assembly, connection, holding down and bracing.

**Warranties**

Submit a warranty complying with the terms specified at the end of this worksection.

**21.1.7 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Damp-proof course installed before installation of steel framing.
- Steel framing erected on site before lining or cladding.

**21.2 PRODUCTS****21.2.1 GENERAL****Storage and handling**

Requirement: Transport all components to site and store, if required, so that components or their coating are not damaged or distorted.

Frames and trusses: If required, store on a flat even surface and do not load with other items.

Exposure: Minimise exposure of components to the weather, both during storage, handling and after erection.

**21.2.2 COMPONENTS****Damp-proof course**

Membrane: To the membrane requirements of AS 2870 or AS/NZS 2904.

Type: Embossed polyethylene

**Cold-formed steel framing**

General: Cold-formed sections from steel, metallic-coated to AS 1397.

Corrosion protection: To NASH-2 Section 8.

Product name: Rondo steel stud and track systems or product equivalent in function and quality to the approval of the Superintendent's Representative.

**Framing members**

Cold-formed steel framing for proprietary systems: To NASH-1 or NASH-2.

Steel wall frame type (internal walls): Rondo steel stud and track wall framing of sizes nominated on the drawings.

Steel wall frame type (external walls): Rondo MAXI- JAMB steel stud and track wall framing or product equivalent in function and quality to the approval of the Superintendent's Representative of sizes nominated on the drawings.

**21.3 EXECUTION****21.3.1 GENERAL****Frame fabrication**

Length: Cut members accurately to length so that they fit firmly against abutting members.

Service holes: If not pre-punched, form holes by drilling or punching, without compromising the structural integrity of the frame, located centrally within the centre third span of the element, conforming to the requirements of NASH-2.

Swarf: Immediately remove swarf and other debris from cold-formed steel framing.

**External frame walls**

Comply with the notes documented on the Structural Engineering drawings.

**Fastening**

Prefabricated framing: Fasten framing elements using fasteners, as documented, to the fabricator's requirements.

Framing built in-situ: Use fasteners, as documented, from the following types:

- Bolting.
- Self-drilling, self-tapping screws.

- Blind rivets.
- Proprietary clinching system.
- Structural adhesives.
- Welding. On-site welded connections are not permitted.

Compatibility: Compatible with steel frame to prevent galvanic corrosion of dissimilar metals.

#### **Welding**

Burning: Avoid procedures that result in greater than localised burning of the sheets or framing members.

#### **Prefabricated frames**

General: Protect frames from damage or distortion during erection.

#### **Unseasoned or CCA treated timber**

General: Do not fix in contact with framing without fully painting the timber and/or the steel.

#### **Earthing**

Requirement: To AS/NZS 3000. Provide temporary earthing during erection until the permanent earthing is installed.

#### **Protection**

General: Restore coatings which have been damaged by welding or other causes. Thoroughly clean affected areas back to base metal and coat with a zinc rich organic primer.

Metal separation: Install lagging to separate non-ferrous service pipes and accessories from the framing.

Grommets: Provide grommets to isolate piping and wiring from cold-formed steel framing.

Site cut holes: Provide plastic bushes or grommets to site cut holes.

### **21.3.2 WALL FRAMING**

#### **Wall studs**

General: Provide studs in single lengths without splices. Place a stud and a stiffened top plate under each structural load point from the roof or ceiling (except at openings). Provide multiple studs at points of concentrated load.

Maximum stud spacing: 600 mm.

#### **Heads to openings**

Requirement: Provide lintels appropriate to load and span.

#### **Additional support**

General: Provide additional support in the form of noggings, trimmers, studs and plywood for support and fixing of lining, cladding, hardware, accessories, fixtures and fittings as a minimum as follows:

- Timber nogging: Provide 240 x 40 mm timber nogging with proprietary stud fixing brackets for wall hung sanitary fittings.
- Provide 19mm marine grade plywood sheet with proprietary continuous nogging bracket for areas nominated for wall hung AV screens / interactive whiteboards / whiteboards with projectors over, grab rails and handrails and sanitary fittings and fixtures. Timber noggings and plywood sheets to span full size of the nominated wall hung fixture and over to the adjacent stud. Note: CCA treated timber should not be used with Rondo steel stud systems.
- Stud stiffening: Provide stud stiffening to support wall hung joinery units and wall hung AV screens / whiteboards with:
  - Plywood sheet nogging, 19mm marine grade.
  - Boxed steel lipped studs.
- Note: refer to the steel stud system manufacturer's design and installation requirements if unsure of the appropriate nogging to use due to the weight of the fixtures to be supported and comply with their recommendations.

#### **Vermin barriers**

Brick veneer barrier: Close nail steel wire mesh, with a maximum aperture of 10 mm, to the underside of the bottom plate of external stud walls, extending across the cavity for building into brickwork.

#### **Damp-proof course**

Requirement: Provide damp-proof courses under the bottom plate of stud walls built off slabs or masonry dwarf walls, as documented or as follows if not documented otherwise:

- External walls (not masonry veneer): Turn up a minimum of 75 mm on the inside and tack to studs. Project 10 mm beyond the external slab edge or dwarf wall and turn down at 45°.
- Walls of bathrooms, shower rooms and laundries: Turn up a minimum of 150 mm on the wet side and tack to studs.

Installation: Lay in long lengths. Lap full width at angles and intersections and at least 150 mm at joints.

Junctions: Preserve continuity of damp-proofing at junctions of damp-proof courses, sarking and waterproof membranes.

### Flashings

Location: Provide flashings to external openings sufficient to prevent the entry of moisture. Form trays at the ends of sill flashings.

### Cladding support

Requirement: Supply and fix Rondo battens over the structural framing, suitable for span, direction, spacing and proposed cladding material. Note: specific cladding may require appropriate proprietary framing system; refer Cladding worksections.

Materials:

Tophat 15 or a similar product equivalent in function, quality, etc to the approval of the Superintendent's Representative, at maximum 600 centres. Tophat width as required; BMT 0.75mm; lapped double span.

Tophat 25 or a similar product equivalent in function, quality, etc to the approval of the Superintendent's Representative, at maximum 600 centres. Tophat width as required; BMT 0.75mm; lapped double span.

Tophat 35 or a similar product equivalent in function, quality, etc to the approval of the Superintendent's Representative, at maximum 600 centres. Tophat width as required; BMT 0.75mm; lapped double span.

## 21.3.3 COMPLETION

### Cleaning

General: On completion of framing remove debris from any gaps between members and make sure void between bottom chord of roof trusses and top of any non-supporting internal wall is clear.

### Warranties

Requirement: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the supplier and the installer.

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: As offered by the supplier.

**22 STEEL PROTECTIVE PAINT COATINGS****22.1 GENERAL****22.1.1 RESPONSIBILITIES****General**

Requirement: Provide protective paint coatings for the protection of steel products and structural steelwork against interior and exterior atmospheric corrosion, as documented.

**Performance**

Requirement: Control atmospheric corrosion to structural steelwork and steel products until the first scheduled maintenance.

Period from application to first scheduled maintenance: 25 + years

**22.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other Worksections as appropriate.

**22.1.3 STANDARDS****General**

Surface preparation and coating: To AS/NZS 5131 Section 9 and the recommendations of AS 2312.1.

**Site testing of protective coatings**

Test methods: To AS 3894.

**22.1.4 INTERPRETATION****Abbreviations**

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

- ACA: Australasian Corrosion Association.
- DFT: Dry Film Thickness.
- ITP: Inspection and Test Plan.
- MIO: Micaceous Iron Oxide.
- NACE: National Association of Corrosion Engineers (USA).
- PDS: Product Data Sheet.
- SDS: Safety Data Sheet.
- SSPC: The Society for Protective Coatings (USA).
- µm: Micron (10-6m).

**Definitions**

General: For the purposes of this worksection the definitions given in AS/NZS 2310 and the following apply:

- Coating contractor: The protective coatings application contractor conducting the on or off-site coating application works.
- Coating manufacturer: Dulux Protective Coatings.
- Inspection and test plans (ITP): A series of formal inspection and test plans, prepared by the coating contractor to reflect the specific inspection and testing that will be carried out on the surface preparation, coating application and the record keeping tasks to be undertaken.
- Safety data sheet (SDS): Prepared in conformance with Safe Work Australia's requirements and distributed by the coating manufacturer to provide information on the safe handling, storage, personal protective equipment requirements, use and disposal of a coating product. Previously called a material safety data sheet (MSDS).

**22.1.5 QUALITY ASSURANCE****General**

Standard: Applicator Quality Assurance system to AS/NZS ISO 9001.

Applicator's quality assurance officer: Nominate a qualified NACE Certified Coating Inspector or a ACA Certified Coatings Technician under direction of a NACE inspector.

Records: Maintain records:

- Access: Have records available for inspection.

Verification: Nominate an independent NACE Certified Coating Inspector to carry out quality audits.

Defects: Provide written inspector reports.

The Contractor shall be responsible for design, controlling the work and ensuring that the work is carried out and the quality of the finished work all conforms to this Specification, the drawings and the Contractors Quality System to the approval of the Superintendent's Representative.

It is a requirement of the Contract that an Independent Third-Party Coating Inspector be appointed by the Contractor to carry out inspections of the steelwork at all stages of surface preparation and coating processes.

The Contractor will be responsible for giving seven (7) days' notice to the Third Party Coating Inspector that works and inspection activities will begin. The Contractor must give a minimum 48 hours' notice for all inspections of batch steelwork thereafter.

The completed work shall comprise only those materials, items, components, composite systems and the like that are warranted by the manufacturer and/or installer to be free of defects or faulty, installation and the consequence thereof including but not limited to water penetration, physical deterioration and displacement of materials or components.

### **Coating inspector**

The Subcontractor's coating inspector shall be ACA qualified or NACE Certified Coating Inspector level 2 or equivalent.

The Contractor's third-party coating inspector shall be a NACE Certified Coating Inspector Level 3.

Evidence of all coating inspector's qualification shall be submitted to the Principal 21-days in advance of anticipated commencement of works.

## **22.1.6 SUBMISSIONS**

### **Execution details**

Detailing features: If design and fabrication features of the items to be coated may lead to difficulties, identify these and submit details for improvement.

Repair of damaged coating: If the protective coating is damaged, submit a coating repair proposal, based on the coating manufacturer's recommendations for reinstating the corrosion protection function of the system.

Reinstatement: If final coat varies from the submitted sample, submit proposals for reinstatement of the visible final coating system.

### **Maintenance painting**

Existing steelwork: Identify, itemise and submit details of areas of corrosion, damage and other degradation.

Recoating systems: Submit details of coating systems for maintenance painting of previously coated items and structural elements, including surface preparation.

### **Products and materials**

Multi-component coatings: If partial mixing of packs is proposed, submit details.

### **Quality**

ITPs: Submit for each proposed coating system.

Quality supervisor: Submit the name and record of experience of the person responsible for the implementation of the ITPs.

### **Records**

General: Prepare and maintain records of all surface preparation and coating application works, as follows:

- Standards: To AS 3894.10, AS 3894.11, AS 3894.12, AS 3894.13 and AS 3894.14.
- Reference the relevant parts of the ITP and record conformance.

### **Samples**

Painting and coating colour: Submit a 400 x 400 mm sample of the finished product for each coating system.

Retention: Retain half of each sample for comparison during coating application.

### **Subcontractors**

General: Submit names and contact details of proposed suppliers and applicators.

Evidence of experience: Submit details of project experience with the application of the specified coating system including project details and date of application and the coating system applied.

Requirement: Submit proof of currency of the applicator's environmental operating licence.

Substrate acceptance: Submit evidence of applicator's acceptance of the coating substrate before starting installation.

#### **Coating inspector**

Submit evidence of the coating inspector's qualification to the Superintendent 21-days in advance of anticipated commencement of works.

#### **Inspection and test plan**

Prior to initiation of the protective coating works, and after approval of submittals, the Contractor's quality control manager shall provide an Inspection and Test Plan. The Inspection and Test Plan shall describe work method statements, referenced inspection standards, inspector qualifications, testing equipment and procedures, environmental and health and safety control systems and reporting procedures.

Time for submission: 14 days prior to commencement of preparation and coating.

#### **Samples**

General: Submit samples as follows:

- Samples for painting types and typical locations, where determined by the Superintendent's Representative.
- Samples shall be applied in conditions approximating as closely as possible the conditions of the finished work.
- Test Samples shall include the suitable preparation of substrates.

#### **Warranties**

General: Submit the warranty specified at the end of this Worksection.

### **22.1.7 INSPECTION**

#### **Notice**

Inspection: Give notice so that inspection may be made of the following:

- As documented.

## **22.2 PRODUCTS**

### **22.2.1 GENERAL**

#### **Product substitution**

Other products: Conform to PRODUCTS, **GENERAL, Substitutions** in *General requirements*.

#### **Storage and handling**

General: Store in a cool shady place.

Care: Handle, store, mix and apply all protective coatings in conformance with Dulux recommendations.

Original containers: Deliver coating products to site in manufacturer's labelled and sealed containers.

Ambient temperature range for storage: 15°C to 25°C.

Sunlight: Protect coating materials from direct sunlight before mixing or adding the converter (catalyst).

Use-by-date: Use products with limited shelf life before their use-by-date, unless written authorisation from the coating manufacturer's technical services section is provided.

#### **Paint material**

Requirement: To AS/NZS 5131 clause 9.9.3.

#### **Proprietary products**

Substitution: Dulux paint products and specified coatings systems have been selected for this project and unauthorised product substitution will jeopardise or void the Warranties.

Product data sheets (PDS): Keep on site copies of all relevant Dulux technical data sheets.

Safety data sheets (SDS): Keep on site copies of all relevant Dulux SDS's.

Recording: To AS/NZS 5131 clause 9.9.5.

## 22.3 EXECUTION

### 22.3.1 GENERAL

#### Sample approval

No painting of the substrate type shall commence until the sample is approved by the Superintendent's Representative

#### Product warnings

Requirement: Conform to the requirements and recommendations of the relevant Dulux [SDS](#).

#### Qualifications

Requirement: All work is to be completed by suitably qualified professionals holding TAFE or other recognised qualifications.

#### Surroundings

Protection: Prevent the release of abrasives, overspray or paint waste debris into the air, ground or to any watercourse. Prevent damage to other assets, services or equipment.

Reinstatement: Repair and/or clean affected surrounding areas.

#### Working area

General: Perform all painting under cover and/or protected from rain, condensation, dew, excessive wind, overspray or wind-blown dust.

Period: Continue protection where any of these conditions exist until the coating is no longer affected.

### 22.3.2 SURFACE PREPARATION

#### General

Requirement: Conform to AS/NZS 5131 clauses 9.3, 9.4 and 9.5.

#### Treatment grade to AS/NZS 5131: P3

Surface cleansing: Wash and degrease all surfaces to be coated, to AS 1627.1, with a free-rinsing, alkaline detergent, such as Gibson F310B or Gamlen CA No. 1 used in conformance with the manufacturer's written instructions and all safety warnings.

Bolts: Provide washers at heads and nuts at replacement bolts.

#### Galvanized, aluminium and zinc primed surfaces

Requirement: Remove grease, oil and other solvent-soluble contaminants to AS 1627.1. Allow to dry and immediately proceed with the next operation.

Galvanized and aluminium surfaces: Abrade surfaces to a medium coarse type finish to provide an adhesion key.

Zinc primed surfaces: If present, remove zinc salts from zinc primers.

#### Treatment of welds

Requirement: Clean welds to remove roughness, using power tools to AS 1627.2. Remove filings by vacuuming or compressed air.

Temporary welds: Grind flush any temporary welds.

Porous, skip or stitch welds: Not permitted.

Site welding: If possible, avoid site welding. If on site welding is required, prepare and treat the weld to AS/NZS 5131 clause 9.12.2.

#### Shop priming

Requirement: Dust off and apply a coat of primer, according to the technical specification.

#### Site coating

General: High pressure wash down all surfaces with clean water. Lightly sand down primer/intermediate coats, which have been shop applied, before site application of next coat.

### 22.3.3 PREPARATION ASSESSMENT

#### General

Conformance: Assess all surfaces of each steel member for conformance with the documented preparation requirements.

#### Abrasive blast cleaning

Assessment: To AS 1627.4 and AS 1627.9.

Minimum acceptance class: Sa 2.5.

**Mechanical cleaning**

Assessment: To AS 1627.9 and ISO 8501-2.

Minimum acceptance class: St 2.

**Surface profile**

General: To AS 3894.5 Method A.

Acceptable profile range: 35 to 65 µm.

**Surface dust from abrasion**

General: To AS 3894.6 Method C.

Rating criteria for rejection of surface treatment: 2

**Chloride level testing**

Test: To AS 3894.6 Method A.

Maximum allowable chloride levels: 50 mg/m<sup>2</sup> for critical applications (heavy condensation, fresh water ponding or immersion) or to manufacturer's recommendations.

Conformance: If the maximum allowable chloride is exceeded, rewash the affected surface area until the chloride level is within the acceptable limits using clean water or chloride neutralising solutions.

Jet-washing or steam cleaning is also acceptable before re-testing and re-abrasive blasting.

Timing of testing: Early in the blasting work so that removal procedures can be started before the blasting is completed.

**22.3.4 MIXING****General**

Requirement: To AS/NZS 5131 clause 9.9.6.

Powered agitators: Mix package sizes larger than 4 litres using powered agitators driven by air motors.

Multi-component coatings: Combine as whole pack units before application.

Thinners: If addition of thinners is proposed, conform to the Dulux PDS for the documented product.

Colour consistency: If colour consistency is required, pre-mix tinted products, before the addition of the curing agent or converter and before coating application.

**22.3.5 COATING APPLICATION****General**

Requirement: Conform to the Dulux PDS, the Dulux specification and AS/NZS 5131 clause 9.9.

Painting and coating colour: Verify all project finish colours with the retained samples.

**Final surface preparation or coating application**

Limits: If the environmental/climatic/substrate conditions listed in AS/NZS 5131 clause 9.9.10 and the following are present do not apply coating:

- Ambient air temperature below 5°C or above 40°C.
- Substrate temperature below 5°C or above 35°C.
- Full prime coat application cannot be carried out before the specified cleanliness of the surface deteriorates.
- Surface preparation standard has not been achieved.
- Time between final surface preparation and the commencement of coating has exceeded 4 hours.
- Visual tarnishing or black spots develop on the surface of the steel.

Exception: Preliminary blast or other surface preparations may be performed in conditions that are outside the limits, providing the final surface preparation and all coating applications are undertaken under the limit conditions.

Pre-coating: Before the spray application of each coating, stripe coat by brush method all edges, welds, seams, rivets, bolts, boltholes (including slots) and difficult to spray areas. Prime the underlying surfaces of replacement bolting, washers and nuts before installation.

Procedure: Conform to the coating order shown in **SELECTIONS, PROTECTIVE PAINT COATING SYSTEMS**.

Subsequent coats: Make sure that before any subsequent coating layer is applied, the surface condition of the preceding coat is complete and correct in all respects, including its DFT achievement, cleanliness and freedom from defects. These are detailed on the Dulux Protective Coating specification. Depending on the applicators chosen method additional coats may be required to achieve the nominated minimum DFT.

Conformance: To AS 2312.1 for the specified film thickness of individual coats.

Correction: Correct any defect in a coating layer before the subsequent coating layer is applied.

#### **Wet film thickness (WFT)**

Method of measurement: To AS 3894.3 Appendix C using an approved wet film gauge continuously during application.

#### **Dry film thickness (DFT)**

Method of measurement: To AS 3894.3 clause 10.

Extent: Measure all surfaces at the completion of each prime, intermediate and finish coats, including areas of the element difficult to paint, masked by structure, or where double or light coating is likely.

Number of measurements: To AS 3894.3 clause 7.

Coatings with DFT 150 µm or less: If testing, deduct the effect of the measured surface profile from all DFT readings.

Single readings: Conform to the following:

- The average of 5 point readings for each 10 m<sup>2</sup> area of coating surface to be within the documented coating thickness range.
- No single point reading in any 10 m<sup>2</sup> to be less than 80% of the specified minimum coating thickness. If the average of three readings is used to produce a point reading, an individual reading may be less than 80% of the minimum coating thickness.
- Check any single reading that is greater than 150% of the documented maximum DFT with three additional readings within 50 mm of the original reading. If the average of these three readings is not greater than 150% of the specified DFT, take the average reading as the point reading. If greater than 150%, reject the DFT for that area. If no maximum limit for DFT is documented, consult manufacturer.

#### **Rectification and defects**

Rectification: Re-work areas rejected, using the same surface preparation, coatings and sequence as for the original work.

Defects (including under-thickness and over-thickness): Mark with dustless chalk, adhesive inspection labels or masking tape. Do not use crayon, paint or spirit based ink pens.

**Defects for rejection: Dry spray, splatter, inclusions, lumps, excessive orange peel or other visually unattractive defects.**

### **22.3.6 PROTECTION**

#### **Contamination**

Surfaces: Prevent contamination of coated surface, which are not yet dry, from blasting dust, abrasive or surface preparation debris and any other foreign matter.

#### **Post application care**

General: Protect the coating against physical, chemical, or atmospheric damage until all components are fully cured.

Care: Stack and handle all coated items using fabric slings or padded chains. Use soft packaging, carpet strips or other deformable materials between all coated items.

Water ponding: Stack coated items to prevent water ponding.

### **22.3.7 COATING REPAIR**

#### **Repair of coating damage**

Preparation: Feather back by hand or machine sanding all leading edges of intact coating adjacent to the repair, to remove any sharp edge.

Surface contamination: Remove by dusting or blowing down before applying the first coat of paint.

Sequence: Apply the repair coating in the same sequence and manner as the original coating.

Areas damaged without exposing the primer: Wash with a proprietary detergent solution, rinse with clean water and abrade so that edges of sound paint are feathered. Coat the area with the appropriate intermediate and finishing coat materials.

Areas damaged exposing the primer or steel surface: Blast clean to the original standard. Prepare at least 50 mm into the sound coating and to a further feathering zone of approximately 50 mm. Recoat with the documented system to restore the film thickness and integrity over the whole prepared surface including the feathered zone.

Aesthetic reinstatement: If required, repaint to a physical or discernible boundary line.

Defects: If corrosion pitting or areas of significant metal loss and defects are exposed by the blasting process, advise for inspection and have areas passed as being fit for service before proceeding with the coating system.

Timing: Apply the Dulux Protective Coating system within 4 hours of blast cleaning or in any case before visual tarnishing of the steel occurs.

Cleaning: Provide, at no additional cost, surface treatment as follows:

- Surfaces left longer than four hours: Re-blast cleaning before coating.
- Surfaces that develop visual tarnishing (red rust or black spots) at any time before coating: Wash down with clean water then blast clean before coating. There are commercially available chloride reducing solutions that may assist.

### 22.3.8 COMPLETION

#### General

Joints: On completion, seal all joints and mating surfaces with a compatible polyurethane sealant.

#### Warranties

Requirement: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the supplier and the applicator.

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: 10 years

## 22.4 SELECTIONS

### 22.4.1 PROTECTIVE PAINT COATING SYSTEMS

#### Gloss polyurethane

Coastal AS 2312.1 Categories C3, C4 and C5: Steel protection and decoration using a MIO finish, using the products shown in the schedule below

Location	Primer	Second Coat	Third Coat	Duspec No.
Exterior Decorative (PC2)	75 µm DULUX Zincanode 402 DI0539	200 µm DULUX Duremax GPE Pc255 Two Pack Epoxy DI1115	125 µm DULUX Weathermax HBR two pack gloss DI1156	SI1398

### 22.4.2 SCHEDULES

#### Protective paint coating schedule

Property	PC2
Atmospheric corrosivity category to AS 2312.1	C3
Level/grids/reference	Refer to the drawings
Protective paint coating system	Gloss polyurethane
Location	All external exposed steel and window box
Colour (To AS 2700)	To future colour schedule

#### Steelwork buried or encased

Steelwork that is buried, encased, or in contact with masonry, soil or grout, whether galvanised or not, requires isolation from alkaline materials with 400 µm of high build epoxy. AS 1627.4 Sa 3 abrasive blasting cleanliness is required for carbon steel. Galvanised steel shall be lightly blasted (Sweep

blasted as per AS/NZS 4680) so that it resembles a dull matt finish prior to coating with the high build epoxy (HBE400).

**23 WATERPROOFING – EXTERNAL AND TANKING****23.1 GENERAL****23.1.1 RESPONSIBILITIES****General**

Requirement: Provide external waterproofing and tanking systems to substrates, as documented.

**Performance**

Requirements: Conform to the following:

- Graded to falls to dispose of stormwater without ponding above the depth of lapped seams.
- Able to accommodate anticipated building movements.
- Able to accommodate its own shrinkage over the warranty life of the roofing system.
- Able to resist water under hydrostatic pressure.

**23.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**23.1.3 STANDARDS****External waterproofing**

Membrane materials: To AS 4654.1.

Membrane design and installation: To AS 4654.2.

**23.1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given in AS 4654.1 and AS 4654.2 and the following apply:

- Bitumen: A viscous material from the distillation of crude oil comprising complex hydrocarbons, which is soluble in carbon disulphide, softens when it is heated, is waterproof and has good powers of adhesion. It is produced as a refined by-product of oil.
  - . APP Bitumen: Bitumen modified with atactic (meaning non-crystalline or amorphous) polypropylene wax to form a plastomeric sheet. The membrane is reinforced with fibreglass or non-woven polyester (NWP).
  - . SBS bitumen: Bitumen modified with Styrene Butadiene Styrene, a thermoplastic rubber that undergoes a phase inversion at elevated temperature and converts to an elastomeric material. The membrane is reinforced with fibreglass or non-woven polyester (NWP).
- Bond breaker: A system preventing a membrane bonding to the substrate, bedding or lining.
- Double detail joint: A joint formed by turning up and bonding the horizontal membrane to a vertical substrate and adding an overflashing of membrane material bonded to the vertical substrate and folded over and bonded to the horizontal membrane. In certain situations the double detail can be achieved by bonding an angle profile of membrane material to the junction prior to laying the membrane.
- Liquid applied: A water-based formulation which cures to form an elastomeric membrane.
- Polyurethane: Water or solvent based formulations which moisture cure to form an elastic rubber membrane.
- PVC membrane: Flexible plastic sheet membrane (vinyl).
- Slip sheet: A sheet used to isolate the membrane system from the supporting substrate or from the topping or mortar bedding. The most common material is polyethylene.
- Substrate: The surface to which a material or product is applied.

**23.1.5 SUBMISSIONS****Products and materials**

Manufacturer's documentation: Submit copies of the following data:

- Product technical data sheets.

- Safety data sheets (SDS).
- Preventative maintenance procedures.
- Instructions and procedures for the repair of the membrane.
- Type test certificates verifying compliance with AS 4654.1 Section 2, Tables 2.1 to 2.3.

**Records**

Placing records: Photographically record the application of membranes and label with the following information:

- Date.
- Portion of work.
- Substrate preparation.
- Weather during application and curing.
- Protection provided from traffic and weather.

Liquid membrane applications:

- Record wet film thickness once every 10 m<sup>2</sup> and compare to the manufacturers requirements.
- On completion of every 100 m<sup>2</sup> of each coat compare the amount of membrane used with the manufacturer's application rate and record the result.

**Warranties**

Requirement: Submit warranties to **COMPLETION, Warranties.**

**23.1.6 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of following:

- Before membranes are covered up or concealed.

**23.2 PRODUCTS****23.2.1 GENERAL****Storage and handling**

General: Store and handle to the manufacturer's recommendations and as follows:

- Protect materials from damage.

**23.2.2 MEMBRANES****Tanking systems**

Requirement: Provide a proprietary membrane system suitable for the intended below ground tanking.

**Certificate:** A current BRANZ appraisal certificate

**23.2.3 ACCESSORIES****Control joint covers**

Corners, crossovers, tees and bends: Factory mitred, welded and provided with 500 mm legs.

End closures: Factory folded and sealed to match joint cover profile.

**23.3 EXECUTION****23.3.1 PREPARATION****Substrates**

General: Prepare substrates as follows:

- Fill all cracks in substrates wider than 1.5 mm with a filler compatible with the membrane system.
- Fill voids and hollows in concrete substrates with a concrete mix not stronger than the substrate.
- Remove projections.
- Remove deleterious and loose material.
- Remove all traces of a concrete curing compound if used.
- Leave the surface free of contaminants, clean and dust free.

Concrete substrates: Cure for more than 28 days.

**Moisture content**

Requirement: Verify that the moisture content of the substrate is compatible with the water vapour transmission rate of the membrane system by testing to AS 1884 Appendix A.

**Falls**

Requirement: Verify that falls in substrates are greater than 1:80.

**Joints and fillets**

External corners: Round or arris edges.

Control joints: Prepare all substrate joints to suit the membrane system.

**Priming**

Compatibility: If required, prime the substrates with compatible primers for adhesion of the membrane system.

**23.3.2 APPLICATION****Protection during installation**

Damage: Protect membrane from damage during installation and for the period after installation until the membrane achieves its service characteristics that resist damage.

**Sheet membrane joints**

Orientation of laps: Lap sheets on the upslope side of the roof fall over sheets on the downslope side.

End laps generally: Stagger end lap joints.

Bituminous sheet membranes:

- Side laps: 75 mm.
- End laps: 100 mm.
- Method: Heat welded.

Synthetic rubber membranes:

- Factory-vulcanized laps: More than 40 mm.
- Field side laps: More than 50 mm for side laps.
- Field end-laps: More than 100 mm for end laps.

PVC membranes:

- Factory welded laps: More than 30 mm.
- Field-welded laps:
  - . If used over insulation boards: More than 100 mm.
  - . Other instances: More than 75 mm overlaps.

**Curing of liquid applied systems**

General: To the manufacturers' instructions.

**Control of movement**

General: Provide control joints located over control joints in the substructure.

Fillets and bond breakers: Size to allow the membrane to accommodate movement.

Control joint covers: Install after fixing hobs and membranes.

Bonded membranes: Carry control joints in the substrate through to and into the surface finish.

**Membrane terminations**

Membrane upturns: Provide upturns above the maximum water level expected from the exposure conditions of rainfall intensity and wind.

- Height: To AS 4654.2 Appendix A, Table A1.
- Anchoring: Secure sheet membranes along the top edge.
- Edge protection: Protect edges of the membrane.

Waterproofing above vertical terminations: Waterproof the structure above the termination to prevent moisture entry behind the membrane using cavity flashings, capping, waterproof membranes or waterproof coatings.

Horizontal terminations: Do not provide. Use vertical terminations.

**Membrane vertical penetrations**

Pipes, balustrades, ducts, and vents: Provide separate sleeves for all pipes, ducts and vents, and fix to the substrate.

**Membrane horizontal penetrations**

Sleeves: Protect rigid PVC-U conduits and pipes with a sleeve of SBS bitumen in order to seal to the membrane without burning the PVC-U. Do not use high density polyethylene (HDPE), polypropylene (PP) pipes or flexible PVC conduit.

**Membrane to below ground structures**

Membrane: Externally apply membrane to all walls and return to horizontal surfaces to prevent water tracking around structure at joints and corners.

Protection board: Provide protection board to the full extent of the membrane.

Drainage cell: Provide geo-filter fabric wrapped drainage cell to vertical surfaces of the structure.

Reinforcement: Provide reinforcement to the membrane at junctions, corners and over joints to the manufacturer's recommendations.

**23.3.3 COMPLETION****Protection**

General: Keep traffic off membrane surfaces until bonding has set or for 24 hours after laying, whichever period is the longer.

Reinstatement: Repair or replace faulty or damaged work. If the work cannot be repaired satisfactorily, replace the whole area affected.

**Warranties**

Waterproofing: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the supplier and the applicator.

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: As offered by the supplier.

**23.4 SELECTIONS**

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**23.4.1 WATERPROOF MEMBRANE SYSTEMS****General**

All products must be installed in strict accordance with the waterproof membrane system manufacturers instructions.

**23.4.2 RETAINING WALLS (20 YEAR WARRANTY)****Retaining walls**

Apply Tremco or product equivalent in function and quality to the approval of the Superintendent's Representative to basement walls and retaining walls below grade.

- Apply Paraseal LG to all walls and footings.
- Ensure walls have a smooth surface, remove burs and fill any depressions/holes with High build mortar.
- Apply the Paraseal LG on the walls with the Bentonite facing towards the inside of the building. Lap the sheets 50mm and seal with permanent seam tape.
- Seal around penetrations in accordance with manufacturers instructions.
- Finish upper edge with Tremco Termination bar onto pile cap.

**Protection**

Damage: protect membrane from physical or chemical damage during installation and as a permanent application.

**24 ROOFING – PROFILED SHEET METAL****24.1 GENERAL****24.1.1 RESPONSIBILITIES****General**

Requirement: Provide a profiled sheet metal roofing system and associated work, as documented.

**24.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**24.1.3 TOLERANCES****Sheet metal roofing**

Supporting members: To AS 1562.1 clause 4.2.3.

**24.1.4 SUBMISSIONS****Operation and maintenance manuals**

On completion: Submit a manual of recommendations from the roofing manufacturer or supplier for the maintenance of the roofing system including, frequency of inspection and recommended methods of access, inspection, cleaning, repair and replacement.

**Products and materials**

Type tests: As appropriate for the project, submit evidence of conformity to the following:

- Metal roofing generally: Roof sheeting and fastenings to AS 1562.1 clause 5.4 for resistance to concentrated load and to AS 1562.1 clause 5.5 for resistance to wind pressure.
- Metal roofing in cyclonic regions to AS/NZS 1170.2: Roof sheeting and fastenings to AS 1562.1 clause 5.6.
- Plastic sheet roofing: Roofing and fastenings to AS 1562.3 Section 5 for resistance to wind forces and resistance to impact.

**Samples**

Requirement: Submit samples of the following:

- Custom profiled flashings and cappings.
- Sheet metal finishes showing the range of variation available.
- Sealants.
- Trims and accessories with a colour finish.

**Warranties**

Requirement: Submit the following:

- Submit a warranty complying with the terms specified at the end of this worksection.

Roofing materials: Submit the manufacturer's product warranties.

**24.1.5 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Roof supports.
- The parts of the roofing, sarking, vapour barrier, insulation and roof plumbing installation before covering up or concealing.

**24.2 PRODUCTS****24.2.1 GENERAL****Product substitution**

Other products: Conform to **SUBSTITUTIONS** in *General requirements*.

**Storage and handling**

Storage: Store metal roofing materials, as follows:

- Away from uncured concrete and masonry, on a level base, and not in contact with other materials that cause staining, denting or other surface damage.

Handling: Handle metal roofing materials as follows:

- Use gloves when handling precoated metal roofing material.
- Use soft soled shoes when fixing or working on roofs.
- Protect edges and surfaces from damage. Do not drag sheets across each other or over other materials.

#### Product identification

General: Marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.

#### Safety mesh

Standard: To AS/NZS 4389.

### 24.2.2 SHEET METAL ROOFING

#### Standards

Design and materials: To AS 1562.1.

#### Product

Proprietary steel roofing: LYSAGHT steel roofing or product equivalent in function and quality to the approval of the Superintendent's Representative.

#### Fasteners

Prefinished exposed fasteners: Finish with an oven baked polymer coating to match the roofing material.

steel roofing fasteners:

- Type, size, corrosion resistance class and spacing: To the cladding manufacturers recommendations.

#### Profiled fillers

Type: Purpose-made closed cell polyethylene foam profiled to match the roofing profile.

Location: Provide profiled fillers under flashings to the following:

- Ridges.
- Eaves.

### 24.2.3 ROOF PLUMBING

#### General

Description: Flashings, cappings, gutters, rainheads, outlets, downpipes and accessories necessary to complete the roofing system.

Flashing and capping: Notched to match profile of roof sheeting.

#### Standards

Roof drainage: To AS/NZS 3500.3.

Metal rainwater goods: To AS/NZS 2179.1.

Flashings and cappings: To AS/NZS 2904.

### 24.2.4 ROOF ACCESS

#### Walkways

Description: A proprietary roof walkway system including fixings.

## 24.3 EXECUTION

### 24.3.1 INSTALLATION

#### Protection

General: Keep the roofing and rainwater system free of debris and loose material during construction.

**Thermal movement**

Requirement: Allow for thermal movement in the roof installation and the structure, including movement in joints and fastenings.

**Pan type sheets**

Removal: Install sheets so that individual sheets can be removed without damage.

**Metal separation**

Requirement: Prevent direct contact between incompatible metals, and between green hardwood or chemically treated timber and aluminium or coated steel, by one of the following methods:

- Applying an anti-corrosion, low moisture transmission coating to contact surfaces.
- Inserting a separation layer.

**24.3.2 SHEET METAL ROOFING****Roof sheet installation**

Standard: To AS 1562.1.

steel roofing: To the manufacturer's recommendations.

Swarf: Remove swarf and other debris as soon as it is deposited.

Accessories: Provide accessories with the same finish as roofing sheets to complete the roofing installation.

Provide continuous length sheets.

**Ridges and eaves**

Sheet ends: Treat as follows:

- Project sheets 50 mm into gutters.
- Close off ribs at bottom of sheets using mechanical means or with purpose-made fillers or end caps.
- Turn pans of sheets up at tops and down into gutters by mechanical means.
- Pre-cut notched eaves flashing and birdproofing if required.
- Close off ridges with purpose-made ridge fillers of closed cell polyethylene foam.

**Ridge and barge**

Capping: Finish off along ridge and verge lines with purpose-made ridge capping or barge rolls.

**24.3.3 ROOF PLUMBING****Jointing sheet metal rainwater goods**

Butt joints: Make joints over a backing strip of the same material.

Sealing: Seal fasteners and mechanically fastened joints. Fill the holes of blind rivets with silicone sealant.

Jointing system: Blind rivet and seal using aluminium blind rivets

**Flashings**

Installation: Flash roof junctions, upstands, abutments and projections through the roof. Preform to required shapes if possible. Notch, scribe, flute or dress down as necessary to follow the profile of adjacent surfaces. Mitre angles and lap joints 150 mm in running lengths. Provide matching expansion joints at 6 m maximum intervals.

Upstands: Flash projections above or through the roof with two part flashings, consisting of a base flashing and a cover flashing, with at least 100 mm vertical overlap. Provide for independent movement between the roof and the projection.

Large penetrations in low pitch roofs: Extend the base flashing over the roofing ribs to the ridge to prevent ponding behind the penetrating element.

Wall abutments: Where a roof abuts a wall, provide over flashing as follows:

- In masonry walls, planked cladding or concrete: Step in courses to the roof slope. Interleave with damp proof course, if any.
- Raking in masonry: Build into the full width of the outer leaf. Turn up within cavity, slope inward across the cavity and fix to or build into the inner leaf at least 75 mm above the roofing line.
- Raking in concrete: Turn 25 mm into joints or grooves, wedge at 200 mm centres with compatible material and point up.

Fixing to pipes: Solder or seal with neutral cured silicone rubber and secure with either of the following:

- Clamping ring.

- Proprietary flexible clamping shoe with attached metal surround flashing.

### Gutters

Gutter and sump support: Provide framing and lining to support valley gutters, box gutters and sumps. Line the whole area under the gutters and sumps.

Box gutter: Prefabricate box gutters to the required section and shape as follows:

- Form stop ends, downpipe nozzles, bends and returns.
- Dress downpipe nozzles into outlets.
- Overflows: Provide overflows to prevent back-flooding. Size to pass 100% of the design rainfall. Discharge overflows in visible locations and so water does not enter the building or cause damage to the building.
- Sumps: Minimum 150 mm deep and the full width of the box gutter.

Expansion joints in guttering longer than 30 m: Provide as follows:

- Type: Refer to the drawings

### External downpipes

General: Prefabricate downpipes to the required section and shape where possible. Connect heads to gutter outlets and, if applicable, connect feet to rainwater drains.

Access cover: Provide a removable watertight access cover at the foot of each downpipe stack.

Downpipe support: Provide supports and fixings for downpipes.

### Internal downpipes

Jointing method: PVC solvent

Access: Provide access openings as follows:

- At each junction and bend.
- At the foot of each stack.

Acoustic insulation: Mineral fibre pipe insulation 50 mm thick, spirally bound on with 1.5 mm wire at 150 mm pitch.

Building in: If pipes are built into masonry or concrete, spiral wrap the pipe (and insulation, if any) with building paper.

### Rainwater disposal

System: refer to the drawings

## 24.3.4 TESTING

### Site tests

Internal downpipes: Test each stack hydrostatically in stages, each test to run over two storeys high for two hours. Remedy defects and retest if necessary.

## 24.3.5 COMPLETION

### Reinstatement

Extent: Repair or replace damage to the roofing and rainwater system. If the work cannot be repaired satisfactorily, replace the whole area affected.

Damage to pre-painted finish: Replace panels with scratches in the pre-painted finish greater than 2 mm in width visible from the ground.

Fasteners: Make sure weather tight and external panel facings are not distorted.

### Cleaning

Roofing and rainwater drainage system: Remove debris, metal swarf, solder, sealants and unused materials.

Exposed metal surfaces: Clean surfaces of substances that interfere with uniform weathering or oxidation.

Roof plumbing: Clean out spoutings, gutters and rainwater pipes after completion of roof installation.

### Warranties

Requirement: Provide warranties for materials and workmanship in the form of interlocking warranties as follows:

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: 10 years

**24.4 SELECTIONS****24.4.1 PRODUCT****LYSAGHT profiled sheet steel roofing schedule**

Property	MRS 01	MRS 02	
Location	Refer to the drawings	Refer to the drawings	
Profile	Lysaght Spandek	Trimdek	
Material	Coated steel	Zinc coated steel	
Base metal thickness (BMT) (mm)	0.48	0.48	
Colour	Surfmist	Surfmist	
Fasteners	Class 4 colour coded to match roof sheeting	Class 4	

**24.4.2 ROOF PLUMBING****Flashing and capping schedule**

Property			
Type	Refer to the drawing and the sheet manufacturers recommended profiles		
Material	Colorbond steel		
Thickness and grade	0.48		
Colour	To match roof cladding		

**Roof plumbing schedule**

Item	Type		Material	Thickness/Grade	Colour/Shape/Size
Box gutter	Refer to the drawings		Colorbond steel	0.6	To match roof cladding/Refer to the drawings
Sump	Refer to the drawings		Colorbond steel	0.6	To match roof cladding/Refer to the drawings
Downpipe	Refer to the drawings		HDG steel	Refer to the drawings	Refer to the drawings

**25 DANPALON ROOFING - GLAZED****25.1 GENERAL****25.1.1 RESPONSIBILITIES****General**

Requirement: Provide the Danpalon polycarbonate roof glazing system, as documented.

**25.1.2 COMPANY CONTACTS****Danpalon technical contacts**

Website: [danpal.com.au/contact-us](http://danpal.com.au/contact-us)

**25.1.3 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**25.1.4 STANDARDS****General**

Design and installation: To AS 1562.3.

Polycarbonate: To AS 4256.5.

**25.1.5 MANUFACTURER'S DOCUMENTS****Technical manuals**

Brochures: [danpal.com.au/download-page](http://danpal.com.au/download-page)

Design details: [danpal.com.au/download-page](http://danpal.com.au/download-page)

Colour properties: [danpal.com.au/download-page](http://danpal.com.au/download-page)

Warranties: [danpal.com.au/download-page](http://danpal.com.au/download-page)

Further information and sample orders: [danpal.com.au/contact-us](http://danpal.com.au/contact-us)

**25.1.6 INTERPRETATION****Abbreviations**

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

- LT%: The percentage of visible light transmission (400 to 700 nm).
- SHGC: Solar heat gain coefficient.
- SR%: The percentage of total solar reflection (300 to 2800 nm).
- ST%: The percentage of total solar radiation transmission (300 to 2800 nm).

**25.1.7 SUBMISSIONS****Fire hazard properties**

Requirement: Submit evidence of conformance to PRODUCTS, **TRANSLUCENT PANEL SYSTEMS GENERALLY, Fire hazard properties.**

**Operations and maintenance manuals**

On completion: Submit Danpalon's recommendations for the maintenance of the roofing system including, frequency of inspection and recommended methods of access, inspection, cleaning, repair and replacement.

**Samples**

Finish: Submit samples of the roof glazing material showing the range of variation available.

**Warranties**

**Requirement: Submit the following:**

Translucent panel systems: Submit Danpalon's published product warranties.

**25.1.8 INSPECTION****Notice**

Inspection: Give notice so that the framing and anchor points may be inspected before they are covered up or concealed.

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## 25.2 PRODUCTS

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### 25.2.1 GENERAL

#### Product substitution

Other products: Conform to PRODUCTS, **GENERAL, Substitutions** in *General requirements*.

#### Storage and handling

Requirement: Store and handle materials to Danpal's recommendations and the following:

- Protect materials including edges and surfaces from damage.
- Keep dry and unexposed to weather.
- Do not drag sheets or panels across each other or over other materials.
- Sheeting: Stack flat and off the ground on at least 3 evenly placed bearers.

#### Product identification

General: Marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.

### 25.2.2 TRANSLUCENT PANEL SYSTEMS GENERALLY

#### Danpalon systems

Description: Proprietary polycarbonate glazing system comprising polycarbonate panels, associated aluminium or polycarbonate connecting profiles and other framing accessories.

Certification: CodeMark Certificate No. CM20115.

#### Fire hazard properties

Requirement: Conform to the following, tested to AS/NZS 1530.3.

- Ignitability Index: 0.
- Spread-of-flame Index: 0.
- Heat evolved: 0.
- Smoke-Developed Index: Maximum 5.

Group number: To AS 5637.1.

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## 25.3 EXECUTION

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### 25.3.1 PREPARATION

#### Substrate tolerance

Industry standards: Structural steel To AS/NZS5131

### 25.3.2 INSTALLATION

#### Danpalon requirements

Cutting and assembly: To the Danpalon installation specification.

### 25.3.3 COMPLETION

#### Cleaning

General: To Danpal's cleaning instructions.

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## 25.4 SELECTIONS

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### 25.4.1 PROPRIETARY STRUCTURAL SYSTEM - FREESPAN RAFTER SYSTEM

#### General

Danpalon panels: 16 mm Multicell panels, heat sealed at lower End

Panel lengths: Up to 12 000 mm.

Installed module width:

- With fasteners: 1042.

U-Value: 1.84 W/m<sup>2</sup>.K.

Colour: Ice

Solarspace System Components

Connectors:50mm U Connector (DPAC50).

16mm F Sections (DPAFS10),10mm End Cap (DPAEC10),16mm Stainless Steel Knee Fasteners,  
Aluminium U Connector End Capping

Colour: Powder Coated – Surf Mist

Rolling of Extrusions where required.

**26 CLADDING – COMBINED****26.1 GENERAL****26.1.1 RESPONSIBILITIES****General**

Requirement: Provide external wall cladding and associated work, as documented.

**26.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**26.1.3 INTERPRETATION****Abbreviations**

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

- AAC: Autoclaved aerated concrete.
- ACP: Aluminium composite panel.
- CCA: Copper chrome arsenate.
- CFC: Compressed fibre cement.
- EIFS: Exterior insulation and finish system.
- FC: Fibre cement.
- GRP: Glass fibre reinforced polyester.
- LOSP: Light organic solvent preservative.
- PVC-U: Unplasticised polyvinyl chloride.
- EPS: Expanded polystyrene.
- EPS-FR: Expanded polystyrene-fire retardant.
- GRP: Glass fibre reinforced polyester.
- MW: Mineral wool.
- PF: Phenolic foam.
- PIR: Rigid polyisocyanurate foam.
- PUR: Rigid polyurethane foam.
- PVC-U: Unplasticised polyvinyl chloride.
- XPS: Extruded polystyrene

**26.1.4 TOLERANCES****Permitted deviations**

Flat sheet and panel cladding: To the manufacturer's recommendations.

Insulated panel systems: To the manufacturer's recommendations.

Plank and weatherboard cladding: 5 mm from a 1.8 m straightedge or to manufacturer's recommendations.

Profiled metal sheet cladding: To AS 1562.1 clause 4.2.3.

Structural steelwork for wall cladding:  $\pm 5$  mm between bearing planes of adjacent supports.

**26.1.5 SUBMISSIONS****Fire performance**

Combustibility: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE, Combustibility**.

Fire hazard properties: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE, Fire hazard properties**.

Fire-resistance level: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE, Fire-resistance of building elements**.

**Operation and maintenance manuals**

General: Submit manufacturer's published use, care and maintenance requirements.

**Products and materials**

Type tests: As appropriate for the project, submit results of facade testing as follows:

- Water penetration to AS/NZS 4284 .
- Structural testing to AS/NZS 4284 .
- Resistance to wind pressure:
  - . For non-cyclone regions to AS 4040.2.
  - . For cyclone regions to AS 4040.3 .
- Resistance to impact to AS/NZS 4040.5.

**Prototypes**

General: Erect a prototype of each panel type, including at least one example of each component in the system to verify selections submitted as samples, to demonstrate aesthetic effects, to set quality standards for materials and execution, and to verify performance, including wind loading.

Inclusions:

- Typical components, attachments to building structure and methods of installation.
- Window opening with cladding panel, trim and returns.
- Sealant filled joint.

Type: each cladding type

Extent: steel cladding – approximately 2m in width; flat sheets – 2 full sheets edge to edge

Location: on site where directed by the Superintendent

**Warranties**

Submit a warranty complying with the terms specified at the end of this worksection.

Cladding materials: Submit the manufacturer's product warranties.

**26.1.6 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Framing, pliable membranes and insulation before covering up or concealing.
- Completion of a prototype.

**26.2 PRODUCTS****26.2.1 GENERAL****Storage and handling**

Requirement: Store and handle materials to the manufacturer's recommendations and the following:

- Protect materials including edges and surfaces from damage.
- Keep dry and unexposed to weather.
- Do not drag sheets or panels across each other or over other materials.
- Sheeting: Stack flat and off the ground on at least 3 evenly placed bearers.
- Store metal materials away from uncured concrete and masonry on a level base.
- Do not store metal materials in contact with other materials which may cause staining, denting or other surface damage.
- Use gloves when handling precoated metal cladding material.

**Components**

Cladding support: Provide components, as documented.

Fasteners and ties: Type, size, corrosion resistance class and spacing to the cladding manufacturer's recommendations.

Flashings: To AS/NZS 2904.

**26.2.2 FIRE PERFORMANCE****Combustibility**

Cladding: Tested to AS 1530.1.

**Fire hazard properties**

Group number: To AS 5637.1.

Bonded laminated materials: Tested to AS/NZS 1530.3. Fire hazard indices, as follows:

- Spread-of-Flame Index: 0.
- Smoke-Developed Index:  $\leq 3$ .

Insulation materials: Tested to AS/NZS 1530.3. Fire hazard indices as follows:

- Spread-of-Flame Index:  $\leq 9$ .
- Smoke-Developed Index:  $\leq 8$  if Spread-of-Flame Index  $> 5$ .

**Fire-resistance of building elements**

Fire-resistance level: Tested to AS 1530.4.

**26.2.3 FIBRE CEMENT (FC) SHEETS****General**

Requirement: Proprietary single faced fibre cement sheets.

Standard: To AS/NZS 2908.2 and the following:

- Type A Category 3.

Finish: Smooth and even, free of imperfections such as chips.

Sealant and bond breaking tape: To the manufacturer's recommendations.

**26.2.4 PROFILED SHEET METAL****General**

Requirement: Proprietary profiled sheet metal cladding.

Design and installation: To AS 1562.1.

**26.3 EXECUTION**

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**26.3.1 GENERAL****Preparation**

Substrates or framing: Before fixing cladding, check the alignment of substrates or framing and adjust if required.

Flexible underlay: Check that the underlay or insulation is restrained.

Cladding: Make sure the cladding is clean and free of dust and loose particles.

**Installation**

Standard: To AS 1562.1.

Requirement: Install cladding as follows:

- Fix sheeting firmly against framing to the manufacturer's recommendations.
- Plumb, level, straight and to documented tolerances.
- Fixed or anchored to the building structure in conformance with the wind action loading recommendations.
- Isolated from any building loads, including loads caused by structural deflection or shortening.
- Allow for thermal movement.

Cladding layout: Cut/fabricate and install cladding to suit the layout as documented.

Protection: Protect surfaces and finishes, including the retention of protective coatings during installation.

**Proprietary systems or products**

Requirement: Use panels and components from a single proprietary system and install to the manufacturer's recommendations.

**Accessories and trim**

Requirement: Provide accessories and trim required to complete the installation, or as documented.

Corner flashing for profiled and seamed metal sheets: Finish off at corners with purpose-made folded flashing strips.

**Metal separation**

Requirement: Prevent direct contact between incompatible metals, and between green hardwood or chemically treated timber and aluminium or coated steel, by either of the following methods:

- Apply an anti-corrosion, low moisture transmission coating to contact surfaces.
- Insert a separation layer.

Incompatible metal fixings: Do not use.

#### **Horizontal cladding**

Horizontal cladding surface:

- Minimum slope: 1:15.
- Staining: Slope away from visible vertical facade areas to prevent staining.

#### **Defective and damaged parts**

Defective components: Do not install component parts which are defective, including warped, bowed, dented, chipped, scratched, abraded or broken members.

Damaged parts: Remove and replace damaged parts during installation.

### **26.3.2FC SHEET CLADDING**

#### **Joints**

Control joints:

- Locate between the panel and fixing system and the supporting structure, as documented.
- Sheet edges: Square cut.
- Sealant: Do not apply finish coating over joint sealants.

Arrangement: Set out in even panels with joints coinciding with framing or as documented.

#### **Fixing**

General: Use the sheet manufacturers recommended fixings with colour coded heads to match cladding.

Eaves and soffit lining: Fix at 150 mm centres to soffit bearers at a maximum of 450 mm centres.

### **26.3.3PROFILED SHEET METAL CLADDING**

#### **General**

Installation: To AS 1562.1.

Ground clearance: Maintain documented clearance.

Cutting sheets: Wherever possible, factory cut to length. Do not use an abrasion disc.

Accessories: Provide material with the same finish as cladding sheets.

Swarf: Remove swarf and other debris as soon as it is deposited.

### **26.3.4COMPLETION**

#### **Fasteners**

Requirement: Adjust for weather tightness without distortion of external panel face.

#### **Reinstatement**

Extent: Repair or replace damage to the cladding. If the work cannot be repaired satisfactorily, replace the whole area affected.

Damage to pre-painted finish: Replace panels with scratches in the pre-painted finish.

#### **Cleaning**

Requirement: Remove excess debris, metal swarf, solder, sealants and unused materials.

Exposed metal surfaces: Clean surfaces of substances that interfere with uniform weathering or oxidisation.

Protection: Remove protective coatings using methods required by the manufacturer after completion.

Panels: Clean surfaces with soft, clean cloths and clean water to the manufacturer's recommendations.

#### **Warranties**

Requirement: Cover materials and workmanship in the form of interlocking warranties from the supplier and installer.

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: As offered by the supplier.

**26.4 SELECTIONS****26.4.1 PRODUCT****FC sheet cladding schedule**

Property	CFC 01	CFC 02	
Product	BGC Duracom Greystone	BGC Duracom Greystone	
Fixing system	Exposed fixing in accordance with sheet manufacturers instructions	Exposed fixing in accordance with sheet manufacturers instructions	
Thickness (mm)	9	9	
Finish	Natural Velvet	Natural Velvet - painted	
Colour	n/a	To future colour schedule	
Joints	Expressed	Expressed	
Edge profile	Square	Square	
Corners	To manufactures recommended details	To manufactures recommended details	
Trims	To manufactures recommended details	To manufactures recommended details	
Flashings and cappings	To manufactures recommended details	To manufactures recommended details	
Fasteners	Wafer head self drilling screw colour coded to match cladding	Wafer head self drilling screw colour coded to match cladding	

**Profiled sheet metal cladding schedule**

Property	MET 01	MET 02	MET 03
Product	Lysaght standing seam metal wall cladding	Lysaght standing seam metal wall cladding	Lysaght standing seam metal wall cladding
Fixing system	Concealed	Concealed	Concealed
Profile	Enseam	Enseam	Enseam
Pan width	265 and 465	265 and 465	265 and 465
Material type	Coated steel	Coated steel	Coated steel
Thickness (mm)	0.55	0.55	0.55
Colour	Evening Haze	Basalt	Mangrove
Trims	To manufactures recommended details and as documented	To manufactures recommended details and as documented	To manufactures recommended details and as documented
Flashings and cappings	To manufactures recommended details and as documented	To manufactures recommended details and as documented	To manufactures recommended details and as documented
Fasteners	Class 4	Class 4	Class 4

**27 ALUMINIUM WINDOWS AND DOORS****27.1 GENERAL****27.1.1 RESPONSIBILITIES****General**

Requirement: Provide aluminium windows and doors, as documented.

**27.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**27.1.3 STANDARDS****General**

Selection and installation: To AS 2047.

Building classification: 9b

**Glazing**

Glass type and thickness: To AS 1288, if no glass type or thickness is nominated.

Materials and installation: To AS 1288.

Quality requirements for cut-to-size and processed glass: To AS/NZS 4667.

**27.1.4 INTERPRETATION****Abbreviations**

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

- AGWA: Australian Glass and Window Association (formerly Australian Window Association (AWA)).
- WERS: Window Energy Rating Scheme.

**Definitions**

General: For the purposes of this worksection, the definitions given in AS/NZS 4668 and the following apply:

- Aluminium joinery: The collective term used for aluminium framed and glazed windows and doors.
- Hardware: To AS 4145.1 Section 2.
- Total system SHGC: Solar heat gain coefficient as defined by the NCC and tested in conformance with NFRC 200.
- Total system U-value: Thermal transmittance as defined by the NCC and tested in conformance with NFRC 100.

**27.1.5 SUBMISSIONS****Certification**

Conformance: Submit evidence that window and door assemblies conform to AS 2047.

Sealant compatibility: Submit statements from all parties to the installation certifying the compatibility of sealants and glazing systems to all substrates.

Opacified glass: Submit a report, from the manufacturer, certifying that the proposed method of opacifying the glass will not be detrimental to the glass or affect the glass product warranty.

Toughened glass: For each batch of glass, submit certification from the manufacturer of heat soaking.

Protection of openable windows: Submit a certificate of on-site fall prevention testing.

**Fire performance**

Fire-resistance level: Submit evidence of conformity to PRODUCTS, FIRE PERFORMANCE, Fire-resistance of building elements.

**Products and materials**

Safety glazing materials: Submit evidence of conformity to AS/NZS 2208 Appendix A.

Type tests: Submit results, as follows:

- Acoustic performance of windows and doors.
- Protection of openable windows.

**Shop drawings**

General: Submit shop drawings to a scale that best describes the detail, showing the following:

- Full size sections of members.
- Hardware, fittings and accessories including fixing details.
- Junctions and trim to adjoining surfaces.
- Layout (sectional plan and elevation) of the window assembly.
- Lubrication requirements.
- Methods of assembly.
- Methods of installation, including fixing, caulking and flashing.
- Provision for vertical and horizontal expansion.
- Method of glazing, including the following:
  - . Rebate depth.
  - . Edge restraint.
  - . Clearances and tolerances.
  - . Glazing gaskets and sealant beads.

**Subcontractors**

General: Submit names and contact details of proposed subcontractors endorsed by AWS Architectural Window Systems Pty Ltd.

**Warranties**

Requirement: Submit AWS warranty.

**27.1.6 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Openings prepared to receive windows (where windows are to be installed in prepared openings).
- Fabricated window assemblies delivered to the site, before installation.
- Commencement of window installation.

**27.2 PRODUCTS****27.2.1 GENERAL****Product substitution**

Other products: Conform to **SUBSTITUTIONS** in *General requirements*.

**Storage and handling**

Storage: Store in a clean, dry area and unaffected by weather, to the manufacturer's recommendations. Protect from building materials and loose debris such as wet plaster, mortar, paint and welding splatter.

Handling: Handle frames to the manufacturer's recommendations and the following:

- Stack upright, off the ground and against a flat, vertical surface.
- Carry in the vertical position with sashes locked.
- Do not rack frames out of square.
- Do not remove any bands and corner bracing until after installation.

**Acoustic performance**

Windows and doors: Tested to AS 5218.

**Protection of openable windows**

Fall prevention: To BCA D2.24 and BCA 3.9.2.

Testing: To AS 5203.

**Product identification**

General: Marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.

- Product reference code and batch number.
- Date of manufacture.

**Marking**

Window assemblies: To AS 2047 Section 8.

**27.2.2 FIRE PERFORMANCE****Fire-resistance of building elements**

Fire-resistance level: Tested to AS 1530.4.

**27.2.3 GLASS AND GLAZING****Performance**

Glass: Free from defects which detract from appearance or interfere with performance under normal conditions of use.

Glazing plastics: Free from surface abrasions, and warranted by the manufacturer for 10 years against yellowing or other colour change, loss of strength and impact resistance, and general deterioration.

**Safety glazing materials**

Standard: To AS/NZS 2208.

Type: Grade A to AS 1288.

- Certification: Required.
- Certification provider: An organisation accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ).

**Heat strengthened glass**

Requirement: Heat strengthened annealed glass that requires extra strength and thermal resistance.

Standard: To ASTM C1048.

**Heat soaking**

Requirement: All toughened and heat strengthened glass products.

Standard: To EN 14179-1.

**Ceramic-coated glass**

General: Heat strengthened or toughened glass with a coloured ceramic coating fused to and made an integral part of the surface to ASTM C1048, Condition B.

**Opacified glass**

Description: Glass with an opacifier permanently bonded to the inner face.

**27.2.4 GLASS IDENTIFICATION****Heat soaked glass**

Requirement: Marked to EN 14179-1 or certified by the manufacturer to AS 1288 clause 3.8.2.

**Safety glass**

Identification: To AS 1288 clause 5.23.

**27.2.5 GLAZING MATERIALS****General**

Requirement: Putty, glazing compounds, sealants, gaskets, glazing tapes, spacing strips, spacing tapes, spacers, setting blocks and compression wedges appropriate for the conditions of application and required performance.

**Jointing materials**

Requirement: Provide jointing and pointing materials to manufacturer's recommendations that are compatible with each other and with the contact surfaces and non-staining to finished surfaces. Do not provide bituminous materials on absorbent surfaces.

**Elastomeric sealants**

Sealing compound (polyurethane, polysulfide, acrylic): To ASTM C920 or ISO 11600.

Sealing compound (silicone): To ASTM C920 or ISO 11600.

Sealing compound (butyl): To ASTM C1311.

**Primer**

Compatibility: Apply the manufacturer's recommended primer to the surfaces in contact with sealant materials.

**Control joints**

Depth of elastomeric sealant: One half the joint width or 6 mm, whichever is the greater.

Foamed materials (in compressible fillers and backing rods): Closed-cell or impregnated types that do not absorb water.

Bond breaking: Provide backing rods, and other back-up materials for sealants, that do not adhere to the sealant.

**27.2.6 SECURITY WINDOW GRILLES****General**

Requirement: Proprietary metal security grilles, or operable screen and frames, fixed to the building structure with tamper resistant fastenings.

Security window grilles: To AS 5039.

**27.2.7 ALUMINIUM FRAME FINISHES****Powder coatings**

Standard: To AS 3715.

Product: Dulux Duratec or a product equivalent in function and quality to the approval of the Superintendent's Representative as documented

Powder coat thickness: ≥ 50 microns to 90 microns.

Colour: Dulux Duratec Zeus Monument.

**27.2.8 ANCILLARY COMPONENTS AND FITTINGS****Extruded gaskets and seals**

Materials: Non-cellular (solid) elastopressive seals as follows:

- Flexible polyvinyl chloride (PVC): To BS 2571, 100% solids with high consistency, ultraviolet stabilised.
- Rubber products (neoprene, ethylene propylene diene monomer (EPDM) or silicone rubber): To BS 4255-1.

**Flashings**

General: Corrosion-resistant, compatible with the other materials in the installation, and coated with a non-staining compound where necessary.

Standard: To AS/NZS 2904.

**Nylon brush seals**

General: Dense nylon bristles locked into galvanized or stainless steel strips and fixed in a groove in the edge of the door or in purpose-made anodised aluminium holders fixed to the door with double sided PVC foam tape.

**Pile weather strips**

Standard: To AAMA 701/702.

Location: To all door stiles

Materials: Polypropylene or equivalent pile and backing, low friction silicone treated, ultraviolet stabilised.

Finned type: A pile weather seal with a central polypropylene fin bonded into the centre of the backing rod and raised above the pile level.

**Threshold drain**

General: If the frame includes a threshold member, provide a self-draining section with anti-slip surface.

**27.2.9 HARDWARE****Hardware documented generically**

General: Provide hardware of sufficient strength and quality to perform its function, appropriate to the intended conditions of use, compatible with associated hardware, and fabricated with fixed parts firmly joined.

**27.2.10 MIRRORS****Reflective surface**

Type: Silver layer deposited on the glass or glazing plastic.

Protective coatings: Copper free coating, at least 5 µm thick, and 2 coats of mirror backing and edge sealing paint having a total dry film thickness of at least 50 µm.

#### **Safety mirror**

Type to AS 1288: Vinyl backed Grade A safety mirror.

Safety compliance: To AS/NZS 2208.

#### **Solid backed annealed glass mirrors**

Backing: 9 mm waterproof plywood.

Adhesive fixing to backing: Non-acidic silicone adhesive at the rate recommended by the manufacturer.

## **27.3 EXECUTION**

### **27.3.1 GLASS PROCESSING**

#### **General**

Processing: Perform required processes on glass, including cutting, obscuring, silvering and bending. Form necessary holes, including for fixings, equipment, access openings and speaking holes. Process exposed glass edges to a finish not inferior to ground arised.

### **27.3.2 INSTALLATION**

#### **Glazing**

Requirement: Install the glass as follows:

- Permanently fix in place each piece of glass to withstand the normal loadings and ambient conditions at its location without distortion or damage to glass and glazing materials.
- No transfer of building movements to the glass.
- Watertight and airtight for external glass.

Temporary marking: Use a method which does not harm the glass. Remove marking on completion.

Toughened glass: Do not cut, drill, edge-work or permanently mark after toughening. Use installation methods which prevent the glass making direct contact with metals or other non-resilient materials.

Heat absorbing glass: In locations exposed to direct sunlight, provide wheel cut edges free from damage or blemishes, with minimum feather.

#### **Preglazing**

Window assemblies and glazed doors: Supply inclusive of glazing, shop preglazed.

Windows and glazed doors

General: Install windows and glazed doors frames as follows:

- Plumb, level, straight and true within building tolerances.
- Fixed or anchored to the building structure in conformance with the wind action loading requirements.
- Isolated from any building loads, including loads caused by structural deflection or shortening.
- Allow for thermal movement.

#### **Weatherproofing**

Flashing and weatherings: Install flashings, weather bars, drips, storm moulds, joint sealant and pointing to prevent water penetrating the building between the window frame and the building structure under the prevailing service conditions, including normal structural movement of the building.

#### **Fixing**

Fasteners and fastener spacing: Conform to the manufacturers Window Systems manuals.

Packing: Pack behind fixing points with durable full width packing.

Fasteners: Conceal fasteners.

#### **Joints**

General: Make accurately fitted tight joints so that neither fasteners nor fixing devices such as pins, screws, adhesives and pressure indentations are visible on exposed surfaces.

Sealants:

- If priming is recommended, prime surfaces in contact with jointing materials.
- If frames are powder coated apply a neutral cure sealant.

**Operation**

General: Make sure moving parts operate freely and smoothly, without binding or sticking, at correct tensions or operating forces and are lubricated.

**Protection**

Removal: Remove temporary protection measures from the following:

- Contact mating surfaces before joining up.
- Exposed surfaces.

Temporary measures: rigid PVC and tape

**Trim**

General: Provide mouldings, architraves, reveal linings, and other internal trim using materials and finishes matching the window frames. Install to make neat and clean junctions between frames and the adjoining building surfaces.

**27.3.3 SECURITY WINDOW GRILLES****General**

Installation: To AS 5040.

**27.3.4 HARDWARE****Fasteners**

Materials: Use materials compatible with the item being fixed and of sufficient strength, size and quality to perform their function.

- Concealed fasteners: Provide a corrosion-resistant finish.
- Exposed fasteners: Match exposed fasteners to the material being fixed.

Support: Provide appropriate back support (for example lock stiles, blocking, wall noggings and backing plates) for hardware fasteners.

- Hollow metal sections: Provide backing plates drilled and tapped for screw fixing, or provide rivet nuts with machine thread screws. Do not use self-tapping screws or pop rivets.

**Proprietary window systems**

Requirement: Provide the standard hardware and internal fixing points for personnel safety harness attachment, if required by and conforming to the governing regulations.

**Operation**

General: Make sure working parts are accurately fitted to smooth close bearings, without binding or sticking, free from rattle or excessive play, lubricated where appropriate.

**Supply**

Delivery: Deliver window hardware items, ready for installation, in individual complete sets for each window set, as follows:

- Clearly labelled with the intended location.
- In a separate dust and moisture proof package.
- Including the necessary templates, fixings and fixing instructions.

**27.3.5 FIXING MIRRORS**

Fix mirrors in strict accordance with the manufacturers instructions.

**27.3.6 COMPLETION****Hardware**

Adjustment: Leave the hardware with working parts in working order, and clean, undamaged, properly adjusted, and lubricated where appropriate.

**Keys**

Contractor's keys: Immediately before the date for practical completion, replace cylinders to which the contractor has had key access during construction with new cylinders that exclude the contractor's keys.

Keys: For locks keyed to differ and locks keyed alike, verify quantities against key records, and deliver to the contract administrator at practical completion.

Key codes: Submit the lock manufacturer's record of the key coding system showing each lock type, number and type of key supplied, key number for re-ordering, and name of supplier.

**Repair of finish**

Polyester or fluoropolymer coatings: Contact supplier for approval to apply touch up products, otherwise replace damaged material.

**Cleaning**

Method: Clean with soft clean cloths and clean water, finishing with a clean squeegee. Do not use abrasive or alkaline materials.

Extent: All frames and glass surfaces inside and out.

**Warranties**

Aluminium joinery excluding hardware:

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: 6 years, conditional on compliance with the AGWA Code of Conduct.

**27.4 SELECTIONS****27.4.1 WINDOWS AND DOORS**

Refer to the SCHEDULES shown on the drawings and provide AWS windows and doors nominated.

**27.4.2 SECURITY WINDOW GRILLES****Security window grille schedule**

Location	Refer to the drawings – to all opening windows		
Product name	Crimesafe or product equivalent in function and quality to the approval of the Superintendent's Representative		
Generic description	SS security mesh screen		
Material	304 Stainless steel		
Wire mesh diameter	0.9		
Finish	Powdercoated		
Fixing	Tamper resistant fixings		
Frame finish	Powdercoated to match window frames		

**27.4.3 GLAZING****Glass schedule**

Refer to the SCHEDULES shown on the drawings and provide the glass type nominated.

**Glazing film and vision strips**

General: provide glazing film and vision strips in accordance with the code and to glazing where shown on the drawings.

Type: Dusted crystal

**27.4.4 THRESHOLD DRAINS****Threshold drain schedule**

Location	Refer to the drawings – slab set out plan		
ACO FlowTHRU Integrated Stainless Steel Threshold Drain			

**28 DOORS AND ACCESS PANELS****28.1 GENERAL****28.1.1 RESPONSIBILITIES****General**

Requirement: Provide doors, frames, doorsets, security screen doors and fire-resisting doorsets, as documented.

**28.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**28.1.3 STANDARDS****General**

Timber and composite doors: To AS 2688.

**28.1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given in AS 2688 and the following apply:

- Fire-resisting doorset: A doorset which retains its integrity, provides insulation and limits, if required, the transmittance of radiation in a fire.
- Smoke-doorset: A doorset which restricts the passage of smoke.

**28.1.5 SUBMISSIONS****Operation and maintenance manuals**

Recommendations: Submit the manufacturer's published recommendations for service use.

**Products and materials**

Type tests: Submit results, as follows:

- Acoustic performance of doorsets.

**28.1.6 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Door frames installed before fixing trim.

**28.2 PRODUCTS****28.2.1 FRAMES****Aluminium frames**

Construction: Assembled from aluminium sections, including accessories such as buffers, pile strips, strike plates, fixing ties or brackets and cavity flashings, with provision for fixing documented hardware.

Threshold: If the frame includes a threshold member, provide a self-draining section with anti-skid surface.

**Steel frames**

Construction: Continuously welded from metallic-coated steel sheet sections, including accessories such as buffers, strike plates, spreaders, mortar guards, switch boxes, fixing ties or brackets, and cavity flashing with provision for fixing documented hardware and electronic security assemblies, and prefinished with a protective coating.

Base metal thickness (minimum):

- General: 1.2 mm.
- Security doorsets: 1.6 mm.

Metallic-coating class to AS 1397 interior: ZF100.

Metallic-coating class to AS 1397 exterior: ZF100

Finish: Grind the welds smooth, cold galvanize the welded joints and shop prime.

Hardware and accessories: Provide 4 mm backplates and lugs for fixing hardware including hinges and closers. Screw fix the hinges into tapped holes in the backplates.

- . Full let-in jambs.

### 28.2.2 DOORS

#### General

Doors: Proprietary products manufactured for interior or exterior applications and for the finish required.

#### Materials

Standards: Conform to the following:

- Decorative laminated sheets: To AS/NZS 2924.1.
- Wet process fibreboard (including hardboard): To AS/NZS 1859.4.
- Dry process fibreboard (including medium density fibreboard): To AS/NZS 1859.2.
- Particleboard: To AS/NZS 1859.1.
- Plywood and blockboard for interior use: To AS/NZS 2270.
- Plywood and blockboard for exterior use: To AS/NZS 2271.
- Seasoned cypress pine: To AS 1810.
- Timber – hardwood: To AS 2796.1.
- Timber – softwood: To AS 4785.1.

#### Flush panel doors

General: Provide flush panel doors of balanced construction, as documented.

Medium density fibreboard doors: Single thickness of moisture resistant general purpose medium density fibreboard with the same surface finish to both sides, for internal use.

#### Construction

Adhesives:

- Internal: To AS/NZS 2270.
- External: To AS/NZS 2271.

Door thickness:

- General: 38 mm.
- External doors and doors over 900 mm wide: 40 mm.

Cut-outs: If openings are required in flush panel doors (e.g. for louvres or glazing), do not make cut-outs closer than the width of the stiles at the edges of the doors.

Edge strips: Minimum thickness 10 mm. Increase overall thickness to greater than 15 mm to accommodate the full depth of the rebate in rebated doors. Apply to the external edges of door after the facings are bonded to the door framing/core and finish flush with outside surface of the facings.

**Edge strip location: fix all round**

Louvre grilles: Construct by inserting the louvre blades into a louvre frame, and fix the frame into the door.

#### Double doors

Square edged doors: Bevel as necessary to prevent binding between the leaves.

Rebated meeting stiles: If not double acting doors, provide rebated meeting stiles. Form rebates to suit standard rebated hardware.

#### Tolerances

Standard: To AS 2688 clauses 4.1 and 5.3.

### 28.2.3 DOORSETS

#### Cavity sliding doors

General: Proprietary product comprising steel and timber frame construction with rigid steel top, base and rear supporting members and incorporating the overhead door track, ball race type wheel carriages, guides, stops, split jamb linings and removable pelmet.

#### Duct access panels

General: Proprietary products comprising metal-faced doors side-hung to steel door frames, including hardware and accessories such as hinges and lock and installation lugs.

**Security screen doorsets**

Standard: To AS 5039.

**28.2.4 ANCILLARY MATERIALS****Extruded gaskets and seals**

Materials: Non-cellular (solid) elastopressive seals as follows:

- Flexible polyvinyl chloride (PVC): To BS 2571, 100% solids with high consistency, ultraviolet stabilised.
- Rubber products (neoprene, ethylene propylene diene monomer (EPDM) or silicone rubber): To BS 4255-1.

**Flashings**

General: Corrosion-resistant, compatible with the other materials in the installation, and coated with a non-staining compound where necessary.

Standard: To AS/NZS 2904.

**Jointing materials**

General: Compatible with each other and with the contact surfaces and non-staining to finished surfaces. Do not provide bituminous materials on absorbent surfaces.

**Nylon brush seals**

General: Dense nylon bristles locked into galvanized steel strips and fixed in a groove in the edge of the door or in purpose-made anodised aluminium holders fixed to the door with double sided PVC foam tape.

**Pile weather strips**

General: Polypropylene or equivalent pile and backing, low friction silicone treated, ultraviolet stabilised.

Standard: To AAMA 701/702.

**28.3 EXECUTION****28.3.1 FRAMES****General**

Frames: Install the frames as follows:

- Plumb, level, straight and true.
- Fixed or anchored to the building structure.
- Isolated from any building loads, including loads caused by structural deflection or shortening.

**Frame fixing**

Brackets: Metallic-coated steel:

- Width: Minimum 25 mm.
- Thickness: Minimum 1.5 mm.

Depth of fixing for building into masonry:

- Brackets: Minimum 200 mm.
- Expansion anchors: Minimum 50 mm.
- Plugs: Minimum 50 mm.
- Rods: Minimum 60 mm.

Jamb fixing centres: Maximum 600 mm.

**Joints**

General: Make accurately fitted joints where fasteners, pins, screws, adhesives and pressure indentations are not visible on exposed surfaces.

**Aluminium frames**

Building into masonry: Screw galvanized steel brackets twice to jambs and build in.

Fixing to masonry openings: Build in seasoned timber plugs to masonry joints or use proprietary expansion anchors and screw twice through jambs at each fixing.

Fixing to stud frame openings: Screw once to studs at each fixing.

**Steel frames**

Fixing to stud frame openings: Attach galvanized steel brackets to jambs and screw twice to studs at each fixing.

**Finishing**

Trim: Provide mouldings, architraves, reveal linings, and other internal trim using materials and finishes matching the door frames to make neat and clean junctions between the frame and the adjoining building surfaces.

**Seals**

General: Provide the fixings, rebates, grooves, and clearances required for installation and operation of the seals. Allow seals unwound from coils to settle before use.

**Weatherproofing**

Flashings and weatherings: Install flashings, weather bars, drips, storm moulds, caulking and pointing to prevent water from penetrating the building between the door frame and the building structure under the prevailing service conditions, including normal structural movement of the building.

**28.3.2DOORS****Priming**

General: Prime timber door leaves on top and bottom edges before installation.

**28.3.3DOORSETS****Security screen doorsets**

Standard: To AS 5040.

**28.3.4COMPLETION****Operation**

General: Make sure moving parts operate freely and smoothly, without binding or sticking, at correct tensions or operating forces and that they are lubricated where appropriate.

**Protection**

Temporary coating: On or before the date for practical completion, or before joining up to other surfaces, remove all traces of temporary coatings used as a means of protection.

**28.4 SELECTIONS****28.4.1 DOOR TYPES SCHEDULE****Flush panel doors construction schedule**

Refer to the DOOR SCHEDULE shown on the drawings and provide the doors and frames nominated.

**28.4.2CS CAVITY SLIDERS****Cavity Sliders cavity sliding door schedule**

Product type	JDS metal frame cavity slider		
Location	Kitchen Dry Store		
Frame	10 bend steel		
Door type	Solid core flush panel		
Door thickness (mm)	38		
Door finish	Paint		
Detail options			
Lock type	Flush lock to enable door to be completely concealed in cavity when open		

**28.4.3 DOORSETS SCHEDULE****Security screen doors construction schedule**

Location	<b>Kitchen and Bar external doors</b>		
Type	Crimesafe Classic		
Material	0.9mm Tensile-Tuff 304 structural grade mesh		
Finish	To match window and aluminium door frames		
Hinges: Material	To manufacturers specifications		
Hinges: Fixing	To manufacturers specifications		
Lock	3 locking points To manufacturers specifications		

**29 OVERHEAD DOORS****29.1 GENERAL****29.1.1 RESPONSIBILITIES****General**

Requirement: Provide overhead doors, as documented.

**29.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**29.1.3 STANDARDS****General**

Garage doors and other large access doors: To AS/NZS 4505.

Fire shutters: To AS 1905.2.

Design wind pressure: To AS/NZS 1170.2.

**29.1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions in AS/NZS 4505 and AS 1905.2, and the following apply:

- Wicket: Door side-hung on the vertical guide and interlocking with the closed curtain.

**29.1.5 SUBMISSIONS****Certification**

Fire shutters: Submit evidence of compliance of installation to AS 1905.2.

**Operation and maintenance manual**

General: Submit the manufacturer's published instructions for operation, care and maintenance.

**Products and materials**

Type tests: Submit the following:

- Fire-resistance level: Verification from an Accredited Testing Laboratory of fire-resistance level.
- Acoustic performance: Verification from an Accredited Testing Laboratory of weighted sound reduction index ( $R_w$ ).
- Wind-borne debris impact: Verification from an Accredited Testing Laboratory of wind-borne debris impact rating.
- Door manufacturer's standard hardware items.

**Shop drawings**

General: Submit shop drawings showing details of each assembly, component and connection, and information relevant to fabrication, surface treatment and installation.

Motorised overhead doors: Submit shop drawings showing location of motor, wiring, power requirements, location and type of safety devices, location of manual operation switch, and other electronic components.

**Subcontractors**

General: Submit names and contact details for proposed suppliers and installers.

**Warranties**

Submit a warranty complying with the terms specified at the end of this worksection.

**29.1.6 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Framing or structure to receive tracks and motor.
- Tracks and guides installed before doors or shutters are hung.

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## 29.2 PRODUCTS

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### 29.2.1 GENERAL

#### Door assembly

Requirement: Proprietary system complete with the manufacturer's standard operating system, hardware, and accessories.

#### Marking and labelling

General: To AS/NZS 4505 Section 8.

### 29.2.2 ROLLING CURTAIN AND ROLLING SHUTTER DOORS

#### General

Requirement: Materials and finishes, as documented.

#### Curtain

Rolling curtain: Continuous roll formed profiled steel.

Rolling shutter: Individual horizontal interlocking slats with interlocking hinges.

Rolling grille: Articulated curtain formed of horizontal members spaced apart and connected by vertical links.

#### Bottom rail

Requirement: Provide a stiffening member as follows:

- Interlocking with the bottom edge or lowest part of the curtain.
- Extending between the inner faces of the vertical guides.
- Formed or adapted as required for sloping floors or threshold.
- Adapted to house a locking device, if required.

#### Wind locks

General: Provide wind lock end clips and guides to retain the curtain in wide openings or under extreme wind conditions.

#### Drum

Maximum drum deflection: 1/360th of the span.

Springs: Helical torsion springs housed in the drum and arranged to counterbalance the curtain weight without exceeding the safe working stress of the spring material.

### 29.2.3 OPERATION

#### General

Operation method: As documented.

#### Manual operation

General: Install so that the force required to operate the door manually does not exceed 220 N.

Manual method: Provide a manual door operating system incorporating the following, as documented:

- Hand stick (for high openings): By a boat hook type pole supplied with the installation.
- Chain: By pulling on a chain passing over a sprocket on the drum, with reduction gears where necessary.
- Crank handle: By a removable crank handle inserted into a gearbox mounted above the opening.
- Lockable handle: From inside and outside, attached to the door panel.

#### Motorised operation

General: Provide a motorised door operating system incorporating the following, as documented:

- An electric motor with limit switches, and of adequate capacity to operate the specified door smoothly and without strain.
- Overload cutout.
- Automatic safety system to stop and reverse door if obstructed while closing, or stop door if obstructed while opening.
- Photocell or IR beam safety device.
- Intergrated light fixture, automatically switched on when opener is activated, and switched off by timer.
- Manual release handle to disengage door from drive mechanism in the event of a power failure.
- Operation by battery-powered radio remote controller, supplied as part of the system.

- Additional operation by push-button or key switch, located 1500 mm above floor level.\

### Accessories

General: Incorporate the following accessories, as documented:

- Light fixture.
- Radio remote transmitter.
- Push-button or key switch.
- Internet connectivity.
- Obstruction detection – for motor reversal.
- Reversing starters.
- Warning systems – speakers, flashing lights or traffic lights.
- Wall controls.
- Uninterrupted Power Supply (UPS).
- Switches and timers.

## 29.3 EXECUTION

### 29.3.1 INSTALLATION

#### General

Requirement: Install overhead doors in conformance with the manufacturer's recommendations and as documented.

#### Preparation

Substrate: Before start of installation, check the alignment of substrates or framing and adjust if required.

#### Frames, guides and tracks

Requirement: Install frames, guides and tracks as follows:

- Plumb, level, straight, true, and within tolerances and clearances recommended by the manufacturer.
- Fixed or anchored to the building structure using mechanical fixings suitable for the substrate and the imposed loads.
- Isolated from any building loads, including loads caused by structural deflection or shortening.

### 29.3.2 COMPLETION

#### Operation

General: Make sure moving parts operate freely and smoothly, without binding or sticking, at correct tensions or operating forces and that they are lubricated where appropriate.

Safety: Make sure all safety features are operating.

Remote control devices: Make sure devices are programmed and operating.

#### Protection

Temporary coating: On or before the date for practical completion of the works, or before joining up to other surfaces, remove all traces of temporary coatings used for protection.

#### Warranties

General: Submit the manufacturer's published product warranties.

## 29.4 SELECTIONS

### 29.4.1 PRODUCT

#### Rolling curtain and rolling shutter door schedule

	RS 01 - Stores	RS 02 – Kitchen external	RS 03 – Kitchen	RS 04 - Bar
Type	Steel roller door	Steel roller shutter	Aluminium roller shutter	Aluminium roller shutter with removable mullion
Product	Steel Line	Arco Q75	Arco Arcade 2	Arcade 2

	RS 01 - Stores	RS 02 – Kitchen external	RS 03 – Kitchen	RS 04 - Bar
Curtain: Type	Rolling curtain	Rolling shutter	Rolling shutter	Rolling shutter
Curtain: Material	Steel	Steel	Aluminium	Aluminium
Curtain: BMT (mm)	0.6	0.6	1.2	1.2
Curtain: Finish	Colorbond	Colorbond	Powdercoated	powdercoated
Curtain: End material	Nylon felt webbing	With nylon end clips	With nylon end clips	With nylon end clips
Curtain: Slat size	n/a	75	75	75
Perforations: Pattern	n/a	n/a	Bar only – Multi holed to achieve 40% of the slat surface	Multi holed to achieve 40% of the slat surface
Bottom rail	Standard box section with weather seal	Standard box section with weather seal	Extruded aluminium with PVC buffer	Extruded aluminium with PVC buffer
Bottom rail: Size		90 x 48	90 x 48	90 x 48
Bottom rail: Finish	To match door	To match door	To match door	To match door
Vertical guides: Material		Extruded aluminium with false back for concealed fixing and silencer strip	Extruded aluminium with false back for concealed fixing	Extruded aluminium with false back for concealed fixing
Vertical guides: Size (mm)		50 x 33	50 x 33	50 x 33
Vertical guides: Fixing method		Concealed	Concealed	Concealed
Mullions: Type	n/a	n/a	n/a	120 wide x 33
Mullions: Method of removal	n/a	n/a	n/a	Lift out with shot bolts
Operation method	Motorised RD 800 with additional internal operation	Motorised without chain override	Motorised	Motorised
Safety features	Safety stop	Safety stop	Safety stop	Safety stop
Hardware: Item	Key switch keyed to building system	Key switch keyed to building system	Key switch keyed to building system	Key switch keyed to building system

**30 DOOR HARDWARE****30.1 GENERAL****30.1.1 RESPONSIBILITIES****General**

Requirement: Provide door hardware, as documented.

**30.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**30.1.3 INTERPRETATION****Abbreviations**

General: For the purposes of this worksection, the abbreviations given in AS 4145.1 Appendix D apply.

**Definitions**

General: For the purposes of this worksection, the general definitions given in AS 4145.1 Section 2 and Appendix E apply.

**30.1.4 SUBMISSIONS****Execution details**

Key control system:

- New works: Submit details of the proprietary key control security system proposed by the lock manufacturer for locks required to accept a group key (master, grandmaster).

**Operation and maintenance manuals**

on an annual renewal basis.

Manual: Submit the manufacturer's published recommendations for use, care and maintenance of the hardware provided.

**Records**

Door hardware schedule: Submit an amended schedule, prepared by the door hardware supplier, showing changes to the contract door hardware schedule resulting from the following:

- Approval of a hardware sample.
- Acceptance of an equivalent to a specified proprietary item.
- A contract variation to a door hardware requirement.

Key coding system: Submit the lock manufacturer's record of the key coding system showing each lock type, number and type of key supplied, key number for re-ordering, and name of supplier.

**Warranties**

Requirement: Submit the following:

- Hardware: Manufacturer's published product warranties.

**30.2 PRODUCTS****30.2.1 GENERAL****Supply**

Delivery: Deliver door hardware items, ready for installation, in individual complete sets for each door, as follows:

- Clearly labelled to show the intended location.
- In a separate dust and moisture proof package.
- Including the necessary templates, accessories fixings and fixing instructions.

Hardware specified generically: Hardware of the required strength and quality to perform its function, appropriate to the intended conditions of use, suitable for use with associated hardware, and fabricated with fixed parts firmly joined.

### 30.2.2 LOCKS AND LATCHES

#### Standard

General: To AS 4145.2.

#### Padlocks

Standard: To AS 4145.4.

#### Lock and latch classification

Rating systems: To AS 4145.1 Section 3.

Performance requirements: To AS 4145.2 Section 3.

### 30.2.3 DOOR HANGING SYSTEMS

#### General

Requirement: Provide sliding door tracks and guides, as documented.

### 30.2.4 ANCILLARIES

#### Bolts

General: Barrel bolts, flush bolts and tower bolts with keepers, including lock plates, staples, ferrules or floor sockets.

#### Mortar guards

General: For steel door frame installations, provide mortar guards designed to allow the full extension of the lock tongue or similar devices and the correct operation of the locking mechanism.

#### Rebated doors

General: For mortice locks or latches to rebated doors, provide purpose-made rebated pattern items.

#### Strike plates

General: Use strike plates supplied with the locks or latches. Do not provide universal strike plates.

### 30.2.5 KEYING

#### Keying requirements

Requirement: Provide door hardware and keys, as documented.

#### Temporary construction keys and cylinders

Requirement: Provide one of the following:

- Loan cylinder: Install for construction locks and replace at practical completion.
- Construction keyed master key cylinder: Keep up-to-date records of keys issued including recipient's name, company and contact details, date issued and date returned.

#### Delivery of keys

Great grandmaster, grandmaster and master keys: Arrange for delivery direct to the principal.

For locks keyed to differ and locks keyed alike: Check the quantity against key records, and deliver keys to the contract administrator at practical completion.

#### Group keying

Keying system: As documented.

Existing system extension: Obtain the details of existing group or master key systems of the system to be extended.

**Extensions to existing system: Key the new locks to the Principals key system.**

Future extensions: Provide master and grandmaster group keying systems capable of accommodating future extensions.

Proprietary keying control security system: Provide for cylinder or pin-tumbler locks that accept a group key (e.g. master key, maison key).

Stamping: Stamp keys and lock cylinders to show the key codes and/or door number as scheduled.

#### Identification

Labelling: Supply each key with a purpose-made plastic or stamped metal label legibly marked to identify the key, attached to the key by a metal ring.

#### Key material

Lever locks: Malleable cast iron or mild steel.

Pin tumbler locks: Nickel alloy, not brass.

**Number of keys table**

Key code	Key type	Minimum number of keys
GGMK	Great grandmaster keys	2
GMK	Grandmaster keys	2
MK	Master keys	2 per code group
KD	Locks keyed to differ	2 per lock
KA	Locks keyed alike:	
	- 2 locks in code group	4
	- 3 to 10 locks in code group	6
	- 11 to 40 locks in code group	10
	- 41 and over locks in code group	1 per 4 locks or part thereof

**30.3 EXECUTION****30.3.1 INSTALLATION****General**

Handing: Before supply, verify on site, the correct handing of hardware items.

Operation: Make sure working parts are accurately fitted to smooth close bearings, without binding or sticking, free from rattle or excessive play, lubricated where appropriate.

**Mounting height**

Locks and latches: Centreline of the door knob or lever spindle above finished floor: 1000mm

**Locks**

Cylinders: Fix vertically and with consistent key alignment.

**Door stops**

Fixing: Fix on the floor, skirting or wall, as appropriate, to prevent the door or door furniture striking the wall or other surface.

**Fasteners**

Materials: Provide materials compatible with the item being fixed, and of sufficient strength, size and quality to perform their function.

- Concealed fasteners: Provide a corrosion-resistant finish to concealed fasteners.
- Exposed fasteners: Match exposed fasteners to the material being fixed.

Security: Locate exposed fasteners to lock furniture on the inside faces of external doors and on the inside faces of internal doors to lockable rooms.

Support: Provide appropriate back support (for example lock stiles, blocking, wall noggings and backing plates) for hardware fasteners.

- Hollow metal sections: Provide backing plates drilled and tapped for screw fixing, or provide rivet nuts with machine thread screws. Do not use self-tapping screws or pop rivets.

**Hinges**

Metal frames: Fix hinges using metal thread screws.

**30.3.2 COMPLETION****Adjustment**

General: Leave the hardware properly adjusted with working parts in working order, and clean, undamaged, properly adjusted, and lubricated where appropriate.

Automatic door operators: Maintain and adjust the system throughout the defects liability period.

**Keys**

Contractor's keys: Immediately before practical completion, replace or reset cylinders to which the contractor has had key access during construction to exclude the contractor's keys.

**Warranties**

Automatic door operators: Provide interlocking warranties from the supplier and installer covering materials and workmanship.

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: As offered by the supplier and installer.

### 30.4 SELECTIONS

#### 30.4.1 PROVISIONAL SUM

Allow the PROVISIONAL SUM scheduled in the PRELIMINARIES for the supply only of door hardware.

#### 30.4.2 FIXING SCHEDULE

Take delivery of unpack, dispose of packaging legally and fix the following door hardware:

#### ALUMINIUM DOOR AND FRAME HARDWARE

64	Fast Fix Hinges	Surface Fixed
3	Mortice Lockset and Accessories	Fully Morticed
1	Mortice Deadlock and Accessories	Fully Morticed
10	Panic Exit Device	Surface Mounted
14	Door Closers	Surface Fixed
11	Door Closer Accessories i.e. Hold Open Device	Adjustment Only
3	Lever Furniture and Accessories	Back to Back Fixed
13	Entry Pull Handles	Back to Back Fixed
2	Strapbolts	Surface Fixed
9	Floor Threshold	Fixed to Floor
14	Door Bottom Seal	Fully Rebated into Door Bottom
3	Door Stops	Floor Mounted

#### TIMBER DOOR HARDWARE

104	Butt Hinges	Rebated Into Door and Frame
1	Sliding Door Track	Pelmet By Builder
10	Mortice Lockset and Accessories	Fully Morticed
5	Mortice Deadlock and Accessories	Fully Morticed
2	Rebate Kit to suit Mortice Lock/Latch	Rebated into Door Edge
10	Lever Furniture and Accessories	Back to Back Fixed
3	Mortice Indicator Bolt	Fully Morticed
19	Door Closers	Surface Fixed
11	Door Closer Accessories i.e. Hold Open Device	Adjustment Only
4	Strapbolts	Surface Fixed
10	Push Plate and D Pull Handle	Back to Back Fixed
9	Pull Handle	Surface Fixed
11	Floor Threshold	Fixed to Floor
20	Door Bottom Seal	Fully Rebated into Door Bottom
7	Perimeter Frame Seal (Head and Jambs)	Surface Fixed to Frame
16	Door Stops	Floor Mounted
3	Door Stops	Wall Mounted

#### NOTEABLE EXCLUSIONS

ROLLER SHUTTERS - BY OTHERS  
OPERABLE WALL - BY OTHERS

<b>31 THERMAL INSULATION AND PLIABLE MEMBRANES</b>
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**31.1 GENERAL****31.1.1 RESPONSIBILITIES****General**

Requirement: Provide thermal insulation and pliable membrane systems, as documented.

**31.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**31.1.3 INTERPRETATION****Definitions**

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

- Batts: Flexible insulation supplied as factory cut pieces and composed of mineral wool (glass and rock fibre) or polyester fibre.
- Blankets: Flexible insulation supplied as factory cut rolls and composed of mineral wool (glass and rock fibre) or polyester fibre, and may be combined with reflective facings.
- Bio-soluble: A product that dissolves in bodily fluids and is quickly cleared from the lungs.
- Fire hazard properties: To NCC Schedule 3.
- Pliable building membrane: To AS/NZS 4200.1 and equivalent to sarking-type materials as defined in the NCC.
- Thermal insulation terminology: To AS/NZS 4859.1.
- Vapour permeable (breathable) membrane: A flexible membrane material, normally used for secondary waterproofing that allows for the transmission of water vapour.

**31.1.4 SUBMISSIONS****Fire performance**

Fire hazard properties: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE**, **Fire hazard properties**.

**Products and materials**

Thermal insulation properties: Submit evidence of conformity to AS/NZS 4859.1 and AS/NZS 4859.2.

**Warranties**

Submit a warranty complying with the terms specified at the end of this worksection.

**31.1.5 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Insulation or pliable membrane materials after installation and before concealment.

**31.2 PRODUCTS****31.2.1 GENERAL****Storage and handling**

Labelling: Deliver mineral wool products to site in packaging with third party mark of conformity indicating product is bio-soluble and not listed as hazardous material in the Safe Work Australia *Hazardous Chemical Information System* (HCIS).

**31.2.2 FIRE PERFORMANCE****Fire hazard properties**

Insulation materials: Tested to AS/NZS 1530.3. Fire hazard indices as follows:

- Spread-of-Flame Index:  $\leq 9$ .
- Smoke-Developed Index:  $\leq 8$  if Spread-of-Flame Index  $> 5$ .

Materials with reflective facing: Tested to AS/NZS 1530.3 and the recommendations of Appendix A6.

Pliable membranes: Flammability Index  $\leq 5$  tested to AS 1530.2.

### 31.2.3 MATERIALS

#### Thermal insulation

Standard: To AS/NZS 4859.1.

Wet process fibreboard (softboard): To AS/NZS 1859.4.

Mineral wool insulation: Bio-soluble and not listed as a hazardous material in the Safe Work Australia *Hazardous Chemical Information System* (HCIS).

#### Pliable building membranes

Standard: To AS/NZS 4200.1.

Vapour control membranes:

- Vapour barrier:
  - . Vapour control classification: Class 1 or Class 2, as documented.
- Vapour permeable (breathable) membrane:
  - . Vapour control classification: Class 3 or Class 4, as documented.

Water control (sarking) membrane (other than walls and gables):

- Water control classification: Water barrier.

### 31.2.4 COMPONENTS

#### Fasteners and supports

General: Metallic-coated steel.

#### Mesh support to roof insulation

Welded safety mesh: To AS/NZS 4389.

#### Thermal break strips

Product: Proprietary item.

R-Value ( $\text{m}^2\cdot\text{K}/\text{W}$ ):  $\geq 0.2$ .

## 31.3 EXECUTION

### 31.3.1 GENERAL

#### Thermal insulation

Requirement: To AS 3999 and BCA J1.2 or BCA 3.12.1.1, as appropriate.

Installation: Firmly butt together with no gaps except as follows:

- Access openings and vents: Do not obstruct.
- Light fittings: To AS/NZS 3000 clause 4.5.
- Electrical cables: To AS 3999 clause 2.6.

Glass wool and rock wool insulation: Conform to the *ICANZ Industry code of practice for the safe use of glass wool and rock wool insulation*.

#### Pliable building membrane

Installation: To AS 4200.2 and BCA J1.2 or BCA 3.12.1.1, as appropriate.

### 31.3.2 WALLS

#### Framed walls

Fibre batts: Friction fit between framing members. If other support is not provided, staple nylon twine to the framing and stretch tight.

Thermal break strips: Provide to steel framing with lightweight external cladding:

- Screw fixing: Button head screws at 1 m centres.
- Adhesive fixing: Wallboard adhesive walnuts at 1 m centres.

#### Vapour permeable (breathable) membrane

Requirement: Provide a vapour permeable membrane behind external facing material that does not provide permanent weatherproofing or that may be subject to condensation forming on the internal face, including the following:

- Boards or planks fixed vertically or diagonally.
- Boards or planks fixed in exposed locations where wind driven rain can penetrate the joints.

- Unpainted or unsealed cladding.

Installation: Run the vapour permeable membrane horizontally on the outer face of external wall framing, over the flashing, from the bottom plate up. Pull taut over the framing and fix to framing members. Seal across the wall cavity at the top.

Horizontal laps: At least 150 mm wide, lapped to make sure water is shed to the outer face of the membrane.

End or vertical overlaps laps: At least 150 mm wide made over framing.

Openings: Run the vapour permeable membrane over the openings and leave covered until windows and doors are installed. Cut the membrane on a 45° diagonal from each corner of the opening, fold the flaps inside and fix to the inside frame of the opening. If the membrane is used to provide a continuous airtight layer, seal all joints with pressure sensitive adhesive tape.

Fixing: Install as follows:

- Steel or aluminium frames: Hex head screws, with either 20 mm diameter washers or through hardboard strips.
- Plywood: Alternatives:
  - . Metallic-coated clouts, 20 mm long 6 to 8 mm staples or punched multi-point metallic-coated steel brads at minimum 300 mm centres.
  - . Water based contact adhesive with a 50% adhesive cover.

### 31.3.3 CEILINGS

#### Framed ceilings

Fibre batts: Fit tightly between framing members. If support is not otherwise provided, staple nylon twine to the framing and stretch tight.

#### Suspended ceilings

Fibre batts and blankets: Lay batts/blankets over the ceiling system close butted to each other and to the suspension rods.

### 31.3.4 ROOFS

#### General

Requirement: Provide insulation to the whole of the roof area including skylight shaft walls, except the following:

- Eaves, overhangs, skylights, vents and openings.
- Roofs to outbuildings, garages, and semi-enclosed spaces such as verandahs, porches and carports.

#### Mesh support to roof insulation

Requirement: Provide support to the following:

- Water control (sarking), vapour barrier or reflective thermal insulation membranes laid over roof framing members that are spaced at more than 900 mm centres.
- Blanket type thermal insulation laid over roof framing members as sound insulation to metal roofing.

Installing welded safety mesh: To AS/NZS 4389.

#### Metal roofs

Combined fibre blanket and reflective insulation: Lay facing reflective insulation face downwards over safety mesh.

### 31.3.5 COMPLETION

#### Warranties

Requirement: Provide warranties for materials and workmanship warranties in the form of interlocking warranties as follows:

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: As offered by the supplier/manufacturer.

## 31.4 SELECTIONS

## 31.4.1 THERMAL INSULATION

## Thermal insulation schedule

Property	Framed walls – Building 1	Framed walls to Building 2	Framed and suspended ceilings, excluding entry canopies	Metal roofs
Location	Refer to the drawings – all framed walls	Refer to the drawings – all framed walls	Refer to the drawings – all ceilings	Refer to the drawings – all metal roofs including entry canopies
Type/Product	CSR Bradford Gold Hi-Performance batts	CSR Bradfords Gold Hi-Performance batts	CSR Bradford Polymax	Bradfords Anticon
R-Value (m <sup>2</sup> .K/W)	2.5	2.5	2.5	1.8
Thickness (mm)	90	90	140	80
Density (g/m <sup>3</sup> )	11	11		

**32 LINING****32.1 GENERAL****32.1.1 RESPONSIBILITIES****General**

Requirement: Provide internal lining systems, as documented.

**Performance**

Requirement: Provide lining system with a surface that is:

- Resistant to impacts expected in use.
- Resistant to moisture encountered under expected environmental conditions.
- Free of irregularities.
- A suitable substrate for the nominated final finish.

**32.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**32.1.3 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given in AS/NZS 4491 and the following apply:

- Decorative overlaid wood panels: Particleboard or fibreboard with a bonded decorative finishing surface such as thermosetting resin (low pressure melamine), PVC film, paper foils or wood veneer.
- Dry process fibreboard (MDF): Panel material with a nominal thickness of 1.5 mm or greater, manufactured from lignocellulosic fibres (derived from wood or other materials) with application of heat and/or pressure, the bond of which is derived from a synthetic adhesive added to the fibres and the panels are manufactured with a forming moisture content of less than 20%.
- Fibre cement sheet linings: Treated cellulose fibre in a matrix of cement and sand autoclaved sheet, sealed on one side.
- High pressure decorative laminates (HPDL):
  - . Panels consisting of core layers impregnated with phenolic and/or aminoplastic resins and a surface layer(s) impregnated with aminoplastic resins (mainly melamine resins).
  - . Sheets consisting of a decorative face and layers of fibrous sheet material (e.g. paper) impregnated with thermosetting resins and bonded together under heat and pressure of at least 5 MPa.
- Particleboard: Panel material manufactured under pressure and heat from particles of wood (wood flakes, chips, shavings, sawdust and similar) and/or lignocellulosic material in particle form (flax shives, hemp hurds, bagasse fragments, rice hulls, wheat straw and similar) with the addition of an adhesive.
- Wet process fibreboard: Panel material with a nominated thickness of 1.5 mm or greater, manufactured from lignocellulosic fibres (derived from wood or other materials) with application of heat and/or pressure, the bond of which is derived from the felting of the fibres and the panels are manufactured with a forming moisture content greater than 20%.

**32.1.4 TOLERANCES****Permitted deviations**

Bearing surface of finished framing:

- Gypsum lining: To AS/NZS 2589 clause 4.2.2.
- Other lining: 4 mm from a 1.8 m straightedge.

**32.1.5 SUBMISSIONS****Fire performance**

Fire hazard properties: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE**, **Fire hazard properties**.

**Warranties**

Submit a warranty complying with the terms specified at the end of this worksection.

**32.1.6 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Substrate or framing before installation of linings.

**32.2 PRODUCTS**

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**32.2.1 GENERAL****Storage and handling**

Requirement: Store lining stacked in pallets horizontally on a smooth, level surface. Prevent distortion or moisture ingress.

Timber or fibreboard panels: Store off the ground in a well-ventilated area.

Handling: Do not drag sheets across each other or across other materials. Protect edges, corners and surface from damage.

**32.2.2 FIRE PERFORMANCE****Fire hazard properties**

Group number: To AS 5637.1.

**32.2.3 PLASTERBOARD****General**

Standard: To AS/NZS 2588.

**32.2.4 FIBRE CEMENT****General**

Standard: To AS/NZS 2908.2.

Wall and ceiling linings: Type B category 2.

**32.2.5 COATED STEEL****General**

Standard: To AS 1397, for atmospheric corrosivity categories C1 or C2:

- Coating class interior: Z275.
- Coating class exterior: Z450.

**32.2.6 ADHESIVES, SEALANTS AND FASTENERS****Adhesives**

For wallboards: Gunnable synthetic rubber/resin based mastic contact adhesive formulated for bonding flooring and wallboards to a variety of substrates.

**Sealants**

Fire-resisting sealant: Non-hardening sealant, compatible with the materials to be sealed and having a fire-resistance rating equal to that of the building element it seals.

Acoustic sealant: Non-hardening sealant compatible with the materials to be sealed.

**Fasteners**

Steel nails: Hot-dip galvanized.

**32.3 EXECUTION**

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**32.3.1 CONSTRUCTION GENERALLY****Conditions**

Requirement: Do not start lining work until the building or installation area is enclosed and weathertight, and all wet trades have been completed.

**Preparation**

Requirement: Before fixing linings, check and adjust the alignment of substrates or framing, if necessary.

Substrate: Make sure substrates are plumb, level, in true alignment and to the lining manufacturer's recommendations.

Timber, steel framing and battened masonry: To AS/NZS 2589 clause 4.2.

#### **Pre-conditioning**

General: Acclimatise timber panels in the in-service conditions for 2 to 3 weeks before installing.

#### **Battens**

General: Fix at each crossing with structural framing members, to solid walls or ceiling support. Provide wall plugs in solid substrates.

#### **Ceiling linings**

General: Do not install until the timber roof structure is fully loaded for at least 14 days.

#### **Accessories and trim**

General: Provide accessories and trim as necessary to complete the installation.

#### **Adhesives**

General: Provide adhesive types appropriate for the purpose, and apply them so they transmit the loads imposed without causing discolouration of the finished surfaces.

#### **Fire-resisting and acoustic rated installations**

Sealing: Apply sealant to the manufacturer's recommendations and as follows:

- Around services pipes and penetrations.
- Electrical outlets and recessed lights: Line back and sides of fixture with plasterboard and seal around fixture junction with sealant.
- Around perimeter of lining panels: Provide continuous runs of sealant.

### **32.3.2 PLASTERBOARD**

#### **Installation**

Gypsum plasterboard and fibre reinforced gypsum lining: To AS/NZS 2589.

Level of finish and jointing: To AS/NZS 2589 clause 3.1.

#### **Supports**

General: Install timber battens or proprietary cold-formed galvanized steel furring channels as follows:

- Where framing member spacing exceed the recommended spacing.
- Where direct fixing of plasterboard is not possible, due to the arrangement or alignment of the framing or substrate.
- Where the lining is the substrate for tiled finishes.
- If required for penetrations for services, including mechanical grilles and lighting fixtures.
- If required to support fixtures.

#### **Multiple sheet layers**

Application: Fire-resisting and acoustic rated walls.

Joints: Fill and flush up all joints and fasteners in each layer and caulk up perimeters and penetrations before installing following layers. Stagger all sheet joints by minimum 200 mm.

#### **Joints**

Flush joints: Provide recessed edge sheets and finish flush using perforated paper reinforcing tape.

Butt joints: Make joints over framing members or provide back blocking.

External corner joints: Make joints over metallic-coated steel corner beads.

Dry joints: Provide square edged sheet and finish with a PVC-U joining section.

Control joints: Provide purpose-made metallic-coated control joint beads at not more than 12 m centres in walls and ceilings and to coincide with structural control joints.

Wet areas: Install additional supports, flashings, trim and sealants as required.

Joints in tiled areas: Do not apply a topping coat after bedding perforated paper tape in bedding compound.

### **32.3.3 FIBRE CEMENT**

#### **Installation**

Joints and layout: Run sheets across the framing members. In flush jointed applications, stagger end joints in a brick pattern and locate them on framing members, away from the corners of large openings. Provide supports at edges and joints.

**Supports**

General: Install timber battens or proprietary cold-formed galvanized steel furring channels as follows:

- Where framing member spacing exceed the recommended spacing.
- Where direct fixing of fibre cement is not possible, due to the arrangement or alignment of the framing or substrate.
- Where the lining is the substrate for tiled finishes.
- If required for penetrations for services, including mechanical grilles and lighting fixtures.
- If required to support fixtures.

**Fixing**

Steel framed construction: Screw only or combine with adhesive.

Wall framing: Conform to the following:

- Do not fix to top and bottom plates or noggings.
- In tiled areas: Provide an extra row of noggings immediately above wall-to-floor flashings. Fix sheet at 150 mm centres to each stud and around the perimeter of the sheet.

Wet areas: Do not use adhesive fixing alone.

**32.3.4 TRIM AND ACCESSORIES****General**

Requirement: Provide trim such as beads, mouldings and stops to make neat junctions between lining components, finishes and adjacent surfaces.

Proprietary items: Provide complete with installation accessories.

Timber and MDF trim: Fix using full length so that trim is secure and without movement. Where nail or screw fixings are used, make sure fastener finishes sufficiently below face of trim so that stopping piece finishes flush with the face.

**32.3.5 COMPLETION****General**

Damaged or marked lining and components: Replace.

Exposed surfaces: Touch up shop applied finishes and restore damaged or marked areas.

Timber panels: If appearance is not uniform, replace panels.

Cleaning: Clean completed surfaces to remove irregularities and leave panels smooth and clean, to the manufacturer's recommendations. If required, sand with fine paper to remove irregularities and refinish panel surface.

- Debris and unused material: Remove from site.

**Warranties**

Requirement: Warrant against defective materials and installation.

Warranty terms: **Manufacturers standard**

**32.4 SELECTIONS****32.4.1 SHEET LINING****Sheet lining schedule**

Property	Internal walls linings generally	Internal walls linings – Building 2	Eaves – CFC01	Internal walls linings to walls W04, W07 AND W08
Location	Refer to the drawings	Refer to the drawings	Refer to the drawings	Refer to the drawings
Material	BGC GTEK IMPACT – (WET AREA under tiles)	BGC GTEK WET AREA	BGC Duracom Greystone – Velvet	BGC GTEK WET AREA above 10 ply under compressed fibre cement
Thickness (mm)	13	10	9	10 PLB and 9 CFC

Property	Internal walls linings generally	Internal walls linings – Building 2	Eaves – CFC01	Internal walls linings to walls W04, W07 AND W08
Edge type	Recessed	Recessed	Square	Recessed
Joint type	Flush	Flush	Expressed with painted battens behind all joints	Flush
Finish	Painted	Painted	Pre-finished - (Painted only where noted on the drawings)	Painted
Fixing	Glue and screw	Glue and screw	To manufacturers instructions	Glue and screw
Level of finish	4	4		4
Fire hazard properties: Group number	1	1	1	1
Lining trim: Re-entrant corners	Tape and flush	Tape and flush	To manufacturers specifications	Tape and flush
Lining trim: Salient angles	Flushed in Exangle	Flushed in Exangle	To manufacturers specifications	Flushed in Exangle
Lining trim: Edge trim	Flushed in casing bead	Flushed in casing bead	To manufacturers specifications	Flushed in casing bead

**Prefinished timber lining TIM 01**

Worldwide Timber Traders Groove 50 Modulo Panel

Colour: Ashgrove

Fixing: tongue and groove concealed fix over timber battens

**33 CUBICLE SYSTEMS****33.1 GENERAL****33.1.1 RESPONSIBILITIES****General**

Requirement: Provide cubicles, as documented.

**33.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**33.1.3 INTERPRETATION****Abbreviations**

General: For the purposes of this worksection the following abbreviation applies:

- ABS: Acrylonitrile-Butadiene-Styrene.

**Definitions**

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

- Acrylic polymer resin panels: Thermoplastic or thermosetting acrylic resin panels derived from acrylic acid, methacrylic acid or other related compounds, with mineral fillers and pigments.
- Compressed fibre cement sheets: Factory prefinished double faced autoclaved high density fibre cement sheets with square stone cut edges ground smooth and arised.
- Decorative overlaid wood panels: Particleboard or fibreboard with a bonded decorative finishing surface such as thermosetting resin (low pressure melamine), PVC film, paper foils or wood veneer.
- High pressure decorative laminates (HPDL):
  - . Panels consisting of core layers impregnated with phenolic and/or aminoplastic resins and a surface layer(s) impregnated with aminoplastic resins (mainly melamine resins).
  - . Sheets consisting of a decorative face and layers of fibrous sheet material (e.g. paper) impregnated with thermosetting resins and bonded together under heat and pressure of at least 5 MPa.
- Metal faced board: Sheet metal (usually stainless steel) adhesive fixed to moisture resistant particleboard.

**33.1.4 TOLERANCES****General**

Deviation (from true grid lines and planes): 1:1000 to a maximum of 3 mm.

Misalignment (of adjoining surfaces at panel junctions): 1 mm.

Panel thickness:  $\pm 0.5$  mm.

Length and width: 0.1% of the dimension or 0.5 mm, whichever is the greater.

Flatness, twist, winding and bow: 1 mm deviation from a 2.4 m straightedge placed in any position.

Maximum deviation of edges from the intended true line:  $\pm 1$  mm.

**33.1.5 SUBMISSIONS****Operation and maintenance manuals**

Requirement: Submit on completion.

**Products and materials**

Manufacturer's data: Submit manufacturer's standard product literature for each system type.

Type tests: Submit results as follows:

- Graffiti removal: Removal of spray paint and permanent markers from the nominated surface.

**Shop drawings**

General: Submit shop drawings to a scale that best describes the detail, showing the following:

- Overall layout and dimensions.
- Materials, thicknesses and finishes of elements including doors, divisions, fronts, pedestals and top rail.

- Assembly components, including suspension beam and fixing hardware.
- Door hardware type and location.
- Relationship of assembly to adjacent building elements.

**Warranties**

Submit a warranty complying with the terms specified at the end of this worksection.

**33.1.6 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Set-out before installation.

**33.2 PRODUCTS**

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**33.2.1 GENERAL****Storage and handling**

Requirement: Store in a clean, dry, unaffected by weather and to the manufacturer's recommendations. Protect from building materials and loose debris such as wet plaster, mortar, paint, and welding spatter.

**33.2.2 PRODUCT SYSTEMS****High pressure decorative laminate (HPDL) panels and doors**

Material: Compact high pressure decorative laminate panels with an integral surface finish and edges sealed by the manufacturer.

Standard: To AS/NZS 2924.1.

- Classification: Compact general purpose standard (CGS).

Panel edge: Factory prefinished square cut, ground smooth and arrised. Cleaned and oiled by the manufacturer.

**33.2.3 COMPONENTS****Hardware**

Fixing hardware: Bolts, dowels, brackets, standards, cappings and stabilising bars supplied to complete the cubicle assembly.

Door furniture: As documented.

**33.3 EXECUTION**

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**33.3.1 GENERAL****Pre-conditioning**

General: Acclimatise wood-based system components in the in-service conditions for a minimum period of two weeks before assembly.

**Control of movement**

Assembly: Accommodate thermal expansion of panels.

**33.3.2 PANELS****Manufactured cubicle system installation**

Assembly: Attach divisions and nibs to walls and fronts with purpose-made proprietary fixings. Cut nibs and divisions that abut walls, as required, so that assembly is plumb. Seal edges as recommended by the manufacturer.

Floor mounted/overhead braced type: Fix fronts to the floor with proprietary fittings and at the top to a metal channel headrail, supplied as part of the system. Run headrail across the fronts and fix to the walls at each end. Form the channel into a box section over doorways by snapping in a mating channel insert.

Heads of openings: Fix stabilising head channels by screwing to the top of the partitions. Provide an infill strip to the channel across the opening.

Freestanding type: Fix fronts to the floor with proprietary fittings.

**33.3.3 COMPLETION****Operation and maintenance manual**

Requirement: Prepare a manual that includes the following:

- Full product information for each system, including product designations, components list, colours and finishes, and accessories.
- Information on all doors and hardware supplied as part of the system including door type, size, finishes, and hardware details.
- Maintenance recommendations.

**Warranties**

Requirement: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the supplier and installer.

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: As offered by the supplier/manufacturer.

**33.4 SELECTIONS****33.4.1 SCHEDULES****Cubicle schedule**

Property	PART		
Manufacturer	Rynat		
Product name	R-FMFS floor mounted concealed fix free standing cubicle partitioning system		
Cubicle function	Refer to the drawings		
Panel material and thickness: Division (mm)	13 compact laminate		
Panel material and thickness: Front and nib (mm)	13 compact laminate		
Panel finish: Colour	Burnished Wood - natural		
Door material	Compact laminate - rebated		
Door thickness (mm)	13		
Door finish: Colour	Burnished Wood - natural		
Hardware:	Omega style red and green indicator and turnbolt, staple and bumper. 3 gravity hinges per door with 1 rubber tipped coat hook per cubicle.		
Hardware: Finish	304 stainless steel		
Shower seat	13 compact laminate		
Urinal panel	Rynat Urinal Privacy Panel		
Urinal panel: Model	Euro privacy panel 900 high		
Urinal panel: Material	13 compact laminate		
Urinal panel: Fixing and channel finish	Installation by Rynat - Powdercoated channel colour to match panel		
Urinal panel: colour	Burnished Wood - natural		

**34 ROOM DIVIDERS****34.1 GENERAL****34.1.1 RESPONSIBILITIES****General**

Requirement: Provide room dividers, as documented.

**34.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**34.1.3 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given in AS 2688 and the following apply:

- Flush door panels: Door panels with two plane faces which entirely cover and conceal its structure.
- Flush door panels with blockboard core: Door panels consisting of a core plate of timber strips laid edge to edge, and to which are bonded no less than two sheets of veneer on each face.
- Room dividers: Proprietary systems comprising overhead tracks and carriers supporting doors or panels which are linked, or can be linked, to provide complete partition-type enclosures within defined limits, and which may be opened by sliding and stacking to the sides of openings, inclusive of manufacturer's standard operating gear, hardware, and accessories necessary for satisfactory performance.
- . Operable walls: Partition panels independently suspended and stackable, with provision for linking together at the vertical edges and for preventing lateral movement at the bottom when closed.

**34.1.4 TOLERANCES****General**

Deviation (from true grid lines and planes): 1:1000 to a maximum of 3 mm.

Misalignment (of adjoining surfaces at panel junctions): 1 mm.

Panel thickness:  $\pm 0.5$  mm.

Length and width: 0.1% of the dimension or 0.5 mm, whichever is the greater.

Flatness, twist, winding and bow: 1 mm deviation from a 2.4 m straightedge placed in any position.

Maximum deviation of edges from the intended true line:  $\pm 1$  mm.

**Substrates**

Jamb plumb tolerance: 10 mm.

Floor: Maximum 3 mm deviation from a 3 m straightedge. Maximum 6 mm over opening width.

**34.1.5 SUBMISSIONS****Fire performance**

Fire hazard properties: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE**, **Fire hazard properties**.

**Operation and maintenance manuals**

General: Submit manufacturer's published recommendations for service use.

**Products and materials**

Manufacturer's data: Submit manufacturer's standard product literature for each system type.

Type tests: Submit results as follows:

- Weighted sound reduction index: To AS/NZS ISO 717.1.

**Shop drawings**

General: Submit shop drawings to a scale that best describes the detail, showing the following:

- General arrangement and stacking.
- Pass door(s).
- Details of each assembly, component and connection.

- Information relevant to fabrication, surface treatment and installation.
- Details of structural support of the head track.
- Details of how the integrity of the acoustic plenum baffle will be maintained at track supports.
- Thickness and fabrication details of toughened glass panels.
- Hardware.

**Subcontractors**

Substrate acceptance: Submit evidence of the installer's acceptance of the substrate before commencing installation.

**Warranties**

Requirement: Submit the manufacturer's published product warranties.

**34.1.6 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Overhead tracks installed before dividers/door panels are hung and ceiling installed.
- Completion of assembly.

**34.2 PRODUCTS****34.2.1 GENERAL****Proprietary systems**

Requirement: Complete proprietary systems, as documented, fabricated by one manufacturer to **SELECTIONS**.

**34.2.2 FIRE PERFORMANCE****Fire hazard properties**

Group number: To AS 5637.1.

**34.3 EXECUTION****34.3.1 INSTALLATION****General**

Requirement: Fabricate and install wall divider components to substrates undamaged, plumb, level, straight, free of distortion and to the documented tolerances.

Support: Make sure the brackets and fixings supporting the head track from the base building slab soffit are structurally adequate.

**Pre-conditioning**

General: Acclimatise wood-based system components in the in-service conditions for a minimum period of two weeks before assembly.

**34.3.2 COMPLETION****General**

Adjusting: Fine tune and adjust the room divider to make sure it is operating smoothly and correctly and that all the seals are operating and sealing properly. Leave the work clean, free of defects and in good condition.

**Cleaning**

Temporary coating: On or before completion of the works, or before joining up to other surfaces, remove all traces of temporary coatings used as a means of protection.

**34.4 SELECTIONS****34.4.1 OPERABLE WALLS – OW 01**

Provide the operable walls documented:

Dorma Variflex® 100K or a product equivalent in function and quality to the approval of the Superintendent's Representative

**Manufacturer & Product**

Manufacturer: DORMA HUEPPE

Product: **Variflex® 100K**Contact: Angela Simic at Dorma Hueppe Pty Ltd – 0488 900 725 – [angela.simic@dormakaba.com](mailto:angela.simic@dormakaba.com)**Operation**

A. Series of individual flat panels, manually operated, top supported with **retractable top and bottom seals**, travelling along a ceiling track and assembled to form a solid wall. The entire system must function as a solid wall and even when closed should reveal minimal screws, fixings or other similar metal parts.

- Final closure method shall be: Telescopic Expandable door panel

**Construction**

Nominal 85mm thick panels (max 1200mm width). The panel frame shall consist of torsion-free steel horizontal RHS, and torsion stiff adjustable aluminium vertical members. The horizontal panel edge shall not have an aluminium trim.

Vertical panel trim:

- The panel shall not have an exposed aluminium trim (**K Profile**).
- Each panel shall be lined with Medium Density Fibreboard hung in acoustic free suspension from the panel frame. The panel skin shall be installed on site and able to be replaced without totally disassembling the panel frame.
- The panel must be constructed to achieve **Rw 49**.

**Acoustic Sealing**

Vertical sound seals: The panels shall be interconnected by means of a concave/convex aluminium profile. Each vertical profile shall incorporate a vinyl acoustic seal.

Horizontal Seals: Each panel shall have spring-loaded seals that are pressed against the surfaces of the floor and of

the ceiling head track by means of a spindle mechanism. Polyurethane corner pieces provide an overlapping acoustic

seal of horizontal sealing strips. The total force provided of each seal is 150kp.

The seal spindle mechanism must be assessable while the panel is hanging for servicing and adjustment if

necessary. Total disassembly of the panel frame to access internal components is not acceptable.

**Suspension & tracking system**

Tracking configuration shall be **1-Point Suspension** suitable multi-directional tracking.

Track system: Type RT50 – Aluminium track, single trolley, **centre stacking** (1-point suspension).

**Finish**

All exposed aluminium components shall be Natural anodised (Standard).

All suspension track systems shall be Powdercoated White.

Operable Wall Panel faces to be finished with Autex Vertiface, colour TBC applied over pinnable backing

**Installation & Warrantee**

A. Installation to be performed by DORMA HUEPPE, or their authorized installation agent.

B. Variflex Operable Walls are guaranteed against faulty workmanship and materials (Excludes Finishes) for a period of 24 Months.

<b>Wall Model</b>	<b>Variflex 100K (concealed aluminium profiles) – 100mm thick + finishes</b>
<b>Panel Finish</b>	Full Height both sides in Autex Vertiface, colour: TBC, applied over pinnable backing; Telescopic door panel to be finished Full Height both sides in Dorma Standard Magnetic WhiteBoard.
<b>Acoustic Rating</b>	<b>Rw 49</b> Laboratory Tested
<b>Acoustic Seals</b>	Retractable Mechanical Seals to top and bottom of panels
<b>Track System</b>	RT50 track with One-point suspension, <b>powder coated in Dorma Hueppe White</b>

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	<i>(Track will sit 15mm below the ceiling)</i>
<b>Stacking</b>	<i>Centre Stacked – GRD 0</i>
<b>Metal Finish</b>	<i>All exposed aluminium to be <b>natural anodised satin</b></i>
<b>Closing Method</b>	<i>Telescopic Expandable door panel</i>
<b>Track Suspension</b>	<i>Overhead track directly fixed to an existing suitable support with packing to a maximum of 10mm. Note: Support to be installed 45mm above FCL +/- 5mm</i>

**35 SUSPENDED CEILINGS****35.1 GENERAL****35.1.1 RESPONSIBILITIES****General**

Requirement: Provide suspended ceilings, as documented.

**35.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**35.1.3 STANDARDS****General**

Suspended ceilings: To AS/NZS 2785.

**35.1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given in AS/NZS 2785 and the following apply:

- Ceiling unit: Tile, panel, plank, strip or open grid supported within a ceiling suspended system.

**35.1.5 TOLERANCES****Suspension system**

Flatness, twist, winding and bow: 1.5 mm deviation from a 1.5 m straightedge placed in any position.

**Sheeted or flush ceiling system**

Suspension system bearing surface for flush lined ceiling: To AS/NZS 2589 Table 4.2.2.

Deflection: To AS/NZS 2785 Table 2.4.5.

**35.1.6 SUBMISSIONS****Fire performance**

Fire hazard properties: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE, Fire hazard properties.**

Fire-resistance level: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE, Fire-resistance of building elements.**

**Operation and maintenance manuals**

General: On completion, submit manufacturer's recommendations for the care and maintenance of the ceiling, and operating instructions for demounting, if applicable.

**Products and materials**

Type tests: Submit results as follows:

- Weighted suspended ceiling normalized level difference: To AS/NZS ISO 717.1.
- Weighted sound absorption coefficient: To AS ISO 11654, as tested to AS ISO 354.

**Warranties**

Submit a warranty complying with the terms specified at the end of this worksection.

**35.1.7 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- The suspension system before the installation of ceiling units or lining.
- The ceiling assembly before the installation of fittings and site painting, if applicable.

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## 35.2 PRODUCTS

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### 35.2.1 GENERAL

#### Storage and handling

Requirement: Store suspended ceiling system and components in a dry and secure storage area, unaffected by weather.

### 35.2.2 FIRE PERFORMANCE

#### Fire hazard properties

Group number: To AS 5637.1.

#### Fire-resistance of building elements

Fire-resistance level: Tested to AS 1530.4.

### 35.2.3 CEILING SYSTEMS

#### Proprietary systems

Consistency: Provide suspended ceilings as complete proprietary systems, fabricated by one manufacturer.

Installation: Specialist installers recommended by the ceiling system manufacturer.

Support: Fix proprietary suspension system to the structural soffit.

### 35.2.4 SUSPENSION SYSTEM

#### Proprietary suspension system

General: As documented.

Protective coatings for steel components: To AS/NZS 2785 Appendix F.

### 35.2.5 LINING

#### Plasterboard

Standard: To AS/NZS 2588.

#### Sealants

Fire-resisting sealant: Non-hardening sealant compatible with the ceiling materials and to the documented fire-resistance level.

Acoustic sealant: Non-hardening sealant compatible with the ceiling materials and rated to  $R_w$  65.

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## 35.3 EXECUTION

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### 35.3.1 GENERAL

#### Working environment

General: Do not start work before the building is enclosed, wet work is complete and dry, and all work above the ceiling, including services, is complete.

#### Protection

General: Protect existing work from damage during the installation.

#### Partitions

General: If partitions are attached to the underside of the ceiling systems, include the partition mass in the seismic mass of the ceiling.

#### Stability

General: Install the ceilings level and fix to prevent looseness or rattling of ceiling components under normal conditions.

#### Structure-borne sound

General: Provide a ceiling system which does not amplify structure-borne sound. Provide suitable proprietary products or systems for reducing contact vibrations between structure and ceiling.

#### Control of movement

Abutments: Install the ceiling to allow for differential movement at abutting surfaces.

Alignment: Align ceiling control joints with structural control joints. Do not bridge structural control joints.

#### Prefinishes

General: Repair damaged prefinishes by recoating.

### 35.3.2 SUSPENSION SYSTEM

#### Ceiling grid

Set-out: Align ceiling unit joints and centrelines of visible suspension members with documented grid lines. If not documented, set out with equal margins.

#### Suspension system

Support members: Install support members as follows:

- Space as required by the loads on the system and the type of ceiling.
- Allow for the installation of services and accessories, including ductwork, light fittings and diffusers.
- Provide additional back support or suspension members for the fixing of services and accessories to prevent distortion, overloading or excessive vertical deflection.
- Allow for access for maintenance of services.

Failure: Provide a ceiling system where failure of any one suspension point does not cause a progressive failure of the ceiling.

Height adjustment: Provide height adjustment with a length adjustment device at each suspension point, permitting length variation of at least 50 mm.

Grid members: If required, notch grid members at the junction with the perimeter trim to make sure the ceiling units lay flat on the perimeter trim.

Restriction: Do not attach the suspension system to the lip or flange of purlins.

#### Services

Support: Conform to the following:

- If the service has not been designed to accept the ceiling load, do not fix suspension members to services (e.g. ductwork).
- If services obstruct the ceiling supports, provide bridging and suspension on each side of the services.
- Do not support services terminals on ceiling units.

#### Bracing

General: Provide bracing to prevent lateral movement and to resist the imposed horizontal seismic force.

#### Bulkheads

General: Integrate bulkheads with the ceiling structure and brace to prevent lateral movement. If the ceiling is terminated at a bulkhead, provide for seismic requirements.

#### External suspended soffits

General: Support external suspended soffits on rigid members capable of carrying the loads from imposed actions. Install members to minimise any eccentricity, and carry the upward and downward loads from wind actions through to the supporting structure.

#### Fasteners

General: Provide concealed fasteners. If material supporting hangers is less than 3 mm thick, do not use screw fasteners.

### 35.3.3 PLASTERBOARD LINING

#### Installation

Gypsum plasterboard and fibre reinforced gypsum plaster: To AS/NZS 2589.

Suspended flush ceilings: Fix using screws or screws and adhesive to ceiling members or support frame.

#### Joints

Flush joints: Provide recessed edge sheets and finish flush using perforated paper reinforcing tape.

Butt joints: Make joints over framing members or otherwise provide back blocking.

External corner joints: Make joints over metallic-coated steel corner beads.

Control joints: Align lining control joints with structural control joints and as follows:

- Ceilings: At maximum 12 m centres.
- Control joint beads: Purpose-made metallic-coated.
- Location: If possible, position joints to intersect light fixtures, vents or air diffusers.

Wet areas: Install additional supports, flashings, trim and sealants, as required.

**35.3.4 ACCESS PANELS****Finish**

General: Match the access panels to the ceiling in appearance and performance.

**Identification**

General: Provide each access panel with an identification mark.

**Non-demountable ceilings**

General: Provide access panels supported and anchored to permit ready removal and refixing.

**Reinforcement**

General: Reinforce the back of the access panel to prevent warping and facilitate handling.

**35.3.5 TRIM****General**

Trim: Provide trim at junctions with other building elements and surfaces, including walls, beams and penetrations, consistent with the materials and finishes of the ceiling system.

**Accessories**

General: Provide accessories as part of the proprietary ceiling system necessary to complete the installation.

**35.3.6 COMPLETION****Warranties**

Requirement: Provide warranties for materials and workmanship in the form of interlocking warranties from the supplier and the installer.

Form: Against failure of materials and execution under normal environment and conditions of use.

**35.4 SELECTIONS****35.4.1 SUSPENSION SYSTEM****Proprietary suspension system schedule**

Property	Plasterboard ceilings - generally		
Product	Rondo Key Lock		
Material	Zinc coated steel		
Basic grid (l x b) (mm)	1200 x 600		
Suspension system	Concealed		
Wall angle trim	Refer to the drawings		
Finish / colour	To match the ceiling		

**35.4.2 LINING****Sheet lining schedule**

Property	Plasterboard	Perforated plasterboard	
Location	Refer to the drawings	Refer to the drawings	
Material	Plasterboard STD and MR	CSR Rigitone seamless perforated Astral 12-20/66	
Substrate	Refer to the drawings	Refer to the drawings	
Edge	Recessed	Recessed	
Thickness: Plasterboard (mm)	13	13	
Hole pattern	n/a	8 mm round	
Grade: Plasterboard	STD and MR		

Property	Plasterboard	Perforated plasterboard	
Level of finish to AS/NZS 2589: Plasterboard	4	4	
Lining: edge trim	Rondo P50	Rondo P50	
Lining trim: Re-entrant corners	Tape and flush	Tape and flush	
Lining trim: Salient angles	Rondo Exangle external corner bead	Rondo Exangle external corner bead	
Joints	Flush	Flush	
Finish	Paint	Paint	
Control joint	Rondo expansion joint	CSR Rigitone expansion joint	
Access panels	Rondo panther nominal 600 x 600 lockable with flushed in surround	Rondo panther nominal 600 x 600 lockable with flushed in surround	

**36 JOINERY****36.1 GENERAL****36.1.1 RESPONSIBILITIES****General**

Requirement: Provide joinery, as documented.

**36.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**36.1.3 TOLERANCES****General**

Requirement: Fabricate and install joinery items to substrates undamaged, plumb, level, straight and free of distortion.

**Tolerances table**

Property	Tolerance
Plumb and level	1:800
Offsets in flush adjoining surfaces	0.5 mm
Offsets in revealed adjoining surfaces	2 mm
Alignment of adjoining doors	0.5 mm
Difference in scribe thickness for joinery items centred between walls	2 mm
Doors centred in openings	0
Joints in finished surfaces	0

**36.1.4 SUBMISSIONS****Operation and maintenance manuals**

General: Submit manufacturer's published recommendations for service use.

**Products and materials**

Manufacturer's data: Submit manufacturer's product data.

Proprietary items: Submit the manufacturer's standard drawings and details showing:

- Methods of construction.
- Assembly and fixing, with dimensions and tolerances.

**Samples**

Clear finished timber: Submit samples as follows:

- Initial submission:
- Solid timber: Timber bar top – TIM02.
- Control sample: The approved selection from the initial submission.
- Finished sample: Cut the control sample in half and apply the finish to half the remaining area.

**Shop drawings**

General: Submit shop drawings to a scale that best describes the detail, showing the following:

- Overall dimensions.
- Materials, thicknesses and finishes of elements including doors, divisions, shelves and benches.
- Type of construction including mitre joints and junctions of members.
- Hardware type and location.
- Temporary bracing, if required.
- Procedures for shop and site assembly and fixing.
- Locations of benchtop joints.
- Stone benchtop layout including joint arrangement and penetrations.

- Locations of sanitary fixtures, stoves, ovens, sinks, and other items to be installed in the units.
- Relationship of fixture to adjacent building elements.
- Details of fabrication involving other trades or components.
- Proposals for the break-up of large items as required for delivery to the site.
- Proposed method of joining the modules of large items.

Timing: Before fabrication.

#### **Subcontractors**

General: Submit names and contact details of proposed suppliers and installers.

### **36.1.5 INSPECTION**

#### **Notice**

Inspection: Give notice so that inspection may be made of the following:

- Openings prepared to receive assemblies.
- Site erected assemblies on completion of erection, before covering up by cladding and encasing.
- Surfaces prepared for, and immediately before, site applied finishes.

### **36.2 PRODUCTS**

#### **36.2.1 GENERAL**

##### **Storage and handling**

Requirement: Deliver joinery units to site in unbroken wrapping or containers and store so that its moisture content is not adversely affected. Do not store in areas of wet plaster. Store in an adequately ventilated space away from heat and direct sunlight. Keep storage time to a minimum by delivering items only when required for installation.

#### **36.2.2 JOINERY MATERIALS AND COMPONENTS**

##### **Visible work**

Clear finished timber and veneer: Make sure all visible surfaces are free of branding, crayon or chalk marks and of blemishes caused by handling.

##### **Joinery timber**

Hardwood for trim: To AS 2796.1.

Hardwood for furniture: To AS 2796.3.

Hardwood grade: **Select**

Finished sizes of milled timbers: Not less than the documented dimensions unless qualified by a term such as nominal, out of or ex to which industry standards for finished sizes apply.

##### **Plywood**

Interior use generally: To AS/NZS 2270.

Interior use, exposed to moisture: To AS/NZS 2271.

Visible surface with a clear finish: Veneer quality A.

Other visible surfaces: Veneer quality B.

Wet process fibreboard (including hardboard)

Standard: To AS/NZS 1859.4.

Classification: **MR**

##### **Particleboard**

Standard: To AS/NZS 1859.1.

Classification: **MR**

Melamine overlaid particleboard: Particleboard overlaid on both sides with low pressure melamine.

##### **Dry process fibreboard (including medium density fibreboard)**

Standard: To AS/NZS 1859.2.

Melamine overlaid medium density fibreboard: Medium density fibreboard (STD MDF) overlaid on both sides with low pressure melamine.

##### **Decorative overlaid wood panels**

Standard: To AS/NZS 1859.3.

**High-pressure decorative laminate (HPDL) sheets**

Standard: To AS/NZS 2924.1.

Minimum thickness: Conform to the following:

- For horizontal surfaces fixed to a continuous substrate: 1.2 mm.
- For vertical surfaces fixed to a continuous substrate: 0.8 mm.
- For post formed laminate fixed to a continuous substrate: 0.8 mm.
- For vertical surfaces fixed intermittently, including to studs: 3.0 mm.
- For edge strips: 0.4 mm.

**36.2.3 JOINERY ASSEMBLIES****General**

Standard: To AS 4386.

**Plinths**

Material: HRMDF

Thickness: 16 mm.

Fabrication: Form up with front and back members and full height cross members at not more than 900 mm centres.

Finish: High-pressure decorative laminated sheet:

- Colour: To future colour schedule.

Fasteners: Conceal with finish.

Installation: Scribe to floor and secure to wall to provide level platform for carcasses.

**Carcasses**

Material: Melamine overlaid high moisture resistant medium density fibreboard

Thickness: 16 mm.

Joints: Dowels and glue or screws and glue

Adjustable shelves: Support on proprietary pins in holes bored at equal centres vertically.

- Spacing: 32 mm.

Finish: White melamine overlaid board for construction generally with laminated gable ends exposed backs and sides in selected colour.

Edges: 2mm rigid ABS

Fasteners: Conceal with finish.

Installation: Secure to walls at not more than 600 mm centres.

**Drawer fronts and doors**

Material: Melamine overlaid high moisture resistant medium density fibreboard

Thickness: 16 mm.

Door size: Not exceeding 1.5 m<sup>2</sup> on face, with 2400 mm maximum height or 900 mm maximum width.

Drawer fronts: Rout for drawer bottoms.

- Colour: To future colour schedule.

Edges: 2mm ABS all round

**Drawer backs and sides**

Material: PVC film wrapped particleboard.

Thickness: 12 mm.

Colour: White

Installation: Mitre corners leaving outer skin of foil intact, finish with butt joints, glue to form carcass and screw to drawer front. Rout for drawer bottoms.

**Drawer bottoms**

Material: PVC film laminated hardboard.

PVC film faces: all faces

Thickness: 4 mm.

Colour: white

**Drawer and door hardware**

Hinge types: Concealed metal hinges with the following features:

- Nickel plated.
- Adjustable for height, side and depth location of door.
- Integrated soft and self-closing action.
- Hold open function.

Hold open angle: 135 degrees

Piano hinges: Chrome plated steel, extending full height of doors.

Slides: Metal runners and plastic rollers with the following features:

- 30 kg loading capacity.
- Integrated soft and self-closing action.
- Closure retention.
- White thermoset powder coating or nickel plated.

Pulls: Hafele H1935 ART 106.70.060

Size(mm): 142 x 34

Colour: Black

Ventilation grilles: Hafele Ventilation grille ART 575.23.921 (400mm x 86mm)

Finish: powdercoated

Colour: to future colour schedule

Locks: Hafele Symo locking system with pin tumbler cylinder keyed as directed.

#### Laminate

LAM 01: Laminex Natural – Burnished Wood vertical grain

LAM 02: Laminex Metallic – Mirror Smoke

ABS edge: to match face

### 36.2.4 WORKING SURFACES

#### Laminated benchtops

Material: Melamine overlaid high moisture resistant medium density fibreboard

Finish: High-pressure decorative laminated sheet:

- Colour: To future colour schedule.

Exposed edges: 2mm rigid ABS

Balance underside: Extend laminate to the undersides of benchtops.

Installation: Scribe to walls. Fix to carcass at least twice per 600 mm length of benchtop.

Joint sealing: Fill joint with sealant matching finish and clamp with proprietary mechanical connectors.

#### Bar top – TIM 02

World Wide Timber Traders solid timber.

Timber: Blackbutt

Finish: satin polyurethane

All knots to be filled and finished to Superintendents approval.

Provide samples prior to ordering and fabrication

## 36.3 EXECUTION

### 36.3.1 JOINERY

#### General

Joints: Provide materials in single lengths where possible. If joints are necessary, make them over supports.

Framing: Frame and trim where necessary for openings, including those required by other trades.

Concealed surfaces: Prime surfaces concealed by substrates.

Deficiencies: Examine joinery units for completeness and remedy deficiencies.

Substrate: Damp clean and vacuum substrate surfaces that will be permanently concealed.

Openings: Provide openings for the following: Plumbing fixtures and the like

**Acclimatisation**

General: Acclimatise the joinery items by stacking in the in-service conditions with air circulation to all surfaces after the following are complete:

- Air conditioning operational.
- Lighting operational.
- Site drainage and stormwater works are complete.
- Space fully enclosed and secure.
- Wet work complete and dry.

**Accessories and trim**

General: Provide accessories and trim necessary to complete the installation.

**Fasteners**

Visibility: Do not provide visible fasteners except in the following locations:

- Inside cupboards and drawer units.
- Inside open units, in which case provide proprietary caps to conceal fixings.

Visible fasteners: Where fasteners are unavoidable on visible joinery faces, sink the heads below the surface and fill the sinking flush with a material compatible with the surface finish. In surfaces which are to have clear or tinted finish, provide matching wood plugs showing face (not end) grain. In surfaces which are to have melamine finish, provide proprietary screws and caps finished to match.

Fixing to substrate: Fix joinery units to substrates as follows:

- Floor mounted units: 600 mm centres maximum.
- Wall mounted units: To each nogging and/or stud stiffener.

Fasteners: Screws with washers into timber or steel framing, or masonry anchors.

**Adhesives**

General: Provide adhesives to transmit the loads imposed and for the rigidity of the assembly, without causing discolouration of finished surfaces.

**Finishing**

Junctions with structure: Scribe, plinths, benchtops, splashbacks, ends of cupboards, kickboards and returns to follow the line of structure.

Joints: Scribe internal and mitre external joints.

Edge strips: Finish exposed edges of sheets with 2mm ABS edge strips which match sheet faces or to colours nominated.

Matching: For surfaces which are to have clear or tinted finish, arrange adjacent pieces to match the grain and colour.

Hygiene requirements: To all food handling areas and voids at the backs of units in all areas, seal all carcass and junctions wall/floor, and cable and pipe entries with silicone beads for vermin proofing. Apply water resistant sealants around all plumbing fixtures and make sure sealants are fit for purpose.

**Benchtops**

Installation: Fix to carcass at least twice per 600 mm length of benchtop.

Joint sealing: Fill joints with sealant matching the finish colour and clamp with proprietary mechanical connectors.

Edge sealing: Seal to walls and carcasses with a sealant, which matches the finish colour.

**Labelling**

General: Permanently mark each unit of furniture with the manufacturer's name, on an interior surface.

**36.3.2 TRIM****General**

Requirement: Provide trims such as architraves, beads, mouldings, stops and skirtings to make neat junctions to openings and between lining components, finishes and adjacent surfaces.

**Fixing**

To stud walls: Nail to plate or framing at 600 mm centres maximum.

**36.3.3 COMPLETION****Cleaning**

Requirement: Remove all dust, marks and rubbish from all surfaces and internal spaces. Clean and polish all self-finished surfaces such as anodised and powder coated metals, sanitary ware, glass, tiles and laminates.

Temporary coatings: On or before completion of the works, or before joining up to other surfaces, remove all traces of temporary protective coatings.

**36.4 SELECTIONS****36.4.1 TRIM****Trim schedule**

	<b>SK 01</b>		
Skirtings: Timber species or group	MDF		
Skirtings: Grade	MR		
Skirtings: Size (h x t) (mm)	100 x 19		
Skirtings: Profile	Square edge		
Skirtings: Finish	Paint		

**37 METALWORK - FABRICATED****37.1 GENERAL****37.1.1 RESPONSIBILITIES****General**

Requirement: Provide metal fixtures, as documented.

**Performance**

Requirements:

- Undamaged, plumb, level and straight or as documented.
- Free of surface defects or distortions or as documented.

**37.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**37.1.3 STANDARDS****General**

Access for maintenance: To AS 1657.

**37.1.4 TOLERANCES****General**

Requirement:  $\pm 2$  mm from design dimensions.

**37.1.5 SUBMISSIONS****Execution details**

Welding procedures: Submit details of proposed welding procedures and risk mitigation before fabrication.

Welding dissimilar metals: Submit the following details:

- Type and thickness of materials to be welded.
- Proposed joint preparation and welding procedures.
- Proposed filler metal.
- Expected dilution (proportion of fused parent metal in the weld metal).

**Operation and maintenance manuals**

General: Submit manufacturer's published recommendations for service use.

**Products and materials**

Proprietary items: Submit the manufacturer's standard drawings and details showing:

- Methods of construction.
- Assembly and fixing, with dimensions and tolerances.

Stainless steel: For each batch of stainless steel supplied to the works, submit the certificate of conformance or test certificate to the applicable standard, as documented.

Stainless steel welding: Before fabrication commences, submit evidence of qualification of the welding procedure by testing to AS/NZS 1554.6 clause 4.7 or evidence of prequalification to AS/NZS 1554.6 clause 4.12.

**Shop drawings**

General: Submit shop drawings to a scale that best describes the detail, showing the following information:

- Overall and detail dimensions.
- Details of fabrication and components.
- Details of fabrication involving other trades or components.
- Information necessary for site assembly.
- Proposals for the break-up of large items as required for delivery to the site.
- Proposed method of joining the modules of large items.

**Subcontractors**

General: Submit names and contact details of proposed suppliers, fabricators and installers.

**37.1.6 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Arrival of materials on site or in workshop.
- Shop fabricated or assembled items ready for delivery to the site.
- Commencement of shop or site welding.
- Site erected assemblies on completion of erection, before covering up by cladding and encasing.
- Steel surfaces prepared for, and immediately before, site applied finishes.

**37.2 PRODUCTS****37.2.1 GENERAL****Storage and handling**

Requirement: Store and handle fabricated metalwork, as follows:

- Deliver to site in unbroken wrapping or packing.
- Store on a level base, away from uncured concrete and masonry and areas of wet plaster.
- Do not store in contact with other materials that may cause staining, denting or other surface damage.
- Use gloves when handling precoated finishes.
- Keep storage time to minimum by delivering items only when required for installation.

**Marking**

General: Provide suitable and sufficient marks or other means for identifying each member of site-erected assemblies, and for their correct setting out, location, erection and connection. Mark bolted connections to show the bolting category. Do not mark stainless steel by notching.

**37.2.2 MATERIALS****Metals and components**

Performance: Provide metals and components in quantity, lengths and cross-sections of strength and stiffness suited to their required function, finish, fabrication and method of installation.

**Fasteners**

Performance: Provide fasteners to resist galvanic corrosion in materials of structural and mechanical strengths and corrosion resistance at least equal to that of the lowest resistant metal in the connection.

Materials: Provide fasteners as follows:

- To copper and copper alloys: Copper or copper-alloy fixing devices only.
- To aluminium and aluminium alloys: Aluminium alloy or non-magnetic stainless steel fixing devices only.
- To stainless steel: Appropriate stainless steel materials only.

**37.3 EXECUTION****37.3.1 CONSTRUCTION GENERALLY****Aluminium structures**

Standard: To AS/NZS 1664.1 or AS/NZS 1664.2.

**Metals**

Incompatible metals: Separate using concealed layers of suitable materials in appropriate thicknesses.

**Fabrication**

Workshop: Fabricate and pre-assemble items in the workshop wherever practicable.

Edges and surfaces: Keep clean, neat and free from burrs and indentations. Remove sharp edges without excessive radiusing.

Tube bends: Form bends in tube without deforming the cross section and the material thickness.

Colour finished work: Match colours of sheets, extrusions and heads of fasteners.

Thermal movement: Accommodate thermal movement in joints and fastenings.

**Joints**

General: Fit joints to an accuracy appropriate to the class of work. Finish visible joints made by cutting, drilling, welding, brazing or soldering using grinding, buffing or other methods appropriate to the class of work, before further treatment.

Self-finished metals: Free of surface colour variations, after jointing.

Joints: Fit accurately to a fine hairline or as documented.

**Splicing**

General: Provide structural members in single lengths.

**37.3.2 WELDING AND BRAZING****Welding**

Quality: Provide finished welds which are free of surface and internal cracks, welding slag, and porosity.

Site welds: Avoid site welding wherever possible. If required, locate site welds in positions for down hand welding.

Butt weld quality level: Not inferior to the appropriate level recommended in AS/NZS 1554.1 Section 6, AS/NZS 1554.6 Section 6 or AS/NZS 1665 Section 6, as appropriate.

**37.3.3 STAINLESS STEEL FABRICATION****Welding stainless steel**

Certification of welders: To AS 1796.

**Riveting**

General: Use only to join stainless steel sheet or strip less than 1 mm thick. Drill (not punch) the rivet hole, and drive the rivet cold. On completion, clean and passivate the riveted assembly.

**Soldering**

General: Do not solder stainless steel.

**37.3.4 COMPLETION****Cleaning**

Temporary coatings: On or before completion of the works, or before joining up to other surfaces, remove all traces of coatings used as temporary protection.

**38 STEEL HANDRAILS****38.1 GENERAL****38.1.1 RESPONSIBILITIES****General**

Requirement: Provide steel handrails, guardrails, balustrades and other barriers, as documented.

Extent: refer to the drawings

**38.1.2 DESIGN****General**

Designer: equipment supplier

**Requirements**

Responsibility: for design coordination

Performance requirement: Conform to MODDEX's specification sheets including the following:

- Maximum stanchion spacing.
- Mount dimensions and fixing details to the substrate.

**38.1.3 COMPANY CONTACTS****MODDEX technical contacts**

Website: [www.moddex.com/contact-us](http://www.moddex.com/contact-us).

**38.1.4 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**38.1.5 STANDARDS****General**

Access for people with a disability: To AS 1428.1.

Structural design action: To AS/NZS 1170.1.

Structural bridge design: To AS 5100.2 clause 12.5.

Tactile indicators: To AS/NZS 1428.4.1.

**38.1.6 MANUFACTURER'S DOCUMENTS****MODDEX technical manuals**

Products: [www.moddex.com/products](http://www.moddex.com/products).

Specification sheet downloads: [moddex.com/resources/downloads/](http://moddex.com/resources/downloads/)

**38.1.7 SUBMISSIONS****Certificate**

Requirement: Submit installation compliance certificate for the installed system from a MODDEX recommended installer.

**Product and materials**

Manufacturer's documentation: Submit manufacturer's data including the following:

- Product data sheets.
- Installation and maintenance recommendations.

Type test: Submit results, as follows:

- Guardrail and balustrade systems: To AS 1657.

**Operation and maintenance manuals**

General: Submit manufacturer's published recommendations for service use.

**Records**

Requirement: Submit as-built documentation from a MODDEX recommended installer.

**Shop drawings**

General: Submit shop drawings to a scale that best describes the detail, showing the following information:

- Overall and detail dimensions, including stanchion spacing.
- Mount dimensions and fixing details to the substrate.
- Details of fabrication and components.
- Details of fabrication involving other trades or components.
- Information necessary for site assembly.
- Proposals for the break-up of large items as required for delivery to the site.
- Proposed method of joining the modules of large items.

**Subcontractors**

Requirement: Submit evidence of MODDEX approved installer.

Substrate acceptance: Submit evidence of installer's acceptance of the substrate, including load capacity, before starting installation.

**Warranties**

Requirement: Submit warranties as follows:

- Product warranty by MODDEX.
- Installed system warranty by a MODDEX recommended installer.

**38.2 PRODUCTS****38.2.1 GENERAL****Product substitution**

Other products: Conform to **SUBSTITUTIONS** in *General requirements*.

**Storage and handling**

General: Store and handle to the manufacturer's recommendations and as follows:

- Protect materials from damage.

**Product identification**

General: Marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.

**38.2.2 MODDEX BARRIER SYSTEMS****General**

Description: Heavy duty no-weld pedestrian and property protection barrier systems comprising posts, rails, balustrades and connectors for ground level protection of workplace and public thoroughfares including disabled assistance and bikeway protection.

Handrails: To BCA D2.17.

Galvanized coating: To AS/NZS 4680.

Structural design: To AS/NZS 1170.1.

**Assistrail® disability handrails – to stairs where shown on the drawing**

Assistrail® handrail systems: [moddex.com/products/assistrail-disability-handrails/](http://moddex.com/products/assistrail-disability-handrails/)

Description: Engineered for ramps, stairs and walkways, with smooth connections for a safer finish. Standard and fire stair configurations available.

Material - Tubular sections: G390 hot-dip galvanized steel.

Material - Connector/clamps: Cast iron, steel or aluminium with stainless steel clamp locking screws.

**Product: AR10**

**Mount type: Top mount using M12 x 120 stud anchors**

**38.2.3 MODDEX SAFETY ACCESSORIES****General**

Description: Surface products used for pedestrian safety in all public locations such as stairways, ramps, escalators and platforms.

Tactile indicators: To AS/NZS 1428.4.1.

Slip resistance: To AS 4586.

**Intac® tactile indicators**

Intac® surface tactile indicators: [moddex.com/products/intac-tactile-indicators/](http://moddex.com/products/intac-tactile-indicators/)

Description: Tactile indicators for ramps, stairs and walkways for the blind or visually impaired. Ceramic tile or self-adhesive PVC options available.

Material: PVC-U or ceramic.

Product: IN101 PVC Fastile hazard tactile 300 x 300 black

**38.3 EXECUTION****38.3.1 INSTALLATION****General**

Requirement: To MODDEX's recommendations using MODDEX approved installers for installation.

**Fixing**

Requirement: Fix to the structure with documented mounts and/or brackets.

**38.3.2 TRAINING****General**

Requirement: Provide training in the safe use and maintenance of the system to all users.

**38.3.3 COMPLETION****Cleaning**

Temporary coatings: Before completion, or before joining up to other surfaces, remove all temporary coatings used for protection.

**Stair edging schedule**

Location	<b>External stairs</b>		
Product code	DTAC Pemko Urban Edging DEO68OC		
Application	Stair edging		
Dimensions (mm)	10 x 58 x 5		
Fixing	Mechanical fixed to manufacturers instructions		
Colour	Natural anodised grey infill		
Slip-resistance classification	R13		
Substrate	Concrete		

**39 FIRE EXTINGUISHERS AND BLANKETS****39.1 GENERAL****39.1.1 RESPONSIBILITIES****General**

Requirement: Provide portable fire extinguishers and fire blankets, as documented.

**39.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**39.1.3 SUBMISSIONS****Products and materials**

Requirement: Submit evidence of suitability for use, to BCA A5.0, for all fire protection products.

**Records**

General: Submit any routine service records to AS 1851.

**39.2 PRODUCTS****39.2.1 EXTINGUISHERS****Portable fire extinguishers**

General: To AS/NZS 1841.1.

Type:

- Water: To AS/NZS 1841.2.
- Wet chemical: To AS/NZS 1841.3.
- Foam: To AS/NZS 1841.4.
- Powder: To AS/NZS 1841.5.
- Carbon dioxide: To AS/NZS 1841.6.
- Non-rechargeable: To AS/NZS 1841.8.

Selection, location and distribution: To AS 2444.

**39.2.2 BLANKETS****Fire blankets**

General: To AS/NZS 3504.

Selection and location: To AS 2444.

**39.3 EXECUTION****39.3.1 INSTALLATION****Fire fighting equipment**

Standard: Installation to AS 2444.

Signage: Provide signs to **STATUTORY SIGNS** in *Signage*.

**39.3.2 COMPLETION****Routine service**

Portable fire extinguishers: To AS 1851 Section 10.

Fire blankets: To AS 1851 Section 11.

**Baseline data**

Requirement: Provide baseline data to AS 1851.

## 39.4 SELECTIONS

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### 39.4.1 EQUIPMENT

#### **Portable fire extinguishers schedule**

Provide fire extinguishers in accordance with the Code.

#### **Fire blankets schedule**

Provide fire blankets in accordance with the Code.

**40 WINDOW COVERINGS****40.1 GENERAL****40.1.1 RESPONSIBILITIES****General**

Requirement: Provide window coverings, as documented.

**40.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**40.1.3 SUBMISSIONS****Fire performance**

Fire hazard properties: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE**, **Fire hazard properties**.

**Operation and maintenance manuals**

General: Submit the manufacturers' data as follows:

- Recommendations for service use, care and maintenance.
- List of manufacturers and suppliers of replacement parts.

**Products and materials**

Manufacturer's drawings: Submit manufacturer's standard drawings and details showing methods of construction, assembly and fixing, with dimensions and tolerances.

Pest resistance: Submit evidence of conformity to PRODUCTS, **MATERIALS**, **Pest resistance** tested to AS 2001.6.1.

**Samples**

General: Submit two samples showing material, colour, texture, pattern and other visible characteristics for each of the following:

- Roller blinds: 200 mm x 200 mm.
- Track systems: 400 mm long, and including manufacturer's standard control system furniture items and accessories.

**Shop drawings**

General: Submit shop drawings to a scale that best describes the detail, showing the following:

- Window coverings: Show sizes, locations, and details of fabrication and installation.
- Tracks: Show installation and anchorage details, and locations of controls.

**Subcontractors**

General: Submit names and contact details of proposed suppliers and installers.

**Warranties**

Submit a warranty complying with the terms specified at the end of this worksection.

**40.1.4 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Building locations or substrates prepared to receive window coverings before installation.

**40.2 PRODUCTS****40.2.1 FIRE PERFORMANCE****Fire hazard properties**

Windows coverings: Tested to AS/NZS 1530.3.

**40.2.2 MATERIALS****Fabrics**

Uncoated woven and knitted fabrics: To AS 2663.1.

- Performance classification (minimum): 2.  
Coated woven and knitted fabrics: To AS 2663.2.
- Performance classification (minimum): 2.  
Vertical blind fabrics: To AS 2663.3.

**Anti-microbial treatment**

Requirement: Non-metallic, colourless, odourless, positively charged polymer applied during manufacturing to form a molecularly bonded surface to resist bacteria and mould growth.

**Pest resistance**

Requirement: Provide window coverings composed entirely of materials either inherently resistant to insect attack or treated against insect attack, by application of insecticide to the yarn during the dyeing or scouring process.

Insect resist agents for wool: Conform to the recommended application levels published by the Woolmark Company for Level 4 protection.

**40.2.3 BLINDS****Roller blinds**

Requirement: Complete proprietary systems, as documented, fabricated by one manufacturer.

Track material: Extruded aluminium alloy 6063-T6.

**40.3 EXECUTION****40.3.1 INSTALLATION****General**

Installation: Install tracks in documented locations using manufacturer's purpose fabricated mounting brackets, clips, track splicing and other hardware. Install window coverings to hang plumb and level, and true to line.

Fixing: Provide concealed mechanical fixings suitable for mounting tracks to substrate. Match exposed mounting hardware to the finish and colour of adjacent track.

Adjustment: Adjust all operating hardware for smooth operation free from binding, and to provide even, accurate alignment of window covering in open and closed positions.

Safety: Install child safety devices on all control cords and chains. Install all control cords and chains in conformance with

*Competition and Consumer (Corded Internal Window Coverings) Safety Standard.*

**40.3.2 COMPLETION****Warranties**

Requirement:

- Manufacturer's warranty against defects in workmanship.
- Installer's warranty against defects in installation.

**40.4 SELECTIONS****40.4.1 SCHEDULES**

Property	RB 01		
Type	Single roller blind		
Internal window dimension: Width (mm)	Refer to the drawings		
Internal window dimension: Height (mm)	Refer to the drawings		
Mounting			
Product identification	Verosol		
Fabric	Silver Screen 4% semitransparent metallised		
Colour	ED03 Light Grey		

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Operation	Manual		
Chain material	Metal chain		

**41 SIGNAGE****41.1 GENERAL****41.1.1 RESPONSIBILITIES****General**

Requirement: Provide signage systems, as documented.

**Performance**

Requirement: Provide signage as follows:

- Appropriately secured.
- Located within a clear line of vision.
- With characters and symbols contrasting with the background.
- With clean, well-defined edges or arrises, and free from blemishes.

**41.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**41.1.3 STANDARDS****Signs**

Safety signs - design and use: To AS 1319.

Signs and graphics for disability access: To AS 1428.1 and AS 1428.2.

Tactile wayfinding signs: To AS 1428.4.2.

**41.1.4 INTERPRETATION****Definitions**

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

- Changeable letter systems: Sign systems consisting of display boards or holders into which removable individual letters, numbers, symbols or other characters can be inserted.
- Changeable plate systems: Sign systems consisting of fixed plate holders to which removable interchangeable sign plates can be attached or inserted.
- House signage: Internal and external project specific signs.
- Illuminated signs: Signs consisting of cabinets enclosing a light source, illuminating translucent face panels bearing the specified signage.
- Statutory signs: Signs prescribed by the NCC and statutory authorities.
- Variable room identification systems: Changeable plate systems incorporating fixed room numbers and removable name strips.

**41.1.5 SUBMISSIONS****Warranties**

Requirement: Submit the manufacturer's published product warranties.

**41.2 PRODUCTS****41.2.1 MATERIALS****Standards**

Aluminium:

- Plate for engraving: Alloy and temper designation 6063-0 to AS 2848.1.
- For casting: To AS 1874.
- Finishes:
  - . Anodising: To AS 1231.
  - . Powder coating: To AS 3715 and AAMA 2604.

Stainless steel:

- External: Type 316. Mirror electropolish surface finish.
- Internal: Type 304. No. 4 brushed (general purpose polished) surface finish.

Plastics:

- PVC-U sheet: Semi-rigid sheet.
- Rigid cellular polystyrene: To AS 1366.3, class VH for cut-out shapes.

Brass and bronze: Plate, sheet and strip: To AS 1566.

- Finish: Patinated.

Glass type and thickness: To AS 1288.

Photoluminescent exit signs: To BCA E4.8(b).

#### **Adhesive**

General: Proprietary solvent based contact adhesive compatible with the substrate and signage material.

### **41.3 EXECUTION**

#### **41.3.1 WORKMANSHIP**

##### **Production**

General: Form signage and graphic items accurately with clean, well-defined edges or arises, free from blemishes.

Engraving to two-layer plastic laminate: Engrave lettering to expose the lower laminate.

Engraved and filled: Lettering precision cut and filled colouring material. Clean faces of all filling material.

Casting: Produce shapes free of pits, scale, blow holes or other defects, hand or machine-finished if necessary.

Laser cut lettering: Individual vinyl letters with self-adhesive backing.

Printed lettering: Lettering and graphic images screen/digitally printed on:

- Film with self-adhesive backing.
- Acrylic sheet.
- Aluminium plate.
- Stainless steel plate.

Large format digital printing: Lettering and graphic images screen printed film with self-adhesive backing.

Signwriting: Lettering and graphic images hand painted direct to the background by a tradesman with recognised qualifications and demonstrated skills.

Fabricated: Three dimensional, formed as follows:

- Laser cutting from solid material and hand finished as necessary.
- Moulding: Individual plastic hollow three dimensional characters and shapes formed by:
  - . Injection moulding.
  - . Vacuum forming.
- Built-up individual shapes by fabricating the faces and edges from separate pieces neatly and securely joined.

#### **41.3.2 INSTALLATION**

##### **General**

Requirement: Install signage and graphic items level and plumb, securely mounted, with concealed corrosion and theft-resistant fixings.

##### **Self-adhesive signs**

Requirement: Fix free of bubbles and creases.

#### **41.3.3 COMPLETION**

##### **Cleaning**

General: Remove protective coverings, replace damaged signage and leave the work clean, polished, free from defects, and in good condition.

**Warranties**

Requirement: Warrant against defective materials and incorrect installation.

Warranty terms: manufacturers standard

**41.4 SELECTIONS****41.4.1 GENERAL SIGNS****Signage schedule**

Allow the PROVISIONAL SUM scheduled in the PRELIMINARIES for the supply and installation of non-statutory signage.

Allow for statutory signage as documented and in accordance with the regulations

**41.4.2 STATUTORY SIGNS****Termite protection**

Location	In or near meter box or similar
Message	Details of termite management system Indicate: <ul style="list-style-type: none"> <li>- The method of protection</li> <li>- The date of installation</li> <li>- The life expectancy of a chemical barrier as listed on the appropriate authority's pesticides register label</li> <li>- The installer's recommendation for inspections</li> </ul>
Sign type	Laminated page(s)
Conformance	BCA 3.1.4.4, BCA B1.4(i)(ii) AS 3660.1 Appendix A

**Braille and tactile exit signage**

Location	To BCA Spec D3.6 for every door described in BCA E4.5
Message	Exit (and) Level (followed by the floor level number) (Braille and tactile signage)
Letter height (minimum)	BCA Spec D3.6
Mounting height	Braille and tactile signage between 1200 mm and 1600 mm above finished floor level
Sign type	
Conformance	BCA E4.5, BCA D3.6 and BCA Spec D3.6

**Fire hose reels and fire hydrants**

Location	Cupboard door or adjacent the FHR
Message	FIRE HYDRANT (and/or) FIRE HOSE REEL
Letter height (minimum)	50 mm
Sign type	Adhesive backed vinyl
Conformance	AS 2441 clause 10.4.4 AS 2419.1 clause 11.3.2

**Fire hose reel – Location sign**

Location	Above or adjacent the FHR if located in a recess, cavity or obscure location
Message	To AS 2441 Figure 10.1

Letter height (minimum)	16 mm
Mounting height (minimum)	2000 mm above finished floor level or at a height visible to a person approaching the fire hose reel location
Sign type	Adhesive backed vinyl
Conformance	AS 2441 clause 4.1

**Portable fire extinguishers – Location sign**

Location	As nominated in AS 2444 clause 3.2 at every installed extinguisher nominated in BCA Table E1.6
Message	FIRE EXTINGUISHER (and prescribed graphic)
Letter height (minimum)	16 mm
Mounting height (minimum)	2000 mm above finished floor level
Sign type	Computer generated adhesive backed vinyl graphic
Conformance	AS 2444 clause 3.3

**Fire blankets**

Location	As nominated in AS 2444 clause 6.4 at every blanket location nominated in AS 2444 clause 6.3
Message	FIRE BLANKET (and prescribed graphic)
Letter height (minimum)	16 mm
Mounting height (minimum)	2000 mm above finished floor level
Sign type	Computer generated adhesive backed vinyl graphic
Conformance	AS 2444 clauses 6.3, 6.4 and Figure 6.1

**Unisex accessible sanitary facilities**

Location	To BCA Spec D3.6
Message	- Braille and tactile signage incorporating the international symbol of access. - Indicate suitability for left or right handed use.
Symbol size	AS 1428.2 clause 16, Table 1.
Letter height (minimum)	Braille: BCA Spec D3.6 Raised characters: Sans serif type font 20 mm.
Sign type	
Conformance	AS 1428.1 clause 5.1 BCA D3.6

**Ambulant sanitary facilities**

Location	To BCA Spec D3.6
Message	Braille and tactile signage incorporating the male/female ambulant symbol.
Symbol size	AS 1428.2 clause 16, Table 1.
Letter height (minimum)	Braille: BCA Spec D3.6 Raised characters: Sans serif type font 20 mm.
Sign type	
Conformance	AS 1428.1 clause 5.1 BCA D3.6

**Non-accessible sanitary facilities**

Location	At each bank of sanitary facilities that are not provided with an accessible unisex sanitary facility
Message	<ul style="list-style-type: none"> <li>- Braille and tactile signage incorporating the international symbol of access.</li> <li>- Indicate location of the nearest accessible unisex sanitary facility with directional arrow.</li> </ul>
Letter height	AS 1428.2 clause 17, Table 2
Symbol size	AS 1428.2 clause 16, Table 1
Sign type	
Conformance	AS 1428.1 clause 5.1 BCA D3.6

**Main switchboard – Room or enclosure, excluding Class 1 dwellings**

Location	The room or enclosure containing the main switchboard
Message	MAIN SWITCHBOARD
Letter height (minimum)	
Sign type	
Conformance	AS/NZS 3000 clause 2.10.2.4

**42 WATERPROOFING – WET AREAS****42.1 GENERAL****42.1.1 RESPONSIBILITIES****General**

Requirement: Provide wet area waterproofing systems, as documented.

**Performance**

Requirements:

- Graded to floor wastes, to dispose of water without ponding.
- Able to prevent moisture entering the substrate or adjacent areas.

**42.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**42.1.3 STANDARDS****Waterproofing wet areas**

Standard: To AS 3740.

**42.1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given in AS 3740 and the following apply:

- Membranes (waterproof): Impervious barriers to liquid water which may be:
  - . Installed below floor finishes.
  - . Installed behind the wall sheeting or render.
  - . Installed to the face of the wall sheeting or render.
  - . Applied in liquid or gel form and air cured to form a seamless film.
  - . Applied in sheet form with joints lapped and sealed.
- Waterproofing system: Combinations of membranes, flashings, drainage and accessories which form waterproof barriers and which may be:
  - . Loose-laid.
  - . Bonded to substrates.
- Wet area: An area within a building supplied with a floor waste.

**42.1.5 SUBMISSIONS****Products and materials**

Manufacturer's data: Submit product data sheets.

Type tests: Submit certificates verifying conformance to AS/NZS 4858 Table 8.1.

**Records**

General: Submit photographic records of application and protection of membranes. Label photographs with date and location.

Timing: Record at the following stages:

- After substrate preparation.
- After primer application.
- After membrane installation.
- After protection from traffic provided.

Liquid applied membranes:

- Record wet film thickness once every 10 m<sup>2</sup> and compare to the manufacturer's requirements.
- On completion of every 100 m<sup>2</sup> of each coat, compare the amount of membrane used with the manufacturer's application rate and record the result.

Membrane continuity tests: Submit reports:

- Flood test, including photographic records of flooded areas and adjacent areas. Label photographs with date and location.
- Electronic leak detection test.
- Seam probe test.

**Tests**

Site tests: Submit results, as follows:

- Substrate moisture content test.
- Membrane continuity tests, including records of retesting after rectification.
- Flood test.
- Electronic leak detection test.
- Seam probe test.

**Warranties**

Submit a warranty complying with the terms specified at the end of this worksection.

**42.1.6 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Substrates prepared and ready for installation of the wet area waterproofing systems.
- Membranes after installation and before concealment.

**42.2 PRODUCTS**

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**42.2.1 GENERAL****Storage and handling**

General: Store and handle to the manufacturer's recommendations and as follows:

- Protect materials from damage.

**42.2.2 MEMBRANES****Standards**

Standard: To AS/NZS 4858.

**Total VOC limits**

Requirement: Conform to the following maximum TVOC content:

- Waterproof membrane: 250 g/L.

**42.2.3 ACCESSORIES****Bond breakers**

Requirement: Compatible with the extensibility class of the membrane to be used.

Material: Purpose-made bond breaker tapes or fillets of sealant.

**Flashings**

Requirement: Flexible waterproof flashings compatible with the waterproof membrane system.

**Liquid membrane reinforcement**

Requirement: Flexible fabric compatible with the waterproof membrane system.

**Sealants**

Requirement: Waterproof or water resistant, flexible, mould-resistant and compatible with the waterproofing system and to the manufacturer's recommendations.

**Adhesives**

Requirement: Waterproof and compatible with the waterproofing system.

**42.3 EXECUTION**

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**42.3.1 PREPARATION****Substrates**

General: Prepare substrates as follows:

- Clean and remove any deposit or finish which may impair adhesion of membranes.

- If walls are plastered, remove loose sand.
- If walls or floors are framed or discontinuous, make sure support members are in full lengths without splicing.
- If floors are solid or continuous:
  - . Remove excessive projections.
  - . Fill voids and hollows greater than 10 mm with abrupt edges with a cement:sand mix not stronger than the substrate nor weaker than the bedding.
  - . Fill depressions less than 10 mm with a latex modified cementitious product with feathering eliminated by scabbling the edges.
  - . Fill cracks in substrates wider than 1.5 mm with a filler compatible with the membrane system.

Concrete substrates: Cure for more than 28 days.

External corners: Round or arris edges.

#### **Moisture content**

Requirement: Verify that the moisture content of the substrate is compatible with the water vapour transmission rate of the membrane system by testing to the recommendations of AS 3740 Appendix F.

#### **Falls**

Membrane applied to substrate: Make sure the fall in the substrate conforms to the fall documented for the finish.

#### **Priming**

Compatibility: If required, prime the substrates with compatible primers for adhesion of the membrane system.

#### **Bond breakers**

Requirement: After the priming of surfaces, provide bond breakers at wall/floor junctions, hob/wall junctions and at control joints where the membrane is bonded to the substrate.

Sealant fillet bond breakers:

- Application: Form a triangular fillet or cove of sealant to internal corners within the period recommended by the membrane manufacturer after the application of the primer.
- Width: Conform to AS 3740 Table 4.10.

### **42.3.2INSTALLATION**

#### **Ambient conditions**

Requirement: Do not install in conditions outside the manufacturer's recommendations.

#### **Protection**

Damage: Protect membrane from damage during installation and for the period after installation until the membrane achieves its service characteristics that resist damage and an overlaying finish is installed.

#### **Extent of waterproofing**

Waterproof or water resistant surfaces: To the requirements of BCA F1.7 or BCA 3.8.1.2, as applicable.

#### **Drainage connections**

Floor wastes: Provide floor wastes of sufficient height to accommodate the thickness of floor finishes and bedding at the outlet position. Position leak control flange to drain at membrane level. Turn membrane down 50 mm minimum into the floor waste leak control flanges, and adhere to form a waterproof connection.

Floor wastes in shower trays: Provide drainage of the tile bed and a waterproof connection between the tray and the drain.

Preformed drainage channels:

- With continuous leak control flanges: Provide a continuous waterproof connection between the membrane and the channel.
- Without leak control flanges: Provide continuous waterproofing under the channel and terminate the membrane at a floor waste with a recessed leak control flange.

#### **Unenclosed showers**

Requirement: Extend membrane at least 1500 mm into the room from the shower rose outlet, on the walls and floor.

**Taps and spouts**

Requirement: Waterproof penetrations for taps and spouts with preformed flange systems or a sealant.

Provision for servicing: Install taps so tap washers or ceramic discs can be serviced without damaging the waterproofing or seal.

**Wall recesses**

Requirement: Support all faces of the recess and line with the same sheet material as the adjacent wall. Fall base of recess towards the shower area. Flash all junctions and waterproof all surfaces.

**Curing of liquid membrane systems**

General: To the manufacturer's instructions.

Curing: Allow membrane to fully cure before tiling.

**Overlaying finishes on membranes**

Requirement: Protect waterproof membranes with compatible water resistant surface materials that do not cause damage to the membrane.

Suitable materials: Conform to AS 3740.

Bonded or partially bonded membranes: If the topping or bedding mortar is to be bonded to the membrane, provide sufficient control joints in the topping or bedding mortar to reduce the movement over the membrane.

**42.3.3 TESTING****Substrate tests**

Moisture content: Test substrate for suitability for the installation of membranes to AS 3740 Appendix F.

- Maximum relative humidity of concrete or cementitious screeds: To AS 3740 Appendix F2.4.
- Moisture content of timber and plywood substrates: To AS 3740 Appendix F2.3.

**Membrane continuity tests**

Flood test: To AS 3740 Appendix C2.

Electronic leak detection test: To AS 3740 Appendix C3.

Seam probe test: To AS 3740 Appendix C4.

**42.3.4 COMPLETION****Reinstatement**

Extent: Repair or replace faulty or damaged work. If the work cannot be repaired satisfactorily, replace the whole area affected.

**Warranties**

Requirement: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the supplier and the applicator.

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: As offered by the supplier.

**42.4 SELECTIONS****42.4.1 SYSTEMS****Liquid membrane system schedule**

Seamless wet area membranes	Type and/or location		
	To all shower areas - walls and floors and walls and floors of rooms with floor and wall mounted fixtures		
Proprietary system	Dribond flexible sealer or similar approved		
Material type	Acrylic plastic sealer		
Priming	In accordance with manufacturers instructions		
Number of coats	2		



**43 CERAMIC TILING****43.1 GENERAL****43.1.1 RESPONSIBILITIES****General**

Requirement: Provide tiling systems to walls, floors and other substrates, as documented.

**Performance**

Requirements:

- Consistent in colour and finish.
- Firmly bonded to substrates for the expected life of the installation.
- Set out with joints accurately aligned in both directions and wall tiling joints level and plumb.
- Direct all water flowing from supply points to drainage outlets without leakage to the substrate or adjacent areas.

**43.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**43.1.3 STANDARDS****Tiling**

General: Conform to the recommendations of those parts of AS 3958.1 referenced in this worksection.

**Slip resistance**

Classification: To AS 4586.

**43.1.4 INTERPRETATION****Definitions**

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

- Adhesives - cementitious (C): Adhesive in which the binders are hydraulic, e.g. General purpose cement, with aggregates and organic additives.
- Adhesives - dispersion (D): Adhesives in which the binders are in the form of aqueous polymer dispersion with mineral fillers and organic additives.
- Adhesives - reaction resin (R): Adhesives in which the binders are synthetic resins with mineral fillers and organic additives. The curing occurs by chemical reaction.
- Bedding: Mixtures of materials which are applied to substrates in a plastic state and which dry, cure and adhere tiles to substrates:
  - . Adhesive bedding: Paving/tiling adhered by adhesives.
  - . Mortar bedding: Paving/tiling adhered in a cementitious mortar bed.
- Lippage: Height deviation between adjacent units.
- Stepping: The relative surface level of adjacent paving elements within the expanse of the main pavement.
- Substrate: The surface to which a material or product is applied.
- Tile: Thin slab made from clay and/or other inorganic raw materials used generally as coverings for floors and walls and adhered to continuous supporting substrates.
- Tiles – cementitious: Cement based prefinished tiles.
- Tiles – dry-pressed: Tiles made from a finely milled body mixture and shaped in moulds at high pressure. Also known as Type B.
- Tiles – extruded: Tiles whose body is shaped in the plastic state in an extruder then cut to size. Also known as Type A.
- Wet area: An area within a building supplied with a floor waste.

**43.1.5 TOLERANCES****Completed tiling**

Requirement: To the recommendations of AS 3958.1 clause 5.4.6.

### 43.1.6 SUBMISSIONS

#### Execution details

Grouting: Submit proposals for grouting methods and materials.

Margins: If it appears that minor variations in joint widths or overall dimensions will avoid cut tiles, submit a proposal.

#### Operation and maintenance manuals

General: Submit a manual describing care and maintenance of the tiling, including procedures for maintaining the slip-resistance classification stating the expected life of the slip-resistance classification.

#### Products and materials

Product conformity: Submit the following:

- Tiles: Evidence of conformity to AS 13006.
- Tile adhesive: Evidence of conformity to AS ISO 13007.1.

### 43.1.7 INSPECTION

#### Notice

Inspection: Give notice so that inspection may be made of the following:

- Substrate immediately before tiling.
- Trial set-outs before execution.
- Control joints before sealing and grouting.
- Grout and sealant colours before application.

## 43.2 PRODUCTS

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### 43.2.1 TILES AND ACCESSORIES

#### Tiles

Standard: To AS 13006.

Coves, nosings and skirtings: Provide matching stop-end and internal and external angle tiles moulded for that purpose.

Exposed edges: Purpose-made border tiles with the exposed edge (whether round, square or cushion) glazed to match the tile face. If such tiles are not available, mitre tiles on external corners.

#### Accessories

General: Provide tile accessories which match the composition, colour and finish of the surrounding tiles.

### 43.2.2 ADHESIVES

#### General

Standard: To AS ISO 13007.1.

#### Type

General: Provide adhesives compatible with the materials and surfaces to be adhered, and as documented.

Prohibited uses: Do not provide the following combinations:

- Cement-based adhesives on wood, metal, painted or glazed surfaces, gypsum-based plaster.
- Organic solvent-based adhesives on painted surfaces.
- Organic PVC-based adhesives and organic natural rubber latex adhesives in damp or wet conditions.
- PVA (polyvinyl acetate) based adhesives in wet areas or externally.

### 43.2.3 MORTAR

#### Materials

Cement type to AS 3972: GP.

- White cement: Iron salts content  $\leq 1\%$ .
- Off-white cement: Iron salts content  $\leq 2.5\%$ .

Lime: To AS 1672.1.

Sand: Fine aggregate with a low clay content selected for grading, sharp and free from efflorescing salts.

Measurement of volume: Measure binders and sand by volume using buckets or boxes. Do not allow sand to bulk by absorption of water.

#### **Bedding mortar**

Mix proportion (cement:sand), by volume: Select proportions from the range 1:3 to 1:4 for satisfactory adhesion. Provide minimum water.

Terracotta tiles: Use proprietary polymer modified mortar.

Mixing: To AS 3958.1 clause 2.15.

#### **Water**

General: Clean and free from any deleterious matter.

### **43.2.4 GROUT**

#### **Type**

Cement based proprietary grout: Mix with water. Fine sand may be added as a filler in wider joints.

General purpose cement based grout: Mix with fine sand. Provide minimum water consistent with workability.

Mix proportions (cement:sand), by volume:

- For joints < 3 mm: 1:2.
- For joints ≥ 3 mm: 1:3.

#### **Pigments**

Pigments for coloured grout: Provide colourfast fillers compatible with the grout material. For cement-based grouts, provide lime-proof natural or synthetic metallic oxides compatible with cement.

### **43.2.5 CONTROL JOINTS**

#### **Control joint materials**

Control joint strip: A proprietary control joint consisting of a neoprene core sandwiched between metal plates with lugs or ribs for mechanical keying. Set flush with the finished surface.

Proprietary slide plate divider strip: An arrangement of interlocking metal plates grouted into pockets formed in the concrete joint edges.

Sealant: One-part self-levelling non-hardening mould resistant, silicone or polyurethane sealant applied over a backing rod. Finish flush with the finished surface.

- Floors: Trafficable, shore hardness greater than 35.

Backing rod: Compressible closed cell polyethylene foam with a bond-breaking surface.

## **43.3 EXECUTION**

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### **43.3.1 SUBSTRATES**

#### **Drying and shrinkage**

General: Before tiling, allow at least the following times to elapse (for initial drying out and shrinkage) for these substrates:

- Concrete slabs: 42 days.
- Toppings on slabs and rendering on brick or blockwork: A further 21 days.

### **43.3.2 PREPARATION**

#### **Standard**

Preparation: To the recommendations of AS 3958.1 Section 4.

#### **Ambient temperature**

General: If the ambient temperature is less than 5°C or greater than 35°C, do not lay tiles.

#### **Substrates without wet area membranes**

General: Make sure substrates are as follows:

- Clean and free of any deposit or finish which may impair adhesion or location of tiles.
- If framed or discontinuous, support members are in full lengths without splicing.
- If solid or continuous:
  - . Remove excessive projections.

- . Fill voids and hollows greater than 10 mm with abrupt edges with a cement:sand mix not stronger than the substrate or weaker than the bedding.
- . Fill depressions less than 10 mm with a latex modified cementitious product and eliminate feathering by scabbling the edges.

Absorbent substrates: If suction is excessive, control it by dampening but avoid over-wetting and do not apply mortar bedding to substrates showing surface moisture.

Dense concrete: If not sufficiently rough to provide a mechanical key, roughen by scabbling or the like to remove 3 mm of the surface and expose the aggregate; then apply a bonding treatment.

#### **Substrates with wet area membranes**

General: Make sure substrates are as follows:

- Clean and free of any deposit or finish which may impair adhesion or location of tiles.
- Compatible with all components of the floor system.

#### **Trial set-out**

General: Prepare a trial tile set-out of each area, as follows:

- Maximise the size of equal margins of cut tiles.
- Locate control joints.
- Note minor variations in joint widths to eliminate cut tiles at margins.
- Locate fittings on walls.

### **43.3.3 TILING GENERALLY**

#### **Cutting and laying**

Cutting: Cut tiles neatly to fit around fixtures and fittings and at margins where necessary. Drill holes without damaging tile faces. Cut recesses for fittings such as soap holders. Rub edges smooth without chipping.

Laying: Return tiles into sills, reveals and openings. Butt up to returns, frames, fittings, and other finishes. Strike and point up beds where exposed. Remove tile spacers before grouting.

#### **Variations**

General: Distribute variations in hue, colour, or pattern uniformly, by mixing tiles or tile batches before laying.

#### **Protection**

Floor tiles: Keep traffic off floor tiles until the bedding has set and attained its working strength.

Cleaning: Keep the work clean as it proceeds and protect finished work from damage.

### **43.3.4 SETTING OUT**

#### **Tile joints**

Joint widths: Set out tiles to give uniform joint widths within the following limits:

- Floors:
  - . Dry pressed tiles: 3 mm.
  - . Vitrified: 3 to 5 mm.
- Large and/or irregular floor tiles: 6 to 12 mm.
- Mounted mosaics: To match mounting pattern.
- Walls:
  - . Dry pressed tile: 1.5 mm.

Joint alignment: Set out tiling with joints accurately aligned in both directions and wall tiling joints level and plumb.

Joint position: Set out tiles from the centre of the floor or wall to be tiled.

#### **Margins**

General: Provide whole or purpose-made tiles at margins where practicable, otherwise, set out to give equal margins of cut tiles. If margins less than half a tile width are unavoidable, locate the cut tiles where they are least conspicuous.

#### **Fixtures**

General: If possible, position tiles so that holes for fixtures and other penetrations occur at the intersection of horizontal and vertical joints or on the centre lines of tiles. Continue tiling fully behind fixtures which are not built in to the tiling surface. Before tiling make sure fixtures interrupting the tile surfaces are accurately positioned in their designed or optimum locations relative to the tile layout.

**43.3.5 FALLS AND LEVELS****Grading**

Requirement: Grade floor tiling to even and correct falls to floor wastes and elsewhere as required. Make level junctions with walls. Where falls are not required, lay level.

Fall: Conform to the following:

- General: 1:100 minimum.
- Shower areas to a central waste outlet: 1:80 minimum.
- Sanitary facility to a linear drain: 1:90 minimum.

Change of finish: Maintain finished floor level across changes of floor finish including carpet.

**43.3.6 BEDDING****Standard**

Cement mortar: To AS 3958.1 clause 5.5.

Adhesive: To AS 3958.1 clause 5.6.

**Preparation of tiles**

Adhesive bedding: Fix tiles dry; do not soak.

Mortar bedding: Soak porous tiles in water for half an hour and then drain until the surface water has disappeared.

**Bedding**

General: Use bedding methods and materials which are appropriate to the tile, the substrate, the conditions of service, and which leave the tile firmly and solidly bedded in the bedding material and adhered to the substrate. Form falls integral with the substrate.

**Thin adhesive beds**

General: Provide only if the substrate deviation is less than 3 mm, tested with a 3 m straightedge. Cover the entire tile back with adhesive when the tile is bedded.

Thickness: 1.5 to 3 mm.

**Thick adhesive beds**

General: Provide on substrates with deviations up to 6 mm, tested with a 3 m straightedge, and with tiles having deep keys or frogs.

Nominal thickness: 6 mm.

**Adhesive bedding application**

General: Apply adhesive by notched trowel to walls and floors and direct to tiles if required, to provide evenly distributed coverage after laying as follows:

- Other wall and floors: > 90%.
- Wet areas and bench tops: 100%.

Pattern of distribution of adhesive: To the recommendations of AS 3958.1 clause 5.6.4.3. Verify by examining one tile in ten as work proceeds.

Wall tile spacers: Do not use spacer types that inhibit the distribution of adhesive.

Curing: Allow the adhesive to cure for the period nominated by the manufacturer before grouting or allowing foot traffic.

**Mortar beds**

For floor tiles: Either lightly dust the screeded bed surface with dry cement and trowel level until the cement is damp, or spread a thin slurry of neat cement, or cement-based thin bed adhesive, on to the tile back. Do not use mortar after initial set has occurred.

- Nominal thickness: 20 to 40 mm.

**43.3.7 CONTROL OF MOVEMENT****General**

Requirement: Provide control joints carried through the tile and the bedding to the recommendations of AS 3958.1 clause 5.4.5 and as follows:

- Floor location:
  - . Over structural control joints.
  - . To divide complex room plans into rectangles.
  - . Around the perimeter of the floor.

- . At junctions between different substrates.
- . To divide large tiled areas into bays.
- . At abutments with the building structural frame and over supporting walls or beams where flexing of the substrate is anticipated.
- Wall location:
  - . Over structural control joints.
  - . At junctions with different substrate materials when the tiling is continuous.
  - . At vertical corners in shower compartments.
- Depth of joint: Right through to the substrate.
- Sealant width: 6 to 25 mm.
- Depth of elastomeric sealant: One half the joint width, or 6 mm, whichever is the greater.

#### 43.3.8 GROUTED AND SEALANT JOINTS

##### Grouted joints

General: Commence grouting as soon as practicable after bedding has set. Clean out joints as necessary before grouting.

Face grouting: Fill the joints solid and tool flush. Clean off surplus grout. Wash down when the grout has set. When grout is dry, polish the tiled surface with grout film remover and a clean cloth.

Edges of tiles: Grout exposed edge joints.

##### Sealant joints

General: Provide joints filled with sealant and finished flush with the tile surface as follows:

- Where tiling is cut around sanitary fixtures.
- At internal corners of walls in showers.
- Around fixtures interrupting the tile surface, for example pipes, brackets, bolts and nibs.
- At junctions with elements such as window and door frames and built-in cupboards.

Material: Anti-fungal modified silicone.

Width: 5 mm.

Depth: Equal to the tile thickness.

#### 43.3.9 JOINT ACCESSORIES

##### Floor finish dividers

General: Finish tiled floors at junctions with differing floor finishes with a corrosion-resistant metal dividing strip fixed to the substrate using mechanical fixings, with top edge flush with the finished floor. If changes of floor finish occur at doorways, make the junction directly below the closed door. Grout up underneath to provide continuous support.

Type: Ribbed brass angle

Stepping: Less than 5 mm.

##### Adjustments

Requirement: Check that the height of the floor finish divider is sufficient for the topping and tile thickness. Adjust as required with a matching flat bar adhesive fixed to the divider angle.

#### 43.3.10 COMPLETION

##### Cleaning

General: Clean tiled surfaces using an appropriate tile cleaning agent, and polish.

##### Spare tiles

General: Supply spare matching tiles and accessories of each type for future replacement purposes. Store the spare materials on site.

Quantity: At least 1% of the quantity installed.

Storage location: on site in a location nominated by the Superintendent

**43.4 SELECTIONS****43.4.1 SCHEDULES****Wall tiling schedule**

	<b>WT 01</b>	<b>WT 02</b>	
Tile: Type	Myaree Ceramics MG rectified	Ceramo VIS Subway	
Tile: Size (mm)	300 x 600	65 x 225	
Tile: Colour	Gloss white	Mocha	
Tile pattern	Horizontal stack bond	Horizontal stretcher bond	
Grout: Type	Ardex FG 8	Ardex FG 8	
Grout: Colour	Misty Grey	Alabaster	

**Floor tiling schedule**

	<b>FT 01</b>		
Tile: Type	Myaree Ceramics Macchiato Grip		
Tile: Size (mm)	300 x 300		
Tile: Colour	Grafite		
Slip resistance classification	P5		
Grout: Type	Ardex FG 8		
Grout: Colour	Slate Grey		

**Accessories schedule**

<b>Property</b>	<b>A</b>		
Location	Salient edges		
Type	B.A.T Trims aluminium angle		
Size (mm)	To suit tiles		
Colour	To future colour schedule		

**44 RESILIENT FINISHES****44.1 GENERAL****44.1.1 RESPONSIBILITIES****General**

Requirement: Provide resilient floor finishes to substrates, as documented.

**44.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**44.1.3 STANDARDS****General**

Installation: To AS 1884.

**Slip resistance**

Classification: To AS 4586.

**44.1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given in AS 1884 and the following apply:

- Resilient floor coverings classification: To EN ISO 10874.
- Substrate: The surface to which a material or product is applied.

**44.1.5 SUBMISSIONS****Certification**

General: Submit a certificate of conformity for static dissipative and static conductive floor installations.

**Fire performance**

Fire hazard properties: Submit evidence of conformity to PRODUCTS, FIRE PERFORMANCE, Fire hazard properties.

**Operation and maintenance manuals**

General: Submit manufacturer's instructions for care and maintenance for each type of finish.

**Products and materials**

Manufacturer's data: Submit the manufacturer's product data sheets for each type of finish, and the manufacturer's recommendations for its application including the following, as appropriate:

- Thickness and width of sheet, or size of tile or plank.
- Adhesive and jointing method.
- Resistance to wear, indentation, chemicals, light and fire.
- Flexibility and bending strength.

Type tests: Submit results, as follows:

- Slip resistance to AS 4586.

**Warranties**

Requirement: For each type of resilient finish specified, submit the manufacturer and installer's warranty of the material, workmanship and application.

**44.1.6 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Substrate immediately before fixing resilient finishes or underlay.
- Trial set-outs before execution.

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## 44.2 PRODUCTS

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### 44.2.1 FIRE PERFORMANCE

#### Fire hazard properties

Critical radiant flux: Tested to AS ISO 9239.1.

### 44.2.2 ADHESIVES

#### General

Requirement: To the resilient finishes manufacturer's recommendations.

### 44.2.3 SHEETS, TILES AND PLANKS

#### Linoleum

Standard: To EN ISO 24011.

#### Polyvinyl chloride (PVC)

Resilient floor covering, homogeneous: To EN ISO 10581.

Resilient floor covering, heterogeneous: To EN ISO 10582.

Resilient floor covering, jute or polyester felt backing: To EN 650.

Resilient floor covering, with foam layer: To EN 651.

Resilient floor covering, with particle based enhanced slip resistance: To EN 13845.

Resilient floor covering, semi-flexible polyvinyl chloride tiles: To EN ISO 10595.

#### Static control flooring

General: Unbacked flexible sheet with electrical resistance.

### 44.2.4 OTHER MATERIALS

#### Tactile ground surface indicators

Standard: To AS/NZS 1428.4.1.

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## 44.3 EXECUTION

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### 44.3.1 SUBCONTRACTORS

#### General

Requirement: Use specialist installers recommended by the material manufacturers.

### 44.3.2 PREPARATION

#### Substrates

General: To AS 1884 Section 3.

#### Substrate tolerance table

Property	Length of straightedge laid in any direction	Max. deviation under the straightedge
Planeness	2000 mm	4 mm
Abrupt deviation tolerance	150 mm	0.5 mm

#### Concrete substrates

Requirement: Do not start installation of the resilient finishes until the concrete substrate conforms to AS 1884 clause 3.1 and the adhesive and resilient finish manufacturers' recommendations.

**All flooring must be installed using an integral, compatible installation system inclusive of all floor preparation, installation of waterproofing moisture barrier and adhesive in full accordance with AS 1884 – 2012 and such other requirements set out in the manufacturers' guidelines.**

Substrate rectification: Conform to the following:

- Surface treatments: Mechanically remove any incompatible surface treatments, including the following:
  - . Sealers and hardeners.
  - . Curing compounds.
  - . Waterproofing additives.
  - . Surface coatings and contamination.

- Surface quality: Remove projections and fill voids and hollows with a smoothing and self-levelling compound compatible with the adhesive. Allow filling or levelling compound to dry to manufacturer's recommendations.

Cleaning: Remove loose materials or dust.

#### **Working environment**

General: Do not start work before the building is enclosed, wet work is complete and dry, overhead work is complete and good lighting is available. Protect adjoining surfaces.

#### **Conditioning**

Conditioning of floor covering and subfloor: To AS 1884 clause 4.1 and manufacturer's recommendations.

#### **Trial set-out**

General: Prepare a trial tile and plank set-out to each area.

### **44.3.3 INSTALLATION**

#### **General**

Requirement: To AS 1884 Section 5 and the manufacturer's recommendations.

#### **Sheet set-out**

General: Set out sheets to give the minimum number of joints. Position joints away from areas of high stress. Run sheet joints parallel with the long sides of floor areas, vertically on non-horizontal surfaces.

#### **Tile set-out**

General: Set out tiles from centre of room. If possible, cut tiles at margins only to give a cut dimension of at least 100 mm x full tile width. Match edges and align patterns. Arrange the tiles so that any variation in appearance is minimised.

#### **Plank set-out**

General: Set out planks from centre of room. Align patterns, texture and grain in one direction.

#### **Edges**

General: Make sure edges are firm, unchipped and machine-cut accurately to size and square to the face, and that edges are square to each other before installation.

#### **Joints**

Non-welded: Butt edges together to form tight neat joints showing no visible open seams.

Doorways: Where changes of floor finish occur at doorways, locate the joint on the centreline of the door leaf in the closed position.

#### **Expansion joints**

General: To the manufacturer's recommendations for joint widths, and area and length limitations.

#### **Junctions**

General: Scribe neatly up to returns, edges, fixtures and fittings. Finish flush with adjoining surfaces.

#### **Change of finish**

General: Maintain finished floor level across changes of floor finish including carpet.

#### **Cleaning**

General: Keep the surface clean as the work proceeds.

### **44.3.4 TILING**

#### **Vinyl tiles and planks**

Laying: Lay as follows:

- Loose lay: Interlock tongue and groove edges of rigid planks. Tap down with rubber mallet.
- Adhesive fix: Apply acrylic adhesive over whole subfloor surface.

### **44.3.5 SHEETING**

#### **Welded joints**

Thermal welding: After fixing, groove the seams using a grooving tool and weld the joints with matching filler rod, using a hot air welding gun. When the weld rod has cooled, trim off flush.

Chemical welding: Apply seaming compound 100 mm wide to the substrate centrally under the seam. Roll the seam until the compound is forced up into the joint. Clean off flush with a damp cloth.

Epoxy jointing: Join seams with epoxy adhesive.

#### 44.3.6 JOINTS AND ACCESSORIES

##### Accessories

General: Provide purpose-made matching moulded accessories for nosings, coves, skirtings, edge cover strips and finishes at junctions, margins, and angles, if available. Otherwise, form accessories from the sheet material. Provide solid backing for radiused coves and nosings.

##### Edge strips

General: Provide edge cover strips at junctions with different floor finishes and to exposed edges.

Metal cover strip: Extruded tapered strip 25 mm wide, of the same thickness as the sheet or tile. Fix with matching screws to timber bases or to masonry anchors in concrete bases, at 200 mm maximum centres.

##### Control joints

Location: Provide control joints as follows:

- Over structural control joints.
- At junctions between different substrates.

Depth of joint: Right through to the substrate.

Sealant width: 6 to 25 mm.

Depth of elastomeric sealant: One half the joint width, or 6 mm, whichever is the greater.

##### Control joint materials – sheet flooring

Proprietary slide plate divider strip: Provide interlocking metal plates grouted into pockets formed in the concrete joint edges to finish flush with the flooring surface.

##### Coved skirtings

Site formed coving: Carry the flooring material up over a profiled coving section to form the skirting and mitre and weld all joints. Make sure the radius of the coving section conforms to the floor finish manufacturer's recommendations for sheeting material and thickness.

#### 44.3.7 TESTING

##### Substrate tests

Moisture content: Test substrate for suitability for the installation of resilient floor coverings to AS 1884 Appendix A.

- Maximum relative humidity of concrete: To AS 1884 Appendix A3.2.
- Moisture content of timber, plywood and particleboard subfloors: To AS 1884 Appendix A3.3.

Surface pH: Test concrete subfloor for suitability for the installation of resilient floor coverings to AS 1884 Appendix C.

- Maximum pH: 10.

#### 44.3.8 COMPLETION

##### Protection

Finished floor surface: Keep traffic off floors for a minimum of 24 hours after laying or until bonding has set, whichever period is the longer. Avoid contact with water for minimum 7 days after laying.

##### Reinstatement

Extent: Repair or replace faulty or damaged work. If the work cannot be repaired satisfactorily, replace the whole area affected.

##### Cleaning

General: Clean the finished surface. Buff and polish. Before the date for practical completion, mop and leave the finished surface clean and undamaged on completion.

##### Spare materials

General: Supply spare matching resilient finishes and accessories of each type for future replacement purposes. Store the spare materials on site where directed.

Quantity: At least 1% of the quantity installed.

**44.4 SELECTIONS****44.4.1 PRODUCTS****Sheet and tile schedule**

	<b>VO1</b>	<b>VO2</b>	<b>VO3</b>
Type	Forbo Safestep	Armstrong Luxury Tile (LVT)	Armstrong Luxury Tile (LVT)
Form	Sheet	Plank	Tile
Colour	Lava 175592	Blackbutt	Polished Concrete – Dark Grey
Tile laying pattern		Staggered joints	Stack bond
Sheet width (mm)	2000		
Thickness (mm)	2	5	5
Slip resistance classification	R12		
Tile dimensions (mm)		230 x 1500	500 x 500
Welded joints	Epoxy	Non-welded	Non-welded

**Accessories schedule**

<b>Accessory type</b>	<b>Location</b>
MJS Tile Trim (PVC extrusion) black	To vinyl and concrete (no floor covering) junctions
Coving fillet	Coved flooring where shown on the drawings
MJS tile trim to suit tile thickness	To vinyl and tile junctions

**Control joints schedule – proprietary slide plate**

	<b>A</b>	<b>B</b>	<b>C</b>
Location			
Product			
Material			
Insert colour			

**45 PAINTING****45.1 GENERAL****45.1.1 RESPONSIBILITIES****General**

Requirement: Provide coating systems to substrates, as documented.

**Performance**

Requirement:

- Consistent in colour, gloss level, texture and dry film thickness.
- Free of runs, sags, blisters, or other discontinuities.
- Paint systems which are fully opaque or at the documented level of opacity.
- Clear finishes at the level of transparency consistent with the product.
- Fully adhered.
- Resistant to environmental degradation within the manufacturer's stated life span.

**45.1.2 CROSS REFERENCES****General**

Requirement: Conform to the other worksections as appropriate.

**45.1.3 STANDARDS****Painting**

General: To the recommendations of those parts of AS/NZS 2311 referenced in this worksection.

**45.1.4 MANUFACTURER'S DOCUMENTS****Technical manuals**

Product Guide: [www.dulux.com.au/specifier/products](http://www.dulux.com.au/specifier/products)

Duspec Product Data Sheets, SDS, paint system selection: [www.dulux.com.au/specifier/duspec](http://www.dulux.com.au/specifier/duspec)

**45.1.5 INTERPRETATION****Abbreviations**

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

- ASU: Acrylic sealer undercoat multipurpose combo product.
- DFT: Dry film thickness.
- OFC: Off form concrete.
- PDS: Product data sheet.
- PRN: Paint reference number.
- PSU: Primer sealer undercoat multipurpose combo product.
- WFT: Wet film thickness.

**Definitions**

General: For the purposes of this worksection the definitions given in AS/NZS 2310 and the following apply:

- Gloss: The optical property of a surface, characterised by its ability to reflect light specularly.
- Gloss unit: Numerical value for the amount of specular reflection relative to that of a standard surface under the same geometric conditions.
- Levels of gloss finish: When the specular direction is 60 degrees, surfaces with the following specular gloss reading is defined as follows:
  - . Full gloss: Over 85 gloss units.
  - . Gloss: Over 50 and up to 85 gloss units.
  - . Semi-gloss (satin): Over 20 and up to 50 gloss units.
  - . Low gloss (low sheen): Over 5 and up to 20 gloss units.
  - . Flat finish (matt): Up to 5 gloss units.

- Opacity: The ability of a paint or textured and membrane coating to obliterate the colour difference of a substrate.
- Paint or coating system: A product in liquid form, which when applied to a surface, forms a dry film having protective, decorative or other specific technical properties.
- Primer, prime coat: The first coat of a painting system that helps bind subsequent coats to the substrate and which may inhibit its deterioration.
- Sealer: A product used to seal substrates to prevent the following:
  - . Materials from bleeding through to the surface.
  - . Reaction of the substrate with incompatible top coats.
  - . Undue absorption of the following coat into the substrate.
- Substrate: The surface to which a material or product is applied.
- Undercoat: An intermediate coat formulated to prepare a primed surface or other prepared surface for the finishing coat.

#### 45.1.6 SUBMISSIONS

##### Products and materials

General: Submit the following details at least 3 weeks before the paint is required:

- Paint brand name and product range quality statement.
- Safety data sheets (SDS) showing the health and safety precautions to be taken during application.
- The published recommendations for maintenance.

##### Warranties

Requirement: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the supplier and the applicator.

- Form: Against failure of materials and execution under normal environment and use conditions.
- Extent: the whole of the paint coating system covered by this worksection
- Warranty period: 10 years for the paint systems generally

Timing: Before the application of the paint system.

#### 45.1.7 INSPECTION

##### Notice

Inspection: Give notice so that inspection may be made of the following:

- Opaque finishing stages:
  - . Completion of surface preparation.
- Clear finishing stages:
  - . Before surface preparation of timber.
  - . Completion of surface preparation.

#### 45.2 PRODUCTS

##### 45.2.1 GENERAL

##### Product substitution

Other products: Conform to **SUBSTITUTIONS** in *General requirements*.

##### Storage and handling

General: Store materials not in use in tightly covered containers in well-ventilated areas with temperatures maintained at the manufacturer's recommendations.

Delivery: Deliver paints to the site in the manufacturer's labelled and unopened containers.

##### Product identification

General: Marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.

- Date of manufacture.

#### 45.2.2 PAINTING MATERIALS

##### Combinations

General: Do not combine paints from different manufacturers in a paint system. Dulux paint products and coating systems have been selected and specified for this project. Any unauthorised product substitution will void the warranties.

Clear timber finish systems: Provide only the combinations of putty, stain and sealer recommended by the manufacturer of the top coats.

##### Tinting

General: Provide only products which are colour tinted by the manufacturer or supplier.

##### Toxic ingredients

General: To the *Poisons Standard (SUSMP)* Part 2 Section 7.

##### Standards

Paint types: Conform to the Australian Standard referenced in the **DuluxGroup/Dulux paint type reference table**.

##### DuluxGroup/Dulux paint type reference table legend

###### Key:

ASU = Acrylic Sealer/Undercoat.

NE = No Equivalent.

PSU = Primer/Sealer/Undercoat.

Low VOC products are noted in the Table.

^ Use is discouraged in favour of water based paints because of environmental concerns.

# These paints have either limited availability or low requirement in the Building Industry.

##### DuluxGroup/Dulux paint type reference table

Paint type	DuluxGroup/Dulux material description	Dulux PDS No.	PRN AS/NZS 2311 (Table 4.2)	Standard
Semi-gloss solvent-borne: interior	Dulux Super Enamel Semi-Gloss	DD0028	B3	AS 3730.5
Semi-gloss water-borne, interior /exterior trim (alt B8b)	Dulux Aquanamel Semi Gloss (low VOC)	DD1281	B41	AS 3730.2
Gloss solvent-borne: aerosols	Dulux Spray Pak	DD0009	B4#	NE
Full gloss solvent-borne: exterior	Dulux Super Enamel Full Gloss Dulux Metalshield Premium UV Resistant High Gloss	DD0026 LI 011	B5a	AS 3730.6
Full gloss solvent-borne: interior	Dulux Super Enamel Full Gloss	DD0026	B5b	AS 3730.6
Full gloss waterborne interior/exterior trim (alt B9b)	Dulux Aquanamel Gloss (low VOC)	DD1282	B42	AS 3730.2
Flat latex: interior ceilings	Dulux White Ceiling Paint (low VOC)	DD0225 1	B6a	AS 3730.1
Flat latex: interior ceilings (tinted colours)	Dulux EnvirO <sub>2</sub> Tintable Ceiling Flat (low VOC)	DD1466	B6a	AS 3730.1
Low gloss latex: exterior	Dulux Weathershield Low Sheen Acrylic	DD0053	B7b	AS 3730.8

Paint type	DuluxGroup/Dulux material description	Dulux PDS No.	PRN AS/NZS 2311 (Table 4.2)	Standard
Low gloss latex: interior	Dulux Wash&Wear Low Sheen Acrylic (low VOC)  Dulux Wash&Wear +Plus Kitchen & Bathroom Low Sheen (low VOC)	DD02070  DD02074	B7a	AS 3730.3
Low gloss latex: interior	Dulux Professional Steriguard Acrylic Low Sheen	DD01990	B7a	AS 3730.3
Semi-gloss latex: exterior	Dulux Weathershield Semi Gloss Acrylic	DD0037	B8b	AS 3730.9
Semi-gloss latex: interior	Dulux Wash&Wear Semi Gloss Acrylic (low VOC)  Dulux Wash&Wear +Plus Kitchen & Bathroom Semi Gloss (low VOC)	DD02071  DD02075	B8a	AS 3730.2
Semi-gloss waterborne latex: interior	Dulux Professional Steriguard Water Based Enamel Semi Gloss	DD01993	B42	AS 3730.2
Gloss latex: exterior	Dulux Weathershield Gloss	DD0054	B9b	AS 3730.10
Gloss latex: interior	Dulux Wash&Wear Gloss	DD02072	B9a	AS 3730.12
Gloss waterborne interior/exterior trim (alt B9a/B9b)	Dulux Aquanameal Gloss (low VOC)	DD1282	B42	AS 3730.1
Gloss waterborne latex: interior	Dulux Professional Steriguard Water Based Enamel Gloss	DD01992	B42	AS 3730.1
Wood primer, solvent-borne	Dulux 1 Step Oil Based Primer Sealer Undercoat	DD1698	B10	AS 3730.13
Wood primer, latex	Dulux 1 Step Acrylic Primer Sealer Undercoat	DD02479	B10a	AS 3730.17
Metal primer for steel – solvent-borne	Dulux Metalshield All Surface Primer	DI1640	B11	AS 3730.21
Metal primer, latex (domestic)	Dulux Precision All Metal Primer (water based, low VOC)	DD02166	B11a#	AS 3730.15
Metal primer for zinc-coated surfaces, latex	Dulux Professional Galvanised Iron Primer (water based, low VOC)	DD0156	B12a	AS 3730.15
Metal primer for non ferrous metals (domestic)	Dulux Precision All Metal Primer (water based, low VOC)	DD02166	B13	AS 3730.17
Zinc-rich organic	Dulux Zinc Rich 1P Primer	DI0541	B14	AS 3730.9

Paint type	DuluxGroup/Dulux material description	Dulux PDS No.	PRN AS/NZS 2311 (Table 4.2)	Standard
binder/primer for steel				
Concrete and masonry sealer	Dulux Sealer Binder Dulux Acratex Acraprime 501/2 Berger Gold Label Acrylic Block Filler	DD0216 5 DA0442 DD0217	B15	AS 3730.22
Clear low viscosity paint for concrete	Dulux AquaTread Concrete Sealer (low VOC) Dulux Luxafloor WB Acrylic Dust Sealer Gloss	DD1187  DC0264 3	B15a	NE
Moisture resistant plasterboard sealer binder	Dulux 1 Step Acrylic Primer Sealer Undercoat (low VOC)	DD0247 9	B15a	AS 3730.18
Concrete and masonry, latex wallboard sealer, sealer/undercoat,	Dulux Acrylic Sealer Undercoat (low VOC) Dulux 1 Step Acrylic Primer Sealer Undercoat (low VOC)	DD1402  DD0247 9	B16	AS 3730.18
Undercoat, solvent-borne	Dulux 1 Step Oil Based Primer Sealer Undercoat	DD1698	B17	AS 3730.14
Undercoat, latex: exterior	Dulux 1 Step Acrylic Primer Sealer Undercoat (low VOC) Dulux Acratex Water Based 501/1	DD0247 9  DD0441	B17a	AS 3730.18
Undercoat, latex: interior	Dulux 1 Step Acrylic Primer Sealer Undercoat (low VOC) Dulux Acrylic Sealer Undercoat (low VOC)	DD0247 9  DD1402	B17a	AS 3730.18
Wood Stain - spirit	Feast Watson ProofTint	DW0729	B18	NE
Wood Stain - oil	Feast Watson Liming White Cabot's Interior Stain Oil Based	DW0749  DW0661	B18	
Wood Stain - latex	Intergrain UltraDeck® Timber Stain (interior/exterior) (low VOC) Cabot's Interior Stain Water Based	DW0261 3  DW1636	B18a	NE
Interior clear varnish, solvent-based, one-pack	Feast Watson Floorclear – Gloss, Satin Feast Watson Clear Varnish – Gloss, Satin, Matt – not suitable for floors Feast Watson Stain & Varnish – not suitable for floors	DW0736 DW0737 DW1611 DW1612 DW1617 DW1295	B19	AS 3730.25 or AS 3730.27 (for floors)

Paint type	DuluxGroup/Dulux material description	Dulux PDS No.	PRN AS/NZS 2311 (Table 4.2)	Standard
	Feast Watson Stain & Varnish Liming White – Gloss, Satin – not suitable for floors	DW0180 4 DW0180 5		
Interior clear latex varnish, water-based, one-pack	Cabot's Cabothane Clear Water Based Gloss, Satin or Matt (low VOC) – not suitable for floors Feast Watson Liming White Floor Finish Cabot's Stain & Varnish Water Based Gloss, Satin – not suitable for floors	DW1644 DW1645 DW0186 7  DW0180 0  DW1634 DW1635	B19a	NE or AS 3730.27 (for floors)
Floor varnish, solvent based, clear (moisture cure)	Feast Watson Commercial Maxithane – Gloss, Satin	DW0701 DW0703	B20	AS 3730.27
Floor Varnish, water-based, one-pack	Intergrain Enviropro Endure 1 Pack - Matt, Satin, Gloss (low VOC)	DW1418 DW1419 DW1420	B20	AS 3730.27
Floor varnish, clear or tinted, two-pack	Intergrain Enviropro Endure 2 Pack - Gloss, Satin, Matt	DW1421 DW1422 DW1423	B20	AS 3730.27
Exterior latex stain, semi-transparent	Intergrain UltraDeck® Timber Stain (low VOC)	DW0261 3	B22	AS 3730.16
Fence stain, latex paints, opaque	Dulux Weathershield Garden Shades – Low Sheen  Cabot's Timbercolour Deck & Exterior Paint	DD0055  DW0225 6	B22b	AS 3730.16
Exterior stain, solvent-borne, opaque	Feast Watson Timber & Deck Stain	DW0189 4	B23#	AS 3730.28
Exterior stain, solvent-borne, semi-transparent	Feast Watson Exterior Stain & Varnish Gloss	DW0246 8	B23a	NE
Paving paint for concrete, solvent	Berger Jet Dry Paving Paint range	DD0081	B24	AS 3730.29
Paving paint for concrete, latex	Berger Jet Dry Aqua Tread Satin	DD1163	B24a	NE

Paint type	DuluxGroup/Dulux material description	Dulux PDS No.	PRN AS/NZS 2311 (Table 4.2)	Standard
Roofing paint, latex (Solar reflectance)	Dulux AcraTex 962 COOLROOF with InfraCOOL Technology™	DA1471	B25	
Intumescent paints	Dulux Protective Coatings	Protective Coatings link	B28#	NE
Epoxy paint, two-pack, solvent-borne topcoats, interior only	Dulux Durebild STE 2 Pack Epoxy (high build & surface tolerant) Dulux Duremax GPE	DI1109 DI1115	B29	AS/NZS 3750.1
Epoxy paint, two-pack, solvent-borne topcoats, exterior & pools		N/A	B29	AS/NZS 3750.1
Epoxy paint, two-pack, water based, interior only	Dulux Luxafloor ECO2 (low VOC) Dulux Enviropoxy WBE	I1315 DI1120	B29a	NE
High Build Recoatable two-pack, solvent-borne gloss polyurethane	Dulux Weathermax HBR Luxathane HPX	DI1156 DC02059	B29c B29c	NE
Stain sealer, solvent-borne for water soluble stains	Dulux Precision High Opacity Stain Blocker	DD02065	B30	NE
Stain sealer, water based for oil stains	Dulux Precision Maximum Strength Adhesion Primer	DD02066	B30	
Chalk sealer, surface conditioner	Dulux Sealer Binder Dulux Acraprime Solvent Based Primer	DD02165 DA0442	B31	NE
Anti-mould (treatment or wash for timber)	Intergrain Mould Preventer	DW01967	B32	NE
Water-repellent for masonry	Dulux AquaBan	DD0002	B33	NE
Creosote stain	No longer used	N/A	B35	NE
Paint remover, solvent-borne	Selleys Polystrippa Paint Stripper	Poly	B36a	NE
Paint remover, chemical	Selleys Polystrippa Renovators' Choice	Poly	B36b	NE
Bituminous paints	No longer used	N/A	B37	NE
High build membrane or	Dulux Acratex Range	Acratex	B38b	AS/NZS 4548.1 AS/NZS 4548.2

Paint type	DuluxGroup/Dulux material description	Dulux PDS No.	PRN AS/NZS 2311 (Table 4.2)	Standard
texture coatings for masonry and concrete: exterior				AS/NZS 4548.3 AS/NZS 4548.4
Texture finish latex coatings for masonry and plasterboard: interior only	Dulux Effects Range (interior)	Effects range link	B38a	NE
Clear or colourless coatings (waterborne) for timber, exterior	Intergrain UltraClear Exterior – Gloss, Satin Note: not suitable for decking.	DW1401 DW1400	B39	NE
Clear coatings (waterborne) for timber, interior	Cabot's Cabothane Clear Water Based Gloss, Satin & Matt (low VOC)	DW1644 DW1645 DW0186 7	B39	NE
Clear or colourless coatings (waterborne) for timber, interior floors	Intergrain Enviropro Endure 1 Pack - Matt, Satin, Gloss (low VOC) Intergrain Enviropro Endure 2 Pack - Matt, Satin, Gloss	DW1420 DW1419 DW1418  DW1423 DW1422 DW1421	B39	AS 3730.27
Sanding sealer	Feast Watson Sanding Sealer	DW0744	B40	NE
Semi-gloss latex, interior trim (alt B8b)	Dulux Aquanamel Semi-Gloss (low VOC)	DD1281	B41	NE
Gloss or full gloss latex, interior trim	Dulux Aquanamel Gloss (low VOC)	DD1282	B42	NE
Penetrating tung oil type varnish or wax for timber floors: interior	Intergrain Enviropro Hard Wax Oil 0769 Feast Watson Tung Oil	DW0253 3  DW0733	B43	NE
Penetrating tung oil type varnish for timber floors: exterior	Intergrain Nature's Timber Oil Feast Watson Traditional Timber Oil	DW0769  DW0179 5	B43	NE
Gloss pigmented polyurethane	Dulux Luxathane R Dulux Luxathane HPX Dulux Weathermax HBR	DD1137 DC0205 9 DI1156	B44	AS/NZS 3750.6
Powder coatings for	Dulux Powder Coat Range		B45b	AS 3715

Paint type	DuluxGroup/Dulux material description	Dulux PDS No.	PRN AS/NZS 2311 (Table 4.2)	Standard
non-ferrous metals				
Powder coatings for ferrous metals	Dulux Powder Coat Range (www.duluxpowders.com.au)		B45b	AS 4506

**Low VOC compliance reference table**

Green Star Interiors	VOC Limits MAX g/litre	DULUX Products compared to the GBCA specification	VOC g/litre Untinted
COMPLIANCE CRITERIA – GBCA specifications (obtain latest figures).			
Walls and ceilings - interior semi-gloss	16	Dulux EnvirO <sub>2</sub> Interior Semi-Gloss	1
Walls and ceilings - interior semi-gloss	16	Dulux Wash&Wear Semi Gloss Dulux Wash&Wear +Plus Kitchen&Bathroom Semi Gloss	16 16
Walls and ceilings - interior low sheen	16	Dulux EnvirO <sub>2</sub> Interior Low Sheen	1
Walls and ceilings - interior low sheen	16	Dulux Wash&Wear Low Sheen Dulux Wash&Wear +Plus Kitchen& Bathroom Low Sheen	16 16
Walls and ceilings - interior flat-washable	16	Dulux EnvirO <sub>2</sub> Interior Matt	1
Ceilings - interior flat	14	Dulux EnvirO <sub>2</sub> Interior Tintable ceiling Flat	1
Ceilings - interior flat	14	Dulux White Ceiling Paint	14
Trim - interior gloss	75	Dulux Aquanamel Gloss Dulux Professional Steriguard Water Based Enamel Gloss	50 74
Trim - interior semi-gloss	75	Dulux Aquanamel Semi Gloss Dulux Professional Steriguard Water Based Enamel Semi Gloss	53 74
Trim - interior semi-gloss	75	Dulux EnvirO <sub>2</sub> Water Based Enamel Semi Gloss	1
Timber primer	30	Dulux Acrylic Sealer Undercoat	5
Latex primer for galvanized iron and zinalume NOT FOR HDG	60	Dulux Professional Total Prep	45
Latex primer for galvanized iron and zinalume NOT for HDG	60	Dulux Professional Galvanised Iron Primer	< 60

Green Star Interiors	VOC Limits MAX g/litre	DULUX Products compared to the GBCA specification	VOC g/litre Untinted
Interior latex undercoat	65	Dulux EnvirO <sub>2</sub> Acrylic Sealer Undercoat (ASU)	1
Interior latex undercoat	65	Dulux Prepcoat Acrylic Sealer Undercoat	< 5
Exterior latex undercoat	65	Dulux 1 Step Acrylic Primer Sealer Undercoat (PSU) Dulux Professional Total Prep	<37 45
Interior sealer	65	Dulux EnvirO <sub>2</sub> Acrylic Sealer Undercoat (ASU)	1
Interior concrete sealer	65	Dulux Luxafloor Eco2 (clear) + colours Dulux Luxafloor WB (Clear) + colours	10 10
One and two pack performance coatings for floors	140	Dulux Luxafloor Eco2 concrete Dulux Luxafloor WB concrete Intergrain Enviropro Timber Endure One Pack Intergrain Enviropro Timber Endure Two Pack	10 10 <90 <135 (Part A & B)

### 45.3 EXECUTION

#### 45.3.1 PREPARATION

##### Standard

General: To AS/NZS 2311 Section 3.

##### Order of work

Other trades: Before painting, complete the work of other trades as far as practicable within the area to be painted, except for the installation of fittings, floor sanding and laying flooring materials.

Clear finishes: Complete clear timber finishes before commencing opaque paint finishes in the same area.

##### Protection

General: Before painting, clean the area and protect it from dust contamination. Use drop sheets and masking agents to protect surfaces, including finished surfaces and adjacent finishes, during painting.

Fixtures and furniture: Remove door furniture, switch plates, light fittings and other fixtures before painting, and conform to the following:

- Labelling and storage: Attach labels or mark fixtures using a non-permanent method, identifying location and refixing instructions, if required. Store and protect against damage.

Difficult to remove fixtures: Where removal is impractical or difficult, apply surface protection before substrate preparation and painting.

##### Substrate preparation – generally

General: Prepare substrates to receive the documented paint system.

Cleaning: Clean down the substrate surface. Do not cause damage to the substrate or the surroundings.

Filling: Fill cracks and holes with fillers, sealants, putties or grouting cements as appropriate for the finishing system and substrate, and sand smooth.

- Clear finish: Provide filler tinted to match the substrate.

Clear timber finish systems: Prepare the surface so that its attributes will show through the clear finish without blemishes, using methods including the following:

- Removal of bruises.
- Removal of discolourations, including staining by oil, grease and nailheads.
- Bleaching where necessary to match the timber colour sample.
- Puttying.
- Fine sanding, with the last abrasive no coarser than 220 grit, so that there are no scratches across the grain.

Treated surfaces: If surfaces have been treated with preservatives or fire retardants, make sure the paint system is compatible with the treatment and does not adversely affect its performance.

Iron and steel: Remove weld spatter, slag, burrs, or any other objectionable surface irregularities and radius all edges to a minimum of 2 mm. Degrease by solvent or alkaline cleaning.

Iron and steel blast cleaning: To AS 1627.9 and to the class specified in the specified protective treatment. Provide a surface roughness or profile appropriate for the specified treatment. Where steelwork to be abrasive cleaned includes irregular shapes allow for special equipment to achieve required abrasive cleaning.

Structural steel: All exposed fixings including bolts, screws and the like, are to be painted to match adjacent steelwork paint system.

Concrete and masonry: Before application to very smooth concrete, brick or masonry, either acid etch, mechanically grind or abrasive track blast the surface as appropriate to provide a suitable key for the subsequently applied coating and to remove laitance. Remove loose friable matter before filling surface discontinuities.

Set plaster surfaces: Do not apply solvent borne paint or other impervious coatings if the moisture content at the surface, tested with a moisture meter, exceeds 12%.

#### **Unpainted surfaces**

Standard: To AS/NZS 2311 Section 3.

#### **Cleaning external surfaces**

Sound external surfaces other than timber: Remove dirt, grease, loose and foreign matter, efflorescence and mould by water blasting or steam cleaning without damaging the surface. Remove remaining loose material with hand tools. Use sanding blocks to preserve the arrises of masonry and stone details.

Efflorescence: Eliminate the source of salt and water before cleaning. Allow surface to dry for 15 to 30 days before repainting.

### **45.3.2 PAINTING SYSTEMS**

#### **Paint systems**

Requirement: Apply paint systems as documented in the **Interior painting schedule** and the **Exterior painting schedule**.

General: Apply the paint system nominated for each substrate to the referenced manufacturer's Product Data Sheets (PDS) and Spec Sheets and include:

- The number and order of coats.
- The paint type for each coat.

Additional coats: Apply if necessary to:

- prepare porous or reactive substrates with prime or seal coats consistent with the manufacturer's recommendations;
- achieve the total film thickness or texture specified; or
- achieve a satisfactory opacity, in the specified or required colour.

#### **Painting systems**

Standards: The scheduled DuluxGroup/Dulux paint systems override AS/NZS 2311 as follows:

- New unpainted interior surfaces: To AS/NZS 2311 Table 5.1.
- New unpainted exterior surfaces: To AS/NZS 2311 Table 5.2.
- Standard: To AS/NZS 2311 clause 5.2. Provide the following final coats:
  - . High build textured or membrane finishes for concrete and masonry: B38 using products conforming to the AS 4548 series.
  - . Two-pack gloss pigmented polyurethane: B44.
  - . Two-pack epoxy: B29.
  - . Two-pack water based epoxy: B29A.

Paint Reference Number (PRN): The number in brackets against the individual product refers to the Paint Ref. No. (PRN) listed in the **DuluxGroup/Dulux paint type reference table** (See PRODUCTS) and AS/NZS 2311 Table 4.2.

### 45.3.3 APPLICATION

#### Standard

General: To AS/NZS 2311 Section 6.

#### Light levels

General: During preparation of surfaces, painting and inspection, maintain light levels such that the luminance (photometric brightness) of the surface is equal to the specified permanent artificial illumination conditions or 400 lux, whichever is the greater.

#### Substrate moisture content

Requirement: Use a moisture meter to demonstrate that the moisture content of the substrate is at or below the recommended maximum level for the type of paint and the substrate material.

#### Paint application

General: Apply the first coat immediately after substrate preparation and before contamination of the substrate can occur. Apply subsequent coats after the manufacturer's recommended drying period has elapsed.

#### Painting conditions

General: Unless the paint is recommended for such conditions, do not paint under the following conditions:

- Dusty conditions.
- Relative humidity: > 85%.
- Surface temperature: < 10°C or > 35°C.

#### Priming timber before fixing

General: Apply one coat of wood primer, and 2 coats to end grain, to the back of the following before fixing in position:

- Bottoms of external doors.

#### Spraying

General: If the paint application is by spraying, use conventional or airless equipment which conforms to the following:

- Satisfactorily atomises paint being applied.
- Does not require paint to be thinned beyond the maximum amount recommended by the manufacturer.
- Does not introduce oil, water or other contaminants into the applied paint.

Paint with known health hazards: Provide personal protection, masking, ventilating and screening facilities to AS/NZS 4114.

#### Sanding

Clear finishes: Sand the sealer using abrasives no coarser than 320 grit without cutting through the colour. Take special care with round surfaces and edges.

#### Repair

Requirement: Clean off marks, paint spots and stains progressively and restore damaged surfaces to their original condition.

Maintenance painting: To AS/NZS 2311 Section 8.

#### Repair of galvanizing

Cleaning: For galvanized surfaces which have been subsequently welded, power tool grind to remove all surface contaminants, including rust and weld splatter. Prime affected area immediately after cleaning.

Primer: Type 2 organic zinc-rich coating for the protection of steel to AS/NZS 3750.9.

#### Tinting

General: Tint each coat of an opaque coating system so that each has a noticeably different tint from the preceding coat where possible, except for top coats in systems with more than one top coat.

#### Doors

Drying: Maintain door leaf in the open position during drying. Do not allow door hardware or accessories to damage the door finish during the drying process.

**Wet paint warning**

Notices: Place in a conspicuous location and do not remove until the paint is dry.

**Exclusions**

Exclude the following surfaces from paint systems (unless specifically requested):

- Flexible duct connections, rubber hoses and mountings and other non-metallic flexible fittings.
- Wire rope and machined surfaces.
- Metals plated or specially finished for appearance, bronze, brass, copper and stainless steel (except as specified in the *Pipe identification* clause of the *Services* worksections).
- Aluminium frames.
- Prefinished aluminium frames to windows and doors, and trim.
- Metal floor duct covers.
- Raised access floors.
- Floors.
- Fair faced brickwork, blockwork, stonework, artificial stone and exposed aggregates.
- Sprayed vermiculite.
- Floors, paving, roads unless otherwise specified.
- Timber roof structure.
- Concealed timber roof structure.
- Timber ceiling and eaves lining.
- Exterior timber sheeting.
- Exterior timber stairs and decking.
- Plastic finishes generally
- Inside of service ducts, heat exchangers, pipes and valves.
- Shower seats, store shelving, work benches.
- Those parts of timber fixtures, such as insides of cupboards, not visible when doors are closed, unless otherwise specified. Insides of bathroom cabinets are not excluded and shall be painted.
- Self-finished surface such as glass and plastic laminates.
- Door hardware, including hinges.

**45.3.4 COMPLETION****General**

Protection and masking: Remove masking and protection coverings before paint has dried.

Cleaning: On completion of painting, remove splatters from adjacent finished surfaces by washing, scraping or other methods which do not scratch or damage the surface.

Reinstatement: Repair, replace or refinish any damage, including works of other trades. Touch up new damaged paintwork or misses only with the paint batch used in the original application.

Fixtures: Refix removed and undamaged fixture in the original location, make sure they are properly fitted and in proper working order.

**Disposal of paint and waste materials**

Requirement: Conform to requirements of the local government authority.

**Spares**

Spare material: Supply clearly labelled sealed containers of each type, coat and colour of paint/coating from the same batch, for future repair purposes.

Quantity of each type: 1 Litre

Storage location: On site in a location nominated by the Superintendent

## 45.4 SELECTIONS

## 45.4.1 INTERIOR PAINTING SCHEDULE

## Flat and matt latex - Interior

Substrate	1st coat	2nd coat	3rd coat	Manufacturer's Spec Sheet Ref
Plasterboard (ceilings) (low VOC system)	Dulux Acrylic Sealer Undercoat	Dulux White Ceiling Paint	Dulux White Ceiling Paint	SD 0010
Plasterboard (ceilings) (Ultra low VOC system)	Dulux EnvirO <sub>2</sub> Interior Acrylic Sealer Undercoat	Dulux EnvirO <sub>2</sub> Interior Tintable Ceiling Flat	Dulux EnvirO <sub>2</sub> Interior Tintable Ceiling Flat	SD17091

## Low-gloss latex - Interior

Substrate	1st coat	2nd coat	3rd coat	Manufacturer's Spec Sheet Ref
Plasterboard (low VOC system) (wall linings)	Dulux Acrylic Sealer Undercoat	Dulux Wash&Wear Low Sheen	Dulux Wash&Wear Low Sheen	SD 0002
Plasterboard (Ultra low VOC system) (wall linings)	Dulux EnvirO <sub>2</sub> Interior Acrylic Sealer Undercoat	Dulux EnvirO <sub>2</sub> Interior Low Sheen	Dulux EnvirO <sub>2</sub> Interior Low Sheen	SD17

## Semi-gloss, solvent-borne - Interior

Substrate	1st coat	2nd coat	3rd coat	Manufacturer's Spec Sheet Ref
Timber and primed hardboard veneers (door facings)	Dulux 1 Step Oil Based Primer Sealer Undercoat (solvent based)	Dulux Super Enamel Semi Gloss	Dulux Super Enamel Semi Gloss	SD 0041
MDF (skirtings and trim)	Dulux 1 Step Acrylic Primer Sealer Undercoat	Dulux Super Enamel Semi Gloss	Dulux Super Enamel Semi Gloss	SD 1169
Zinc-coated metals (zincalume, Galvabond, zincanneal, zincseal, zinc-primed steel) (steel door frames)	Dulux Galvanised Iron Primer	Dulux Super Enamel Semi Gloss	Dulux Super Enamel Semi Gloss	SD 09093
Plastics (solvent resistant types e.g. FRP, PVC-U) (exposed plumbing)	Dulux Precision Maximum Strength Adhesion Primer	Dulux Super Enamel Semi Gloss	Dulux Super Enamel Semi Gloss	SD 3340
Plastics (solvent sensitive types e.g. polystyrene) (exposed plumbing)	Dulux Precision Maximum Strength Adhesion Primer	Dulux Aquanameal Semi Gloss	Dulux Aquanameal Semi Gloss	SD 3340

**Clear coat single pack polyurethane - Interior**

Substrate	1st coat	2nd coat	3rd coat	Manufacturer's Spec Sheet Ref
Timber and timber veneer (low VOC water based system) (changeroom coat hook rail)	Cabot's Cabothane Clear Water Based Gloss or Satin Apply 12 m <sup>2</sup> /litre	Cabot's Cabothane Clear Water Based Gloss or Satin Apply 12 m <sup>2</sup> /litre		SW 3925 (gloss) or SW 3927 (satin)

**Sealer for concrete – Interior**

Substrate	1st coat	2nd coat	3rd coat	Manufacturer's Spec Sheet Ref
Concrete (commercial) (low VOC, water based system) (concrete floors – tinted to future colour schedule)	Dulux Luxafloor WB	Dulux Luxafloor WB		<a href="#">SC 11138</a>

**45.4.2 EXTERIOR PAINTING SCHEDULES****Semi-gloss latex – Exterior**

Substrate	1st coat	2nd coat	3rd coat	Manufacturer's Spec Sheet Ref
Fibre cement products (eaves linings – only to the extent documented)	Dulux Weathershield Low Sheen	Dulux Weathershield Low Sheen	Dulux Weathershield Low Sheen	<a href="#">SD 1333</a>

**Full gloss, solvent borne – Exterior**

Substrate	1st coat	2nd coat	3rd coat	Manufacturer's Spec Sheet Ref
Zinc-coated metals (zincalume, Galvabond, zincanneal, zincseal, zinc-primed steel) (door facings and door frames)	Dulux Professional Galvanised Iron Primer	Dulux Super Enamel High Gloss	Dulux Super Enamel High Gloss	SD 07814
Plastics (solvent resistant types e.g. FRP, PVC-U) (exposed plumbing)	Dulux Precision Maximum Strength Adhesion Primer	Dulux Super Enamel High Gloss	Dulux Super Enamel High Gloss	SD 0385
Plastics (solvent sensitive types, e.g. polystyrene) (exposed plumbing)	Dulux Precision Maximum Strength Adhesion Primer	Don't use Solvent Based, Use Water Based Paints	Don't use Solvent Based, Use Water Based Paints	N/A

**Paint colours schedule**  
To future colour schedule

**46 ELECTRICAL SERVICES****46.1 GENERAL****46.1.1 RESPONSIBILITIES**

Requirement: Provide the electrical services, as documented and in full accordance with Australian Standards, Western Australia Electrical Requirements (WAER) and Western Power requirements

**46.1.2 RESPONSIBILITIES**

Requirement: Provide the electrical services, as documented and in full accordance with Australian Standards, Western Australia Electrical Requirements (WAER) and Western Power requirements.

This specification section shall be referenced against the entire project specification, to include the General Conditions of the Contract, Contract Preliminaries, Architectural drawings, Structural drawings and all Service trade drawings. Advise in writing on any discrepancies identified at tender stage, otherwise services documented by one document and not the other shall be deemed to be included within the tender and fully completed on site in accordance with current standards and manufacturers recommendations.

For enquires at tender stage related to the electrical services contact Focus Consulting WA.

Additional cost variations will not be accepted during the project due to non-completion of a pre-tender site inspection and associated due diligence audit to ensure a thorough understanding of the existing site constraints and a thorough understanding of the project scope.

**46.1.3 PERFORMANCE**

Requirement: 415 V, 3-phase, 4-wire, 50 Hz multiple earth neutral (MEN) system.

Performance criteria: Meet the performance criteria, as documented.

Maintain standards of materials and workmanship. The Superintendent will make periodic visits to site and instruct the Contractor on what constitutes acceptable or un-acceptable work. All un-acceptable work will require remedial work at the contractor's expense.

Coordinate all work, both directly and indirectly associated with the electrical services trade, with all other disciplines on site, prior to installation.

Advise the Superintendent in writing when the contract works are complete and ready for a practical completion inspection by the superintendent and consulting engineer.

All materials and equipment purchased for this contract shall be inclusive of all royalties, patent rights and fees.

**46.1.4 PROJECT COMMENCEMENT**

Upon commencement of the project, prepare the following information and issue to the Superintendent at the first site meeting:

- 'Contact details (name, mobile phone number, e-mail) of nominated electrical services Project Manager and Site Supervisor,
- Names and contact details of suppliers and manufacturers of major items of equipment,
- Names and contact details of Sub Contractors,
- Working drawings shall be kept on site and updated as installation progresses to ensure a true and accurate record of the installation.
- Sample of format for Request for Information (RFI).

**46.1.5 WORKMANSHIP**

The proposed development shall display the very highest standard of workmanship.

All works shall be undertaken by, or under supervision of, highly experienced specialist trades.

Any works which are considered sub-standard, unsafe or not complying with relevant installation requirements will be rejected and will be required to be rectified at the contractors expense.

Contractors shall carefully plan and consider all cabling and equipment layouts and routes, to provide a neat, carefully planned and considered installation, fully co-ordinated with other trades.

#### **46.1.6 ALTERNATIVE PRODUCTS**

Tenderer's shall include the specified equipment and materials documented.

Potential cost savings resulting from acceptance of alternative products shall be result in a variation to the contract.

Alternative products resulting in a cost saving to the Principal, may be submitted for review, subject to the alternative product matching the performance, quality and appearance of the product documented.

Review of the alternative products will incur cost from the Electrical Consultant, Superintendent, Principal and any other affected parties (e.g. other trade Consultant). The Contractor must pay all costs associated with the review of the alternative products regardless if the alternative is accepted or rejected.

When offering alternative products which match specification, provide all available product information, technical information, test reports carried out by approved independent testing Authorities.

Technical information must include but not be limited to; country of origin manufacturer, supplier, product reference number, product brochure and comparison in performance and appearance of the specified product.

Alternative luminaires shall include full data sheets for each product, NATA testing certification, IES files and full electronic calculations using AGI or Dialux lighting software for all areas, indicating illumination and glare levels in full accordance with AS 1680 and other relevant Australian Standards. All lighting calculations must be certified by an independent qualified Electrical Engineer prior to any review.

Substitution will not be considered through failure of the Contractor to place orders in sufficient time to avoid delays to the Works other than in circumstances where the Contractor can demonstrate in writing the delay in material supply is or was beyond the Contractor's control.

The Superintendent reserves the right to accept or reject any or all alternatives. Financial claims shall not arise from any rejection.

#### **46.1.7 CONTRACT CONDITIONS**

Refer to the contract conditions and include all costs associated with the construction staging program.

Variation claims will not be accepted for delays due to the lack of available materials as a result of late order to suppliers.

Terms in use within this specification section are verified as follows:

- 'Provide' means: supply, installation, testing and commissioning, record documentation of the system in accordance with this specification and standards for a complete installation.
- 'Supply' means: supply and delivery without installation.
- 'Install or Installation' means complete installation of the item excluding supply, including testing and commissioning and record documentation.
- 'Superintendent' means: Site Architecture Studio
- 'Architect' means: Site Architecture Studio
- 'Consulting Engineer' means: Focus Consulting WA Pty Ltd.
- 'Principal' means: Shire of Chittering

#### **46.1.8 DRAWING COORDINATION**

Refer to Architectural, structural, civil, hydraulic, mechanical and landscape trade drawings for locations of all services, equipment, furniture and coordinate the positioning of electrical outlets and equipment accordingly. Where a specific item is not detailed, fully liaise with relevant trade for exact positions and requirements to approval by Superintendent prior to installation.

Services installed and not co-ordinated, will require remedial work at the contractor's expense.

#### 46.1.9 STANDARDS

- *Electrical Installation: To AS/NZS 3000.*
- *Selection of cables: To AS/NZS 3008.1.1.*
- *Degrees of protection (IP code): To AS 60529.*
- *Emergency Lighting in Building: To AS 2293.*
- *Intruder Alarms: To AS 2201.*
- *Western Power Regulations and Standards.*
- *Office of Energy WAER and other applicable documents.*
- *ASA Regulations*
- *Local Building Authorities*
- *DFES*
- *National Construction Code (BCA)*
- *Worksafe Australia*
- *Electromagnetic compatibility (EMC): To AS/NZS 61000.*
- *Communications systems: To AS/CA S008, AS/CA S009, AS/NZS 3008 and AS/NZS ISO/IEC 14763.2.*

Standards shall be the latest edition available at construction stage.

#### 46.1.10 CONTRACT DOCUMENTS

Refer to the Focus Consulting WA project document transmittal reference 2021-162 for the list of the electrical contract documents relevant for this project.

#### 46.1.11 EQUIPMENT POSITIONING

Positioning of devices indicated on the electrical services drawings are approximate. Refer to dimensioned architectural and/or landscape drawings for final setout.

Do not scale from electrical drawings to determine equipment positions. Final location of equipment shall be in accordance with good working practice and to the Superintendents approval, including; -

- Alignment with the building fabric.
- Luminaires spaced with equal centre spacing and uniform layout.
- Accessories installed adjacent to each other are to be from the same wall plate range and manufacturer for uniform appearance.

#### 46.1.12 DEFAULT MOUNTING HEIGHTS

##### General

The default mounting heights to the centre of the electrical accessories shall be in accordance with the following unless otherwise stated or required by Australian standards, request in writing confirmation of the mounting heights where conflicts occur prior to installation:

- Light switches: 1000mm above finished floor level.
- General purpose outlets for common areas: 500mm above finished floor if not documented above bench.
- Data outlets for common areas: 500mm above finished floor if not documented above bench.
- Above bench shall equate to 200mm above finished bench level.

#### 46.1.13 ELECTRICAL ACCESSORIES RANGE

The electrical accessories to include lighting, switches, GPOs, data outlets and other faceplates shall be from the Clipsal Pro Series P3000 Range.

**46.1.14 HOLD POINTS**

The following are the hold points for the project. Do not proceed beyond each hold point prior to having Superintendent's direction/approval. Notify the Superintendent when the following are ready for inspection/review.

- Underground containment systems prior to back filling.
- Cable pit installation prior to back filling.
- Shop drawings for switchboards.
- Shop drawings for light pole arrangements complete with structural engineer's certification.
- Shop drawings for light pole footing arrangements complete with structural engineer's certification.
- Shop drawings for custom continuous linear lighting systems.

**46.2 INSPECTION, TESTING & COMMISSIONING**

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**46.2.1 INSPECTION**

Inspection: Give minimum one week notice so inspection may be conducted to the following:

- Underground containment systems prior to back filling.
- Cable pit installation prior to back filling.
- Wiring and cable containment system prior to ceiling installation, wall lining or concealment of services.

**46.2.2 GENERAL**

Inspect, test and commission the installation in accordance with Australian Standards.

Ensure testing is carried out according to the approved construction program to aid the project and ensure safe systems at all times.

All services shall be tested by mean of dead and live tests and be fully operational to specification. Demonstrate tests as directed and witnessed by the Consulting Engineer.

The Consulting Engineer may attend selected commissioning activities and may conduct a detailed inspection of the completed installation, following which the Consultant will provide a list of any rectification works required.

Submit detailed test results in the specified format only for the complete electrical work, installed under the contract.

A typewritten copy of all test results and certifications shall be included in each operating and maintenance manual, as further documented herein.

Fully test the electrical installation in accordance with the Wiring Rules AS3000 and AS3017.

The minimum tests must include the following:

- Visual inspections in accordance with AS3000 section 8.2.
- Mandatory tests in accordance with AS3000 section 8.3.3
- Continuity  $R_e$  or  $R_{phe}$  for each circuit must be recorded.
- Earth Fault Loop Impedance  $Z_s$ , bridge out the RCD to obtain the result as required.

Test results must be typewritten and presented in the format set out in the following format, alternative formats will not be accepted. An electronic copy of the test result format is available upon request.





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## 46.3 AS BUILT DOCUMENTATION

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### 46.3.1 AS CONSTRUCTED DRAWINGS

Prepare fully detailed 'As Constructed' drawings including all equipment and services installed within the scope of work and as provided within the project.

The following is the minimum content acceptable for 'As Constructed' drawing submissions;

- Locations and type of light fittings and control devices.
- Switching locations and capacity details.
- Lighting control switch group details.
- Emergency and exit lighting (including reference numbers of emergency fittings corresponding to emergency log book).
- Power outlet locations, including current ratings and whether single phase or three phase.
- Circuit reference and detail.
- Communications device locations and unique identification.
- Security Device Locations and unique identification.
- Underground cable/conduit routes and set out dimensions, relative to adjacent walls and building fabric.
- Cable pit locations complete with a schedule of GPS coordinates for each pit (Northings and Eastings).
- Major cable tray and ladder locations and sizing.

Drawings shall not make reference to construction notation or information relevant only to the construction staging.

'As Constructed' drawings shall include the Electrical Contractor's business name or Specialist Installers name within the title block in AutoCAD format.

### 46.3.2 AS CONSTRUCTED DRAWINGS

In no later than one week prior to practical completion, submit final approved As Constructed drawings. The drawings shall be accompanied by a signed statement confirming the drawings meet the AutoCAD protocols required for the project.

Supply one copy of 'As Constructed' drawings in PDF and DWG format and one set of full size drawing prints, for each maintenance manual. See Operations and Maintenance manual section of this document for further details.

### 46.3.3 OPERATIONS AND MAINTENANCE MANUALS

Provide three paper copies of A4 size, three ring binder, embossed with 'Electrical Services- Operating and Maintenance Manual' in a format as further specified.

Each hard copy manual shall also contain a USB flash drive, with a full high resolution soft copy of the manual and drawings (both PDF and AutoCAD) contained within. All drawings must be provided with referenced files (e.g; architectural backgrounds).

Provide a draft copy of the manual complete with all draft 'As Installed / Constructed' drawings and an index of the proposed content of the manual for approval, at least two weeks prior to Practical Completion.

#### Operation and Maintenance Information

The manuals shall be complete with:

- Separate sections for each service provided.
- List of suppliers and sub-contractors, including key personnel names and mobile phone numbers.
- Reports, certification and test results conducted on the project.
- Manufacturers literature on all fixed equipment installed
- Schedule of all light fittings including description of light fitting (as specification format), manufacturer's catalogue number, luminaire details (including colour temperature, beam angle etc.)
- Operating instructions for all equipment and systems specific to the site.
- Shop drawings for switchboards and specialist systems.

- Manufacturers literature on circuit protection, control devices, and general equipment.
- Full discrimination study.
- Operating instructions for automated equipment, designed to be understood by non-technical personnel and tailored for the site-specific installation.
- Equipment guarantees.
- Recommended service schedules for all systems installed

**The following sections shall be included as a minimum within the manual:**

- Contact Register
- Power consumption metering
- Low Voltage switchboard shop drawings
- Lighting
- Emergency lighting
- Voice and data communications infrastructure
- Access Control and Intruder Detection system
- Closed Circuit Television system
- Test records and commissioning certificates

#### **46.4 COMPLETION**

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##### **46.4.1 SYSTEM TRAINING**

Upon acceptance of Practical Completion, train the Principal in the correct operation and maintenance of all electrical services equipment and systems.

Provide suitably qualified personnel to undertake the necessary training. Provide user friendly, site specific instruction sheets to assist in training and for post training use, in easy to follow English.

Provide three, 2-hour training sessions for the Principal.

##### **46.4.2 DEFECTS LIABILITY & PREVENTATIVE MAINTENANCE**

Provide warranty and preventative maintenance for all new equipment as from the date of practical completion for the period stipulated in the Contract Preliminaries and a minimum of 12 months. Provide service support for the complete system for the period stipulated.

Provide corrective maintenance and repair to all electrical equipment and systems which become defective, or are found to be defective, during the Defects Period, including the making good of any resulting damage.

In addition, provide preventative maintenance of the electrical services for the full duration of the Defects Liability Period, in accordance with this section.

Replace all defective lighting or control within 48 hours of reported defect at zero charge to the Superintendent or Principal. All costs associated with defective luminaires and equipment replacement shall be included within tender price.

Generally, the routine preventative maintenance shall include the inspection, testing and such other checking as may be necessary to ensure the satisfactory operation of the electrical systems.

Notify the Proprietor of the building on arrival and log details of all on site visits.

#### **46.5 SCOPE OF WORK**

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##### **46.5.1 GENERAL**

The electrical services scope of work includes the material delivered to the construction / project site, supply of products, equipment and accessories, installation, access equipment as required, modification to existing, commissioning and subsequent maintenance for the defects period, for all works indicated or implied. Tender drawings are diagrammatic and do not necessarily indicate exact location of services. Review architectural, structural, landscape, hydraulic and mechanical services drawings prior to installation to confirm required location. Relocation of services due to failure of review shall be completed at zero cost as required.

The scope shall include, but not be limited to:

- Liaison with Western Power and Telstra/NBN Co.
- Demolition and removal of redundant services
- Out of Hours works
- Low Voltage switchboards
- Utility power consumption metering
- LV consumer mains and submains cabling
- Underground conduits and cable pits
- Cables trays and other cable support systems
- Earthing systems
- Transient protection equipment
- General power distribution
- Power to mechanical services
- Power to hydraulic equipment
- Private power consumption metering
- Lighting
- Emergency lighting
- Voice and data communications infrastructure
- CCTV system
- Access control and Intruder Detection system
- Testing & Commissioning
- As Built drawings and maintenance handbooks
- Maintenance during the defects period

#### **46.5.2 OVERVIEW OF WORKS**

The project involves the demolition of existing buildings and services and the construction of a new recreation centre building, changeroom building, netball court sports lighting and associated services.

The existing services noted on the drawings shall remain operational during the works, therefore any power isolations or disruption must be undertaken during times agreed with the client.

#### **46.5.3 EXCLUSIONS**

The following work is not included and does not form part of this Trade Section:

- Application with Telecommunications Carrier for new communications service. Liaison for the infrastructure to site is included.
- Provision of PABX/VOIP systems or Telephone Handsets.
- Provision of additional ISDN/PSTN links.
- Provision of active communications equipment (e.g. computers, switches, routers, modems, interactive white boards, TVs), unless specification documentation requires otherwise.
- Control wiring for air conditioning and final connection from isolators.
- White goods such as ovens, fridges, microwaves and the like.

#### **46.5.4 EXISTING SYSTEMS**

##### **Demolition**

General: Decommission, isolate, demolish and remove from the site all existing redundant equipment including minor associated components that become redundant as a result of the demolition.

Breaking down: Disassemble or cut up equipment where necessary to allow removal.

Recovered materials: Recover all components associated with the listed items. Minimise damage during removal and deliver to the locations documented.

Prior to commencement of demolition in any area isolate and make safe the existing electrical and extra low voltage installation and clearly identify equipment to be retained.

In accordance with the construction programme, disconnect and remove all redundant services. Trace existing cabling as necessary and retain a tradesman on site during all demolition work to immediately reinstate any services required that are accidentally damaged at zero cost.

All equipment, accessories, submains, sub circuits and extra low voltage cables within the vicinity of the proposed building works associated with the redevelopment that are required to remain are to be located and protected prior to any construction work to avoid any damage. Carefully remove, clean and store equipment to be re-used.

Extend/redirect cables as required to avoid proposed construction work. Provide junction boxes, conduits, etc. as required for a complete installation in accordance with current standards. Joints to be carried out using crimp links within casts and completely covered by heat shrink insulation and resin filled when underground or in approved terminal boxes where not exposed to weather or external influences. When temporary systems are no longer required remove them from site.

Liaise and fully co-ordinate with the main contractor with regard to temporary works and demolition and the removal of equipment and systems.

Prior to demolition or modification of any existing services, review such services with the Superintendent and Consulting Engineer to determine the exact requirements and methods of removal and/or modification.

Ensure all redundant light fittings, identified as containing PCB and associated hazardous material are disposed safely in accordance with current standards and regulations. All costs associated with the removal shall be included within the tender price.

#### **46.5.5 INSTALL FOR DURABILITY AND MAINTAINABILITY**

Install for durability: Develop the design so the installed systems achieve the documented performance, reliability, service life, energy efficiency and safety requirements, and are easily maintainable.

Access for maintenance: Include access for maintenance in full accordance with current standards and manufactures recommendations.

#### **46.5.6 FIXINGS OF PLANT AND EQUIPMENT**

##### **General**

Fixing wall mounted switchboards and enclosures: Fix direct to wall framing for framed wall constructed walls and to masonry or concrete walls.

Fixing floor/wall mounted switchboards and enclosures: Fix to floor plinths and direct wall framing for framed wall constructed walls and to masonry or concrete walls by suitable fasteners.

Fixing floor mounted island switchboards and enclosures: Fix switchboard to floor plinths by suitable fasteners able to withstand seismic events nominated in the project documents.

#### **46.5.7 SUPPORT OF PLANT AND EQUIPMENT**

##### **Ground Level Plant and Equipment**

Ground level:

- If the ground slope is  $\geq 15^\circ$  or the area of the plant and equipment is extensive, obtain the advice of a professional engineer for the documentation of a suitable slab or platform.
- In all other cases, provide proprietary plastic or concrete supports installed with falls that achieve a raised, impervious and water shedding bearing surface.

Balustrades: If balustrades or screening are required, obtain the advice of a registered architect.

#### **46.5.8 CUTTING AND FIXING TO BUILDING FABRIC**

Request the structural engineer's written approval of penetrations and chases in load bearing brickwork, concrete walls or floors, prior to installation. Penetrations shall be sealed air and moisture tight and be compliant with the rated acoustic and fire integrity of the building element to comply with the National Construction Code (NCC).

Chase surfaces as required and make good to original condition. Grout all conduits and services installed in chases over the whole length of the chase.

Drill or cut openings as required. Form up any necessary openings before concrete is poured. Size and fire rate all penetrations in accordance with the NCC and Authority requirements.

Chase conduits or otherwise conceal conduits in masonry to be rendered. All chases and openings shall be in accordance with Australian Standards and suitable for the application of specified finishes. Repair all damages incurred in providing the services outlined with materials compatible and suitable with the surrounding building fabric or finish and ensure the installation is flush with the surface on which they occur to approval.

#### **46.5.9 ASSOCIATED BUILDERS WORKS**

Provide all Builders' work required in association with the electrical services installation. Coordinate the required builders work with all trades prior to the commencement of the works to determine and provide all associated works; including, but not limited to,

- Enclosures for distribution boards.
- Openings and penetrations for recessed luminaires, speakers and all ceiling penetrations.
- Forming of horizontal and vertical openings for cable ducts, cable trays and conduits.
- Set out of walls for location of services.
- Flush plaster, ceiling tile and building structure penetrations, removals, trimming and make-good as necessary.
- Cutting of tiles for wall boxes.
- Patching, painting and making good to conduit chases.
- Building in of such equipment, fittings and fastenings that are required and for forming openings and chases into structure.
- Provision of temporary power, water toilets and messing facilities.
- Installation of the security electric strikes and locks into the doors. (Electric strikes and locks supplied by the electrical contractor.).
- Protection of services prior to Practical Completion.
- Provision of ceiling access panels.

### **46.6 CABLE SUPPORT AND DUCT SYSTEMS**

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#### **46.6.1 RESPONSIBILITIES**

##### **General**

Requirement: Provide cable support, trunking and duct systems, as documented.

#### **46.6.2 INTERPRETATION**

##### **Definitions**

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

- Cable support: Cable tray, cable ladders, cable duct and cable mesh cable support systems.

#### **46.6.3 SUBMISSIONS**

##### **Certification**

General: Submit structural engineer's certification for the following:

- Fabricated columns, cross arms and spigots.
- Flange assemblies at the base of columns.
- Footings for columns.
- Rag bolt assemblies for column support.

##### **Operation and Maintenance Manuals**

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

##### **Shop Drawings**

Cable support and duct systems: Submit shop drawings showing the following:

- Fabricated columns, cross arms and spigots.
- Footing for columns.

**Products and Materials**

Cable support and duct systems: Submit technical data for the following:

- Ducted wiring enclosure systems.
- Cable support systems.
- Proprietary pits.
- Proprietary columns.

**46.6.4 CONDUITS****Inspection Fittings**

Location: Locate in accessible positions.

**Draw Cords**

General: Provide 5 mm<sup>2</sup> polypropylene draw cords in conduits not in use.

**Draw-in Boxes**

General: For conduits in accessible locations provide draw-in boxes as follows:

- In straight runs at 50 m.
- At changes of level or direction.

Underground draw-in boxes: Provide gasketed covers and seal against moisture. Install in accessible pits.

**Expansion**

General: Allow for thermal expansion/contraction of conduits and fittings due to changes in ambient temperature conditions. Provide expansion couplings as required.

**Rigid Conduits**

General: Install in straight long runs, smooth and free from rags, burrs and sharp edges. Set conduits to minimise the number of fittings.

**Routes**

All conduits and cabling shall be fully concealed within the building fabric. Exposed conduits will not be accepted without prior approval from the Superintendent.

Set-out: If exposed to view, install conduits in parallel runs with right angle changes of direction.

Bends: Install conduits with no more than 2 right angled bends per cable draw-in run.

Concealed conduits: Run conduits concealed in wall chases, embedded in floor slabs or installed in inaccessible locations directly between points of termination, minimising the number of sets. Do not provide inspection fittings. Use large radius bends or elbows.

**Painting**

Conduits exposed to view: Paint to match surrounds as documented.

**Underground Conduits**

Provide approved heavy duty Category A, electric orange rigid P.V.C. conduit for low voltage underground services.

Provide white PVC (ACMA approved) for Data/Communications and Telstra or NBN Co. services.

All conduit runs shall be complete with approved accessories for joins and bends.

The minimum installation depth below finished ground to top of conduits shall be 500mm for low voltage services and 450mm for extra low voltage services, except where shown otherwise on design drawings.

Provide cable pits at changes of direction and at intervals not exceeding 65 metres. A maximum of two bends shall be allowed in any conduit run between pits.

The bottoms of trenches shall be flat and clear of protrusions such as rocks, tree roots and the like prior to installation of conduits.

Conduits shall be covered with 300mm depth of rubble free yellow sand. Orange plastic 150mm wide identification tape shall be provided 200mm above the conduit, along the entire length of the installation. The tape shall be indelibly marked "DANGER ELECTRIC CABLE BELOW" at not more than 1 metre intervals.

Conduits from buildings to the first junction box or cable pit external to the building shall be installed with a slight fall to prevent ingress of water back in to the building.

All underground conduits shall be provided with a 7/0.67 (2.5 mm<sup>2</sup>) green /yellow PVC covered draw wire, irrespective of the extent of cabling installed in the conduit.

**Conduits entering Cable pits shall;**

- Be terminated flush with the internal face of the pit,
- Shall be fitted with a conduit bush for Telstra, NBN Co. or other utility conduits.
- Shall only enter the ends of rectangular pits,
- Shall be located 100mm above the floor of the pit.

**Conduits installed for Telstra services shall;**

- Have a minimum bending radius of 300mm for 25mm diameter conduit,
- Have a bending radius of 800mm for 50mm and 100mm conduit, where less than 800mm form an access point,
- Have a bending radius of not less than 5.0m for 50mm and 100mm conduit, where greater than 800mm from an access point,
- Have a maximum of two bend between access points,
- Be compliant with NBN Co. requirements.

Where external conduits are entering or leaving cable pits, poles, switchboards or buildings, seal conduits internally with an expanding foam on completion of works to prevent water and insect/rodent ingress.

All spare conduits shall be provided with a conduit cap.

**Conduits in Roof Spaces**

Location: Locate below roof insulation and sarking. In accessible roof spaces, provide mechanical protection for light-duty conduits.

**Conduit Installation - Turf**

All turf required to be removed to enable conduit installation shall be removed by turf cutter and set aside.

Tree roots shall be hand cut carefully, and not pulled or ripped from the surface. Any tree root not required to be removed shall be left in situ.

On installation of conduits, trenches shall be backfilled and turf reinstated, consolidated to match existing levels.

Turf shall be compacted with a vibratory plate compactor and sand top dressed. No gravel or similar material shall be left on the surface.

**Conduit Installation - Hardstand**

All existing hardstand surfaces required to be removed to enable conduit installation shall be neatly cut and removed. Bitumen and concrete surfaces shall be neatly saw cut in straight lines parallel to existing expansion joints. Pavers shall be neatly removed and set aside for re-installation.

Tree roots shall be hand cut carefully, and not pulled or ripped from the surface. Any tree root not required to be removed shall be left in situ.

On installation of conduits, trenches shall be backfilled and surfaces reinstated, consolidated to match existing levels.

**46.6.5 TRENCHING**

All trenching zones shall be provided with barriers in accordance with OS&H standards and 100% backfilled at the end of each day.

Trenching near / adjacent to trees is to maintain the required minimum clearances of 4000mm.

Ensure to mark the trench route and seek approval of the proposed route, a minimum of 3 days prior to excavation. Ensure the proposed routes is in full accordance with AS2560.2.3 and AS3000.

**Existing Trees & Vegetation**

The Contractor shall not clear or cut back shrubs, trees, roots and limbs, apart from those necessary for the execution of the works and will preserve the vegetation.

Notices shall be provided before clearing commences, as required by the General Conditions of Contract.

**Harmful Materials**

Do not store or otherwise place bulk materials and harmful materials under or near trees. Do not place spoil from excavations against tree trunks, even for short periods.

Prevent wind-blown materials, such as cement, from harming trees and plants.

**Damage**

Prevent damage to tree bark. Do not attach stays, guys and the like to trees.

**Work under Trees**

Do not add or remove topsoil within the drip line of trees. If it is necessary to excavate within the drip line, use hand methods such that root systems are preserved intact and undamaged. Open up excavations under tree canopies for as short a period as possible.

**Roots**

Do not cut tree roots exceeding 50 mm in diameter unless permitted. Where it is necessary to cut tree roots, use means such that the cutting does not unduly disturb the remaining root system. Immediately after cutting, apply a bituminous fungicide sealant to cut surface to prevent the incursion of rot or disease.

**Backfilling**

Do not back fill around tree trunks to a height greater than 300 mm above the original ground surface. Immediately after back filling thoroughly water the root zone surrounding the tree.

**Compacted Ground**

Avoid compaction of the ground under trees. If compaction nevertheless occurs, for example from the operation of heavy constructional plant, loosen the soil by coring.

**Trenching Through Existing Turf (Grass)**

It is required that all trenching, in turf (grass) areas, to have turf replaced or relayed following the installation of electrical or pipe works. If the condition of the turf is not to a standard to be replaced, it will be replaced with new turf supplied and laid by the client at the Contractor's expense.

Where existing turf requires relaying, the turf must be lifted by the Contractor and then replaced after the trench has been backfilled and compacted. Any turf areas removed and replaced must be inspected and approved by the superintendent.

If the turf does not meet the superintendent's approval then the superintendent may elect to replace the turf with new turf at the contractor's expense. The Contractor is responsible for keeping the turf in good condition until it is replaced.

All trenches will be one turf cutter width, cut to a minimum depth of 60mm. All turf will be replaced level with the existing ground level. Trenches are to be highly compacted and levelled prior to the turf being laid. The Contractor should allow for as many times as needed to return to site in the 12 months following, to rectify any subsidence in turf due to trenches not being compacted adequately.

All backfill sand must be removed from turf to be relayed or turf areas adjacent to the trench to prevent the deterioration of these turf areas. Rectification to turf areas not in compliance shall be carried out at the Contractor's cost.

**Backfilling**

Excavated spoil may be used as backfill material if free of rocks, rubble and organic matter and must be deemed suitable by the Principal of their approved representative. Approval from the Principal of their approved representative is required on the use of excavated spoil prior to backfilling. If excavated spoil is inadequate then trenches shall be backfilled with clean fill (sand) in accordance with AS3500.

Rejected spoil shall be removed from the site and replaced with clean sand at the Contractor's cost. The Contractor shall provide all necessary equipment for the backfilling of trenches, compacting and levelling.

No turf or organic matter is to be backfilled into the trench.

The Contractor shall warrant all trenches against excessive subsidence for a period of twelve months from Practical Completion. Any subsidence during the Defects Liability Period shall be the responsibility of the Contractor to rectify at his own expense.

The Contractor shall remove all surplus spoil excavation, including rocks removed from backfill material from the site.

All top backfill to trenched areas should be level with the adjacent ground or to a depth to accommodate the relaying of turf. Any trip hazards created by trenching works shall be rectified by the Contractor at their own expense.

#### **Compaction of Backfill**

All backfill material in the trench is to be compacted below and on the sides of the laid conduit or pipework. All sand backfill is to be compacted to a minimum of 5 blows/300mm, as tested with a Perth Sand Penetrometer. Meanwhile, crushed rock compacted backfill should attain 98% maximum dry density as measured by standard compaction.

### **46.6.6 NON-METALLIC CONDUITS AND FITTINGS**

#### **General**

Standards: To AS/NZS 2053.3, AS/NZS 61386.21, AS/NZS 61386.22 or AS/NZS 61386.23.

Solar radiation protection: Required for conduits and fittings exposed to sunlight.

#### **Flexible Conduit**

Requirement: Provide flexible conduit to connect with equipment and plant subjected to vibration. If required, provide for adjustment or ease of maintenance. Use the minimum possible length.

#### **Associated Fittings**

Type and material: Same as the conduit.

Wall boxes on PVC-U conduits: For special size wall boxes not available in PVC-U, provide prefabricated earthed metal boxes.

#### **Inspection-type Fittings**

Requirement: Use only in accessible locations and where exposed to view.

#### **Joints**

Type: Cemented or snap-on joints.

### **46.6.7 CABLE SUPPORT SYSTEMS**

#### **General**

Standard: To NEMA VE-2.

Design: Support cable support systems as follows:

- Horizontal runs:
  - Concealed cable support system: At spacing which is less than length of cable support section.
  - Visible cable support: Loaded deflection  $\leq$  span/200.
- Vertical runs: To manufacturer's recommendation, taking into account the weight of cables installed.

#### **Fixing to Building Structure**

General: Fix supports to the building structure or fabric with threaded rod hangers greater than or equal to 8 mm attached to hot-dip galvanized U-brackets, or by means of proprietary brackets.

#### **Cable Fixing**

General: Provide strapping or saddles suitable for fixing cable ties.

#### **Inside Bend Radius**

Requirement: At least 12 times the outside diameter of the largest diameter cable carried.

#### **Cable Protection**

General: Provide rounded support surfaces under cables where they leave trays or ladders.

#### **Clearances**

Access requirement: At least 150 mm free space above and at least 600 mm free space on at least one side of cable trays and ladders.

From hot water pipes: > 200 mm.

Electromagnetic interference (EMI): Locate support systems for electrical power cabling and communication cabling to minimise electromagnetic interference.

#### 46.6.8 CATENARY SYSTEMS

##### General

Catenary systems: May be used within suspended ceiling spaces, this shall not replace the major cable tray and ladder systems where documented.

Wire: Stainless steel or coated galvanized cable and couplings.

Anchoring: Anchor catenary systems to the structure. Do not fix to any part of a suspended ceiling system.

Design loads: Design catenary systems to support the proposed load of the cables with a spare capacity of 50% loading.

Fixing: Fix cables to the catenary system so that no cable is under stress due to tension or compression. Use proprietary fasteners that allow cables to be added or removed without destroying the integrity of the system.

#### 46.6.9 CABLE PITS

##### General

Cable draw-in pits: Provide cable draw-in pits, as documented. Sizes given are internal dimensions.

The following minimum requirements shall apply to cable pits:

- Where sizes are not noted on design drawings, cable pits shall be sized to suit number of specified conduits + 25% spare.
- Cable pit lids shall level with the adjacent finished ground level.
- Secure the immediate area with orange barrier mesh until compaction has taken place to avoid damage from vehicles.
- All pits shall be installed in accordance with the manufacturers' recommendation to ensure structural integrity is maintained.
- All pit lids shall comply with the following, unless specifically noted otherwise on drawings:
  - medium duty (minimum 4000kg static wheel load) where installed in areas not accessible by vehicular traffic
  - heavy duty (minimum 9000kg static wheel load) in road ways, parking areas, loading docks and the like
- engraved 'ELECTRIC' or 'TELSTRA' (to ACMA approval), 'NBNC' (to NBNC approval) or "COMMUNICATIONS" as applicable.
- All cable pits shall be ACO Cablemate Polycrete. Alternative manufacturers will not be approved.
- Provide a concrete collar to every pit. The collar shall be in accordance with the pit manufacturer's recommendations.
- Pits shall be backfilled with correct material as per the manufacturers installation guidelines.
- Provide a layer of blue metal, of 200mm depth, immediately beneath the cable pit to improve stability and drainage from the pit.

##### Proprietary Cable Pits

Pits ≤ 1200 x 1200 mm: Proprietary concrete or polymer moulded pits.

##### Pit Covers

General: Provide pit covers to suit external loads. Fit flush with the top of the pit.

Standard: To AS 3996.

Weight: < 40 kg for any section of the cover.

Lifting handles: Provide a lifting handle for each size of cover section.

##### Drainage

General: Provide drainage from the bottom of cable pits, either to absorption trenches filled with rubble or to the storm water drainage system.

Absorption trenches: Minimum size 300 x 300 x 2000 mm.

#### 46.6.10 CABLE TRAY & LADDER SYSTEMS

##### General

Provide cable trays and cable ladders to the locations indicated on the drawings.

Cable trays and ladders shall comply with the following minimum requirements;

- Unless specifically noted on drawings, trays and ladders shall have width as required to accommodate the cables specified and 50% space for future cables.
- Trays and ladders shall be manufactured from minimum 1.25mm hot dipped galvanised mild steel sheet. Cable trays shall be perforated with slotted holes over the entire tray area. The perforations shall be suitable for metal thread studs and nuts or nylon 'tray nuts'.
- Trays and ladders shall have sides of depth and shape to provide rigidity. Trays shall be provided with 45mm high sides with return edge.
- Ladders in vertical risers shall be provided with 75mm high sides. Horizontal ladders shall have minimum 90mm high sides.
- Trays and ladders shall be provided with suitable brackets and fixings at intervals to ensure the tray or ladder does not deflect more than 6mm at any point when loaded with cables as specified.
- Where installed externally, within moist areas, plant rooms and the like, trays and ladders shall be hot dipped galvanised to AS/NZS 4680.
- Where installed within indoor applications and not subject to a moist environment, trays and ladders shall be manufactured with Galvabond protection.
- Brackets shall be provided with equal surface protection to that of the tray which they support.
- Trays and ladders shall be complete with matching splice plates, tees, bends, transitions, and all related componentry for a complete installation. All changes of direction shall be of radius not less than the minimum bending radius of the largest cable installed on the tray and shall be complete with transition pieces, plates and all associated componentry.
- Where supporting fire rated cables, the cable tray or ladder and associated support system shall be of equal fire rating integrity to the cable. In such cases the tray or ladder and associated support system shall be rated by the manufacture to provide WS52 integrity, as defined in AS/NZS3013.
- Where cable trays are specified to be provided with the lids, the lids shall be provided as peaked and ventilated covers.
- Provide sample of cable tray and ladder for approval prior to placing orders.
- Fixing shall be rigid hot dipped galvanised metal brackets or 'Unistrut' channels (and accessories) as appropriate.
- Cable trays and ladders shall be supported using proprietary or custom-manufactured brackets and rods where required.

#### **46.6.11 CABLES IN TRENCHES**

##### **Sand Bed and Surround**

Sand bed and surrounds: Provide at least 150 mm clean sharp sand around cables and conduits installed underground.

##### **Sealing Ducts and Conduits**

General: Seal buried entries to ducts and conduits with waterproof seals as follows:

- Spare ducts and conduits: Immediately after installation.
- Other ducts and conduits: After cable installation.

#### **46.6.12 FIRE ISOLATION**

Requirement: Provide fire-stop sealing where electrical services pass through fire-resisting walls, floors or ceilings.

### **46.7 LOW VOLTAGE POWER SYSTEMS**

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#### **46.7.1 RESPONSIBILITIES**

##### **General**

Requirement: Provide low voltage power systems, as documented.

## 46.7.2 STANDARDS

### General

- Requirement: To AS/NZS 3000 Part 2, unless documented otherwise.
- Electrical design: To AS/NZS 3000 and SAA HB 301.
- Electrical equipment: To AS/NZS 3100.
- Fire and mechanical performance classification: To AS/NZS 3013.
- Selection of cables: To AS/NZS 3008.1.1.
- Distribution cables: To AS/NZS 4961.
- Degrees of Ingress Protection (IP code): To AS 60529.
- Electromagnetic compatibility (EMC): To AS/NZS 61000.
- Communications systems: To AS/CA S008, AS/CA S009, AS/NZS 11801 and AS/NZS ISO/IEC 14763.2.
- Western Power Regulations
- WA Electrical Requirements (WAER)

### Testing

Standard: To AS/NZS 3000 & 3017.

## 46.7.3 INTERPRETATION

### Abbreviations

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

- RCD: Residual current device.
- SPD: Surge protection device.

## 46.7.4 SUBMISSIONS

### Operation and Maintenance Manuals

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

### Samples

Low voltage power systems: Submit samples of all visible accessories and equipment.

Cabling accessories: Submit switched socket outlets, light switch plates and other accessories.

### Tests

Site tests: Submit results as follows:

- Installation: To AS/NZS 3000 Section 8 using the methods outlined in AS/NZS 3017.

## 46.8 SITE ELECTRICITY SUPPLY

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### 46.8.1 GENERAL

Electrical systems: Connect to the electricity distributor's supply, as documented and provide the equipment necessary to meet the electricity distributor's requirements.

### 46.8.2 ORIGIN OF SUPPLY

Origin of supply shall be the existing Western Power substation. Apply to Western Power and pay all fees associated with the disconnection and reconnection of the existing consumer mains to suit the new site main switchboard.

### 46.8.3 UTILITY POWER CONSUMPTION METERING

Pay all cost for the removal of the existing Western Power meter from the existing Site Main Switchboard and the supply and installation of a new Western Power meter into the new Site Main Switchboard. Western Power meter arrangements shall comply with the Western Australian Distribution Connections Manual (WADCM).

### Western Power Current Transformer (CT) Meters:

Provide CT meters where indicated for loads greater than 100Amps.

Commercial series meters shall be capable of recording and displaying information for two billing periods; being, Peak and Off-Peak usage only.

Provide the following as required by Western Power:

- Spatial requirements, including clearances from heavy current carrying conductors.
- Protection device in accordance with WADCM.
- Current transformers.
- Access to read meter (via key).
- Western Power kWh master meters.

Submit all necessary applications to the Supply Authority, to enable metering equipment to be installed and supply accounts to be created on behalf of the Principal.

#### **46.8.4 SERVICE PROTECTIVE DEVICE**

Provide a Service protection device (SPD) in accordance with Western Power and WAER regulations. Adjust the protection device trip settings to Western Power approval.

#### **46.8.5 PROSPECTIVE FAULT CURRENT**

All parts of the installation shall be sized to withstand the nominated prospective fault current for a period of one (1) second.

Circuit breakers shall be rated for the prospective fault current at the point of installation, or the level of fault current nominated on the drawings, whichever is the greater.

#### **46.8.6 PHASE SEQUENCING**

The same phase sequence as provided by the Supply Authority shall be maintained to all switchboards, submains, three phase outlets and other three phase equipment throughout the installation.

Prior to disconnection of supply or disconnection of any motors, equipment and the like, confirm the existing phase sequencing.

#### **46.8.7 LOAD BALANCING**

The loads and circuits shall balance as evenly as possible over the three phases throughout the installation. Failure to comply with this section will result in the rejection of the electrical installation.

Where phases have not been nominated for particular loads, balance the loads between individual phases to the approval of the Superintendent or his representative and the Supply Authority.

#### **46.8.8 ELECTROMAGNETIC COMPLIANCE**

Take all reasonable precautions to prevent adversely affecting the reliability and quality of supply to other customers supplied from the same Supply Authority's distribution network. As a minimum the electrical installation shall meet the requirements of AS/NZS 61000 including:

- AS/NZS 61000.3.7: "Electromagnetic compatibility (EMC): Limits - Assessment of emission fluctuating loads in MV and HV power systems"
- AS/NZS 61000.3.5: "Electromagnetic compatibility (EMC): Limits - Limitation of voltage fluctuations and flicker in Customer's Mains power supply systems for equipment rated greater than 16 A
- AS/NZS 61000.3.3: "Electromagnetic compatibility (EMC): Limits - Limitation of voltage changes, voltage fluctuations and flicker in public Customer's Mains power supply systems, for equipment rated greater than 16 A per phase and not subject to conditional connection.
- Ensure all connected equipment does not introduce harmonic levels in the network supply voltage in excess of those specified in AS/NZS 61000.3.6: Limits - Assessment of emission limits for distorting loads in MV and HV power systems. When in doubt, obtain a statement of compliance from equipment suppliers prior to connecting the equipment.

#### **46.8.9 EARTHING**

##### **Earthing Systems**

Protective earthing system with a multiple earth neutral (MEN) connection: To AS/NZS 3000 Section 5 and the Australian Communications Authority (ACMA) requirements.

The main earth electrode and earth bar shall be provided with an engraved label with red filled letters inscribed - "MAIN EARTH – DO NOT DETACH".

Where required, Electrical Earth electrodes shall be:

- Positioned not less than 4 metres from Western Power substation boundaries,
- A minimum 15 mm diameter extensible copper clad steel 2 m in length per section driven to a maximum depth of 8 metres, equal to Furse RB series.
- Number of electrodes shall be sufficient in number to achieve the necessary resistance to earth.
- Installed within a pit fitted with a lid inscribed in red filled letters - "MAIN EARTH – DO NOT DISCONNECT".
- Driven into the ground by mechanical hammering.

Use proprietary mixture of earth enhancing compound (e.g. Furse Marconite) in accordance with manufacturer's recommendations.

Bonds or joints subject to moisture and/or positioned where they are not readily accessible for inspection or maintenance is to be by means of 'Cadweld' or approved equal.

#### **Earth Electrodes**

General: Provide electrodes to AS/NZS 3000 clause 5.3.6.

#### **Bonding**

General: Provide equipotential bonding to AS/NZS 3000 clause 5.6.

#### **Earth and Bonding Clamps**

General: Provide proprietary earthing and bonding clamps.

Standard: To AS 1882.

### **46.9 POWER ANALYSIS METERS**

#### **46.9.1 DIGITAL POWER ANALYSERS – TYPE DPA1**

Provide power analysis meter(s) to the switchboard(s) as indicated on the drawings as type DPA1 meters. Power analysis meters shall be Schneider Electric reference PM3250 complete with current transformers and current limiting fuses. The meter shall provide the following functions:

- Instantaneous phase current
- Instantaneous neutral current
- Voltage
- Total active, reactive and apparent power
- Active, reactive and apparent power per phase
- Total power factor
- Phase power factor
- Maximum demand current

The meter shall store accumulated power values and maximum demand values, using an on-board memory.

### **46.10 WIRING SYSTEMS**

#### **46.10.1 GENERAL**

Cables shall be of the size, type, voltage and insulation grade as specified and shall:

- Comply in all respects with AS/NZS 3000, AS/NZS 5000, Western Power, relevant Australian Standards Specifications,
- Be installed in accordance with the manufacturer's instructions, adequately fixed and braced with purpose made clips, cleats or supports to ensure that damage is minimised under fault conditions and adequate air is allowed to circulate around the cable at all times.
- Be PVC insulated V90 grade 450/750V, with stranded copper conductors complying with AS/NZS 5000 except where indicated otherwise.

- Be installed between items of equipment without any joints and, when installed or during installation, ensure the cables are not bent beyond their minimum bending radii, and in a manner such that they may be readily withdrawn for replacement purposes.
- Be protected by rigid PVC conduits where passing through or installed in walls, floors and structural partitions, and not protected by an RCD.
- Be protected by rigid PVC conduits in all exposed situations.

The cabling systems for extra low voltage, voice and fire services shall be installed in accordance with the requirements of AS/NZS 3013 Electrical Installations Classification of the Fire and Mechanical Performance of Wiring Systems.

**Where single core cables are used, they shall be;**

- Installed in a trefoil configuration with the neutral conductor installed adjacent.
- Installed using purpose made clamps such that proximity effects in adjacent ferrous metals are minimised consistent with minimum equal reactance values being achieved for each active of the service.

Requirement: Provide wiring and site cable reticulation systems appropriate to the installation conditions and the function of the load. Include the following:

- Underground services.
- Above-ground services.
- In-building services.

Type: Re-wireable system.

Neutral Conductors: Same size as the corresponding active conductors. Rate the neutral conductor size for the maximum harmonic currents.

Cable support system: Conform to the *0911 Cable support and duct systems* worksection.

#### 46.10.2 POWER CABLES

##### Standards

Polymeric insulated cables: To AS/NZS 5000.1.

##### Cable

Requirement: Provide multi-stranded copper cables as the default.

Default insulation: V-90.

Default sheathing: 4V-90.

Minimum size: Conform to the following:

- Lighting sub circuits: 2.5 mm<sup>2</sup>.
- Power sub circuits: 4.0 mm<sup>2</sup>.
- Submains: As documented.

Voltage drop: Select final sub circuit cables within the voltage drop parameters dictated by the route length and load.

Fault loop impedance: Provide final sub circuit cables to satisfy the requirements for automatic disconnection under short circuit and earth fault/touch voltage conditions.

##### Colours

Conductor colours: For fixed wiring cables, provide coloured conductor insulation or at least 150 mm of close fitting coloured sleeving at the termination points of each conductor.

Active conductors in single phase circuits: Red.

Active conductors in polyphase circuits:

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

Sheath: White.

##### Tagging / Marking

General: Identify all single core, multicore cables and trefoil groups at each end with stamped non-ferrous tags clipped around each cable or trefoil group.

**Submains and Final Sub-circuits**

Installation: Provide the following:

- Cables with diameter less than 13 mm: Run in conduit, cable ducts or support on cable trays or ladders.
- Cables for lighting systems: Run in conduit, cable ducts, suspend on catenary systems or support on cable trays or ladders.
- Accessible concealed spaces: Install thermoplastic insulated and sheathed cables.
- Inaccessible concealed spaces: Install cable in PVC-U conduit.
- Roof spaces: Install cable below heat insulation and sarking. If not protected from high ambient roof space temperatures by thermal insulation, derate the cables, to AS/NZS 3008.1.1 Table 27, for an assumed ambient temperature of 55° C.
- Accessible ceiling voids: Support and enclose cables on ceiling surfaces or ceiling suspension systems.
- Plastered or rendered masonry: Install cable in PVC-U conduit.
- Double sided face brick partition: Install cable in PVC-U conduit installed within the brick wall by slotting bricks or using any pathways provided in the brick.
- Stud framed walls filled with bulk insulation: Install cables in PVC-U conduit.
- Stud framed walls without bulk insulation: Thermoplastic insulated and sheathed cables allowing rewirability. Bush all knock-outs in steel framing to prevent cable damage. Earth metal stud frames to the electrical earthing system.
- Horizontal cable trays or ladders: Fix cables using proprietary nylon cable ties or straps, cable saddles or clips at 1500 mm intervals.
- Vertical cable risers: Fix cables using proprietary nylon cable ties or straps, cable saddles or clips at 500 mm intervals.

**46.10.3 PVC INSULATED AND SHEATHED CABLES (TPS)**

Cables for small power and lighting services located within accessible false ceiling space, cable access ducting and wiring channels, shall be of the thermoplastic sheathed type, which shall:

Be PVC V-90 insulated 3V-90 PVC sheathed grade 450/750V, with stranded copper conductors complying with AS/NZS 5000.2.

Be fixed using proprietary approved cable clamps supported from the structure directly in the case of single cables and by means of cable trays for multi-runs.

Be erected in straight lines, vertically and horizontally, with at least 300 mm of straight cable adjacent to terminations and enclosed in rigid conduits or sleeves where installed in short lengths of concrete, brick or masonry walls.

**46.10.4 PVC INSULATED PVC SHEATHED CABLES (PVC/PVC)**

PVC insulated PVC sheathed, thermoplastic cables shall be circular with orange coloured PVC sheathed overall. installed in accordance with the manufacturer's instructions, fixed using proprietary approved cable clamps and be supported from the structure directly in the case of single cables and by means of cable trays for multi-runs.

PVC insulated PVC sheathed cables shall;

Be PVC V-90 insulated 5V-90 PVC sheathed grade 450/750V to 16mm<sup>2</sup> and 0.6/1kV otherwise, with stranded copper conductors complying with AS/NZS 5000.1 and 5000.2.

Be fixed using proprietary approved cable clamps supported from the structure directly in the case of single cables and by means of cable trays for multi-runs.

Be erected in straight lines, vertically and horizontally, with at least 300 mm of straight cable adjacent to terminations and enclosed in rigid conduits or sleeves where installed in short lengths of concrete, brick or masonry walls.

**46.10.5 XLPE INSULATED PVC SHEATHED CABLES**

XLPE insulated PVC sheathed cables shall be circular single core cables rated at 90°c, supported and fixed as specified for PVC/PVC cables and shall be XLPE X-90 insulated 5V-90 PVC sheathed grade 0.6/1kV, with stranded copper conductors complying with AS/NZS 5000.1.

#### 46.10.6 COPPER CONDUCTOR TERMINATIONS

##### General

Requirement: Other than for small accessory and luminaire terminals, terminate copper conductors to equipment, with compression-type lugs of the correct size for the conductor. Compress using the correct tool or solder.

##### Within Assemblies and Equipment

General: Loom and tie together conductors from within the same cable or conduit from the terminal block to the point of cable sheath or conduit termination. Neatly bend each conductor to enter directly into the terminal tunnel or terminal stud section, allowing sufficient slack for easy disconnection and reconnection.

Alternative: Run cables in PVC-U cable duct with fitted cover.

Identification: Provide durable numbered ferrules fitted to each core, and permanently marked with numbers, letters or both to suit the connection diagrams.

Spare cores: Identify spare cores and terminate into spare terminals, if available. Otherwise, neatly insulate and neatly bind the spare cores to the terminated cores.

#### 46.10.7 FINAL CIRCUIT CABLING

Where final circuit cable sizes are shown on the contract drawings, the cable size shall be read as a minimum size. Determine the final cable size shall be to suit exact route lengths, Volt drop (based on full rating of circuit protection for the full extent of the fixed wiring on site), derating and earth loop impedance requirements in accordance with AS3000 and WAER. Make due allowance in the contract price to provide final circuit cables to suit the installation conditions.

Where more than 5 cables are in close proximity, they shall be secured to a catenary wire, or installed on cable tray.

Cables shall be securely fixed direct to the structure. Cabling shall not be fixed to other services or ceiling hangers.

Where cables are installed in walls filled with thermal insulation, increase cable size or separately enclose cables in individual conduits to ensure ventilation around cable. Refer to derating tables of AS3008.

Where cables serving circuits which are not RCD protected are installed in cavity walls, the cables shall be enclosed in conduit or provided with similar mechanical protection; all devices mounted to the cavity wall and served by the unprotected circuit, shall be enclosed with a back box.

Cabling installed within ceiling spaces over removable tile ceilings shall be secured above the ceiling to ensure cables do not interfere with the removal and reinstallation of tiles, or the maintenance of in ceiling equipment.

Horizontal cabling in cavities and/or stud walls shall be avoided and where considered unavoidable, cables shall be enclosed in conduit. Cables from ceiling spaces to accessories shall be installed vertically.

#### 46.10.8 UNDERGROUND WIRING

Provide underground wiring in accordance with AS3000 and as indicated on the drawings.

Where underground wiring requires trenching;

- Make all appropriate enquiries (e.g. dial before you dig) to determine extent of existing services prior to trenching.
- Engage a qualified professional cable scanner to scan the existing ground along proposed cable routes to identify location of existing services.
- Hand dig or utilize vacuum extraction where existing services may exist, and within 2m of any existing services.
- Liaise with other trades for coordination of trench layouts
- Excavate trenches and remove rubbish fill from site
- Complete backfilling of trenches using clean fill and compact to match surrounding material.
- Make good to surfaces after back-filling.

Notify Superintendent of any damage to existing services

Excavate trenches straight and true and to an adequate depth to provide the required cover for conduits.

Where underground wiring is proposed to take an alternative route to design drawings, hand mark up the proposed route and send to the Superintendent for approval. Ensure "As Constructed" drawings are amended to document the final wiring route.

Damage to existing services, caused by the digging of trenches, shall be repaired at the Contractor's expense.

#### **46.10.9 CABLE LABELLING**

All mains, submains, backbone and major earth cabling, both within the building footprint and external underground cabling, including but not limited to LV and ELV services, shall be provided with fixed labelling, identifying the cable type, origin and destination.

Labelling shall be provided at the following locations:

- Within each cable pit, through which cabling passes.
- Within 250mm of each end of each cable.
- Where cabling enters or leaves major cable pathways (e.g. cable trays, ladders ducts).

Labelling shall be two-tone micro etched acrylic, permanently attached to Panduit Cable tie marker (PLF1M-M) or equivalent, with minimum text size of 5mm.

Handwritten or electrical tape labels will not be accepted.

#### **46.11 ELECTRICAL ACCESSORIES**

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##### **46.11.1 GENERAL**

Style: Provide accessories of the same style and from the same manufacturer, as documented.

Fittings and accessories shall be supplied from a single manufacturer throughout, unless otherwise specified. Where works are alterations and additions to existing buildings, fittings shall be of type to match existing unless specifically noted in detailed clauses or drawings.

Request the Superintendent to select accessory colours from standard ranges not less than two (2) weeks before the ordering date required ensuring delivery of the equipment in accordance with the Contract Program.

Heights shown on plans or specified shall be the height from finished floor level to the centre of the equipment. The height and exact position of fittings in all tiled walls shall be as indicated on detailed drawings or as directed by the Superintendent.

All fittings shall be vertically and horizontally aligned. Coordinate with other trades to ensure considered positioning with other service equipment

##### **46.11.2 INSTALLATION**

General: Install accessories and conceal cabling in walls in conformance with the following:

- Rendered masonry partition: Flush wall box, with conduit chased into wall.
- Double sided face brick partition: Vertically mounted flush wall box, with conduit concealed in cut bricks.
- Face brick external cavity wall: Flush wall box, with thermoplastic insulated cables in conduit run in cavity and tied against inner brick surface, or thermoplastic sheathed cables run in cavity.
- Stud partition: Flush plate secured to proprietary support bracket or wall box.

Location: Confirm final location of all outlets and equipment on site, before installation.

Spacing from adjacent horizontal surface:  $\geq 75$  mm to the centre of accessory socket.

Default mounting heights to centre of accessory plate:

- Outlets: 500 mm unless otherwise documented.
- Switches and controls: 1100 mm unless otherwise documented.

Accessories: Flush mounted, except in plant rooms.

Common face plates: Mount adjacent flush mounted accessories under a common faceplate.

Restricted location: Do not install wall boxes across junctions of wall finishes.

Surface mounting: Proprietary mounting blocks.

#### **Installation of Ceiling Mounted Accessories**

Connections for appliances: Flush mounted outlets on the ceiling next to support brackets.

Mounting: Mount appliances independent of ceiling tiles and suspended ceiling suspension system. Fix directly to concrete slab or to roof structure above ceiling.

Connections for fixed equipment: Provide concealed permanent connections.

Fixing: For equipment and appliances heavier than 30 kg, provide support through the suspended ceiling to the building structure. Brace appliances that have excessive bending moments, are heavy or vibrate, to prevent horizontal movement.

#### **46.11.3 WALL BOXES**

Install all fittings and accessories on flush set wall boxes as recommended by the accessory manufacturer.

Provide fire rated wall boxes in all fire rated walls and acoustically rated wall boxes in all acoustic walls. Refer to the Architectural drawings for determination of fire rating and acoustic properties of all walls.

“C” clips for plasterboard type walls may be used in non-fire or acoustically rated stud plaster walls.

Provide fully enclosed wall boxes in stud walls for all final circuits not protected by an RCD.

#### **46.11.4 GENERAL PURPOSE SOCKET OUTLETS**

Provide socket outlets as indicated on the drawings and in accordance with the following;

- Generally socket outlets shall be Clipsal Pro Series P3000 No. P3015 mounted on flush horizontal wall boxes
- Double socket outlets shall be Clipsal Pro Series P3000 No. P3025.
- Double USB socket outlets shall be Clipsal Pro Series P3000 No. P3025USBAC
- General purpose socket outlets comprise of a 10A, 240V rocker operated switch and 3-pin plug base with flat earth pin, mounted under a common moulded impact resistant plastic wall plate.
- Comprise two (2) switches/plug bases within a common 115mm x 70mm wall plate for double socket outlets.
- Be IP56 rated to AS 1939 where located external to the building or in damp situations.
- Be horizontally oriented at a mounting height shown on drawings.
- Have finish colour ‘Vivid White’ unless otherwise nominated.
- Be flush mounted in a wall box having adjustable metal fixing lugs where located in masonry walls.
- Be flush mounted within a metal bracket fixed to a stud or noggin where located in stud partitions.
- Maintain a minimum of 300mm separation between outlets mounted back to back in studwork walls.

Socket outlets for dishwashers and microwave ovens shall be located in the cupboard adjacent.

RCD protection shall be provided via combined MCB/RCD units installed at the switchboard with a separate MCB/RCD unit for each socket outlet circuit.

#### **46.11.5 ALLOCATED OUTLETS**

All Socket Outlet circuits, other than those meeting the specific criteria for exemption as defined in AS 3000, shall be protected with a 30mA RCD device. Outlets not protected by RCD shall be labelled clearly in accordance with AS 3000 “Not RCD protected, not for general use”.

Sockets Outlets provided for specific functions shall comply with the following:

- Socket outlets nominated for ‘Cleaner’ shall be on dedicated circuit.
- Socket outlets nominated for serving a Boiling Water Unit shall be on a dedicated circuit. Engrave outlet ‘Boiling Water Unit’. Circuit shall be on time-controlled circuit in accordance with the NCC and as further specified.
- Socket outlets nominated for serving a Chilled Water Unit shall be on a dedicated circuit. Engrave outlet ‘Chilled Water Unit’. Circuit shall be on time-controlled circuit in accordance with the NCC and as further specified.

- Socket outlets nominated for fridges and microwave ovens shall be on a separate circuit to those serving other areas. Location of microwave oven outlets shall be such that access is not inhibited when microwave is in place (e.g. mount on side panel or cupboard adjacent).
- Provide isolator (single or three phase and rating as nominated – if not noted, assume 40A three phase) nominated for serving a Hot Water Unit' on a dedicated circuit. Liaise with Hot Water Unit installer for exact location and requirements.
- Provide isolator (single or three phase and rating as nominated) for air conditioning equipment, on dedicated circuit. Liaise with A/C installer for exact location and requirements.
- Socket outlets nominated for 'FS' (Functional Switch) shall include a separate switch for the isolation of the nominated device. Engrave the switch to identify the item to which it is connected.

#### 46.11.6 HEAVY DUTY AND WEATHERPROOF ACCESSORIES

Where Heavy Duty and Weatherproof fittings are documented, these shall be as follows; -

- Switches shall be Clipsal 2000 Series IP66 2031V66 or 2032V66.
- Socket outlets shall be Clipsal Weathershield WSC227F2 IP54 with flap.
- Isolators shall be Clipsal Weathershield IP66 series.

#### 46.11.7 TIME SWITCH FOR BOILING WATER UNIT AND/OR CHILLED WATER UNIT

Provide time switch and contactor switching for each boiling water unit and chilled water unit capable of; -

- a) switching on and off electric power systems:
  - i) at variable pre-programmed time s and on variable pre-programmed days; and
  - ii) limiting the period the systems is switched on to 2 hours beyond the time for which the building is occupied; and
- b) being overridden by a manual switch for a period of up to 2 hours, after which the time switch must resume control.

#### 46.11.8 SWITCHES

All switches shall;

- Generally, be Clipsal Pro Series P3000 range mounted on flush Vertical wall boxes.
- Comprise multiple rocker switches within a common wall plate.
- Be vertically oriented.
- Be flush mounted in a wall box having adjustable metal fixing lugs where located in masonry walls.
- Be flush mounted within a metal bracket fixed to a stud or noggin where located in stud partitions.
- Line up with adjacent wall switches in vertical and horizontal axis. Co-ordinate with other trades to ensure considered positioning with other service equipment.
- Line up switches to tile coursing on tiled walls. Coordinate with designers detailed wall elevations where possible.
- Architrave switches to be provided on door frames and mullions as required by locations indicated on plans.
- Where 2 or more phases occur behind a common plate, provide adequate barriers or separation.
- Where 5 or more, light switches are in a single location, or where light switch panels (L.S.P) are shown, provide a machine engraved, Clipsal Stainless Steel B Series multi-gang switch assembly or equal. Provide the Architect with details of the proposed engravings, for approval, prior to manufacture.

#### 46.11.9 ISOLATORS

Provide weatherproof isolators adjacent equipment as nominated on drawings. Liaise with the installer of the nominated equipment for the preferred location and confirmation of the correct rating. Unless otherwise specified, isolators installed externally shall be IP56 rated.

All isolators shall have Fault Make, Load Break contacts rated at not less than 125% of circuit cable ratings.

All motor isolators shall be rated to Fault Make, Locked Rotor Current Break.

All isolators shall accept a padlock in the on and off position.

**46.11.10 PERMANENT CONNECTIONS**

Provide permanent connection to equipment as nominated on drawings. Provide all cable lugs as necessary to connect the circuit cables to the equipment. Liaise with the installer of the equipment to determine the exact location of the point of entry of cables to the equipment, and to confirm the rating and number of phases of the electrical supply necessary to enable the correct operation of the equipment.

**46.11.11 PENDANT OUTLETS**

Pendant outlets shall be suspended on Stainless Steel wire as detailed. Power outlets shall be of type to suit suspension. Suspensions shall be securely fixed back to the building structure.

Cabling to the outlet shall be via an approved ceiling rose/junction at ceiling level and flexible cord fixed to stainless steel wire at 300mm centre using cable ties or equal approved.

Socket outlets (GPOs) shall be Clipsal Cat No. W/PO/20 / Clipsal Cat No. 56SPO310 or equal approved.

**46.11.12 LABELLING AND IDENTIFICATION**

Where flush plates, light switch panels and other items of equipment are to be labelled or engraved, they shall be machine engraved in upper case lettering filled with black pigments to approval.

Switch plates and socket outlet plates shall be marked to identify phase and circuit number. The identification shall be provided by means of indelible ink positioned so as to be concealed by the cover plate when in position.

Provide IPA markers to IP44 and IP56 rated devices with circuit numbers coloured to the appropriate phase colour. Install the IPA markers centrally at the bottom of the device.

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**46.12 SERVICES TO OTHER TRADES****46.12.1 POWER SUPPLY TO MECHANICAL SERVICES EQUIPMENT**

Mechanical services equipment (e.g. exhaust fans, air conditioning units etc) shall be supplied and installed by the Mechanical Services Trade.

Provide all power supplies to Mechanical Services equipment. Verify the exact location and rating of the power supplies to Mechanical Services equipment on site with the Mechanical Services Trade prior to installation. Advise the Superintendent if there are any discrepancies.

**Exhaust Fans**

Exhaust fans shall be provided and installed by the mechanical sub-contractor.

Provide power and control to the exhaust fans as indicated on the drawings and detailed herein.

The exhaust fans shall be controlled via a local motion sensor with two channel control. Channel one shall be utilised for the local lighting and channel two (volt free contact) shall be utilised to control the exhaust fan. Provide power to the volt free contact of channel two from the un-switched active of the respective local lighting circuit and cable from the load side of the volt free contact to the exhaust fan location.

Set the integral motion sensor run-on time function for channel two to 20 minutes.

Provide an IP56 weather proof isolator adjacent to the exhaust fan and make final connection from the isolator to the exhaust unit for a complete installation.

**Air Conditioners**

The air conditioning units will be supplied and installed by the mechanical contractor. Provide power to the air conditioning units as indicated on the drawings.

Provide an IP56 weather proof isolator immediately adjacent to intended equipment at 1100mm AFFL unless otherwise stated and make final connection from the isolator to the equipment via medium duty corrugated conduit installed to the manufactures recommendations.

**46.12.2 POWER SUPPLY TO HYDRAULIC SERVICES EQUIPMENT**

Hydraulics Services equipment (i.e., cold water units, hot water units, dishwashers, circulating pump etc) shall be supplied and installed by the Hydraulic Services Trade.

Provide all power supplies to Hydraulic Services equipment via a local isolator as indicated on the drawings. Provide final connections to the Hydraulic Services equipment as required.

Verify the exact location and rating of the power supplies to the equipment on site with the Hydraulic Services Trade prior to commencing the installation. Advise the Superintendent if there are any discrepancies.

#### **46.12.3 CHILLED WATER DRINKING UNITS**

Install weatherproof outlets behind the drinking unit metal skirt.

Confirm the exact location of outlets on site before proceeding with the installation.

Make final connection to the unit with ordinary duty sheathed flex and plug top.

#### **46.12.4 ELECTRIC INSECT KILLER**

Provide electronic insect killer equipment as indicated on the drawings.

Electronic insect killer shall be Insect-o-matic SE22 or equivalent to the approval of the Superintendent.

Electronic insect killers shall comply with the following requirements:

- Comply with AS3350.2.59
- Minimum of 5 year Warranty – Tubes and starters not included.
- Be provided with a removable debris tray.
- Be complete with ultra violet tubes and starters.

Connect the insect killer to the fixed wiring via a single automatic GPO located immediately adjacent to equipment and control the GPO via a 20amp rocker switch located adjacent to the local light switch and engrave the face plate to read 'Insect Controller'. Shorten the flex of the equipment to remove excess length, excessive loops of cable will not be accepted.

Mount insect killers at 2100mm above finished floor level to the centre line unless otherwise stated.

### **46.13 SWITCHBOARDS – CUSTOM-BUILT – AS/NZS 61439**

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#### **46.13.1 RESPONSIBILITIES**

##### **General**

Requirement: Provide custom-built switchboards as documented.

#### **46.13.2 STANDARD**

##### **General**

Standards: To AS/NZS 3000 and AS/NZS 61439.1 and parts 2 & 3 as appropriate.

Western Power Standards & Requirements.

#### **46.13.3 INTERPRETATION**

##### **Definitions**

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

- Custom-built assemblies: Low voltage switchgear and controlgear assemblies manufactured to order and incorporating proprietary components and proprietary bus-bar assemblies.
- Fault current limiters: Circuit opening devices designed or selected to limit the instantaneous fault current.
- Incoming busbars: Busbars connecting incoming terminals to line side terminals of main switches.
- Main circuit supply busbars: Busbars connecting incoming functional unit terminals, or incoming busbars where no main switches are included, to outgoing functional unit terminals or outgoing functional unit tee-offs.
- Proprietary assemblies: Low voltage switchgear and control gear assemblies available as a catalogue item, consisting of the manufacturer's standard layout and equipment.
- Rated currents: Continuous uninterrupted current ratings within the assembly environment under in-service operating conditions.

- Rated short-circuit currents: Maximum prospective symmetrical root mean square (r.m.s.) current values at rated operational voltage, at each assembly incoming supply terminal.
- Tee-off busbars: Busbars connecting main busbars to incoming terminals of outgoing functional units.

#### 46.13.4 SUBMISSIONS

##### Design Verification Documentation

Submit Design Verification for each switchboard for review. This documentation shall demonstrate that the assembly manufacturer's design is the same or better than the verification documentation from the original manufacturer.

Verification shall be to the characteristics outlined within Table D1 of AS/NZS 61439.1 and shall be via Verification by Test, Verification by Comparison or Verification by Assessment.

##### Operation and Maintenance Manuals

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

##### Tests

Standard: To AS/NZS 61439.1.

##### Shop Drawings

General: Submit shop drawings showing:

- Types, model numbers and ratings of assemblies.
- Design calculations of non-type tested and non-proprietary busbar assemblies.
- Overall dimensions.
- Rated current of components.
- Number of poles and spare capacity.
- Mounting details.
- Paint colours and finishes.
- Access details.
- Schedule of labels.
- Component details, functional units and transient protection.
- Detailed dimensions.
- Shipping sections, general arrangement, plan view, front elevations and cross-section of each compartment.
- Projections from the assembly that may affect clearances or inadvertent operation, such as handles, knobs, arcing-fault venting flaps and withdrawable components.
- Fault level and rated short circuit capacity characteristics.
- IP rating.
- Form of construction
- Fixing details for floor or wall mounting.
- Front and back equipment connections and top and bottom cable entries.
- Door swings.
- External and internal paint colours and paint systems.
- Quantity, brand name, type and rating of control and protection equipment.
- Construction and plinth details, ventilation openings, internal arcing-fault venting and gland plate details.
- Terminal block layouts and control circuit identification.
- Single line power and circuit diagrams for all new and modified switchboards.
- Details of mains and submain routes within assemblies.
- Busbar arrangements, links and supports, spacing between busbar phases and spacing between assemblies, the enclosure and other equipment and clearances to earthed metals.

- Dimensions of busbars and interconnecting cables in sufficient detail for calculations to be performed.
- Form of separation and details of shrouding of terminals.
- Labels and engraving schedules.

**46.13.5 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the following:

- Fabrication and painting completed.
- Factory assembly completed, with busbars exposed and functional units in place.
- Assembly ready for routine testing.
- Assembly installed before connection.
- Assembly installed and connected.

## 46.13.6 USER REQUIREMENTS

## Site Main Switchboard

Characteristics	User Requirement
<b>Electrical System</b>	
Earthing system	Multiple earthed neutral (MEN) / TN-C-S
Nominal voltage (V)	Default
Transient overvoltages	Overvoltage category IV
Temporary overvoltages	Default
Rated Frequency	Default
Additional on site testing requirements	Default
<b>Short-circuit withstand capability</b>	
Prospective short-circuit current at supply terminals (kA)	25kA for 1 second
Prospective short-circuit current in the neutral	Default
Prospective short-circuit current in the protective circuit	Default
SCPD in the incoming functional unit requirement	Yes
Co-ordination of short-circuit prospective devices including external short-circuit protective devices details	Full discrimination
Data associated with loads likely to contribute to the short-circuit current	
<b>Protection of persons against electric shock</b>	
Type of protection against electric shock – basic protection	Protection via insulation and escutcheon panels – dead front. Lockable door
Type of protection against electric shock – fault protection	Default
<b>Installation environment</b>	
Location type	Outdoor
Protection against ingress of solid foreign bodies and ingress of water	Refer design drawings
External mechanical impact (IK)	Protection against accidental impact
Resistance to UV radiation	Outdoors
Resistance to corrosion	To suit 25-30 year life location outdoors
Ambient air temperature – Lower limit	Outdoor
Ambient air temperature – upper limit	Default
Ambient air temperature – Daily average maximum	Default
Maximum relative humidity	Outdoor
Pollution degree	Default
Altitude	Default
EMC environment	B
Special service conditions	Default
<b>Installation method</b>	
Type	Default

Stationary/moveable	Stationary
Maximum overall dimensions and weight	Maximum preferred height 2000mm Maximum preferred width 1800mm Maximum preferred depth 500mm
External conductor(s)	Refer design drawings
Direction of external conductors	Refer design drawings
External conductor material	Refer design drawings
External phase conductor, cross sections and terminations	Refer design drawings
External PE, N, PEN conductor, cross sections and terminations	Refer design drawings
Special terminal identification requirements	
<b>Storage and handling</b>	
Maximum dimensions and weight of transport units	Default
Methods of transport	Default
Environmental conditions	Default
Packing details	Default
<b>Operating arrangements</b>	
Access to manually operated devices	Lockable door keyed to Western Power and Client Requirements. Access restricted to authorised persons
Location of manually operated devices	Accessible
Isolation of load installation equipment items	Default
<b>Maintenance and upgrade capabilities</b>	
Requirements related to accessibility in services by ordinary persons	Lockable door keyed to Western Power and Client Requirements.
Requirements related to accessibility for inspection and similar operations	Visual inspection and switching. Dead-front with escutcheon panels
Requirements related to accessibility for maintenance in service by authorised persons	No live work permitted
Requirements related to accessibility for extension in services by authorised persons	None
Method of functional units connection	Default
Protection against direct connect with hazardous live internal parts during maintenance	Default – no live work permitted
<b>Current carrying capability</b>	
Rated current of the Assembly	Refer to design drawings
Rated current of circuits	Refer to design drawings
Rated diversity factor	Default
Ratio of the cross section of the neutral conductor to phase conductors	100%

**Building Main Switchboard – DB-1**

Characteristics	User Requirement
<b>Electrical System</b>	
Earthing system	Multiple earthed neutral (MEN) / TN-C-S (MEN at Site Main Switchboard) running earth from SMSB
Nominal voltage (V)	Default
Transient overvoltages	Overvoltage category III
Temporary overvoltages	Default
Rated Frequency	Default
Additional on site testing requirements	Default
<b>Short-circuit withstand capability</b>	
Prospective short-circuit current at supply terminals (kA)	Refer to design drawings
Prospective short-circuit current in the neutral	Default
Prospective short-circuit current in the protective circuit	Default
SCPD in the incoming functional unit requirement	No. Load break main switch
Co-ordination of short-circuit prospective devices including external short-circuit protective devices details	Full discrimination
Data associated with loads likely to contribute to the short-circuit current	N/A
<b>Protection of persons against electric shock</b>	
Type of protection against electric shock – basic protection	Protection via insulation and escutcheon panels – dead front. Lockable door
Type of protection against electric shock – fault protection	Default
<b>Installation environment</b>	
Location type	Outdoors
Protection against ingress of solid foreign bodies and ingress of water	Refer design drawings
External mechanical impact (IK)	Protection against accidental impact
Resistance to UV radiation	Outdoors
Resistance to corrosion	To suit 25-30 year life location Outdoors
Ambient air temperature – Lower limit	To suit Outdoor
Ambient air temperature – upper limit	Default
Ambient air temperature – Daily average maximum	Default
Maximum relative humidity	Outdoor
Pollution degree	Default
Altitude	Default
EMC environment	B
Special service conditions	N/A
<b>Installation method</b>	
Type	Default
Stationary/moveable	Stationary
Maximum overall dimensions and weight	Maximum allowable height 2000mm

	Maximum preferred width 1300mm Maximum preferred depth 300mm
External conductor(s)	Refer design drawings
Direction of external conductors	Refer design drawings
External conductor material	Refer design drawings
External phase conductor, cross sections and terminations	Refer design drawings
External PE, N, PEN conductor, cross sections and terminations	Refer design drawings
Special terminal identification requirements	None
<b>Storage and handling</b>	
Maximum dimensions and weight of transport units	Default
Methods of transport	Default
Environmental conditions	Default
Packing details	Default
<b>Operating arrangements</b>	
Access to manually operated devices	Lockable door. Access restricted to authorised persons
Location manually operated devices	Accessible
Isolation of load installation equipment items	Default
<b>Maintenance and upgrade capabilities</b>	
Requirements related to accessibility in services by ordinary persons	Lockable door
Requirements related to accessibility for inspection and similar operations	Visual inspection and switching. Dead-front with escutcheon panels
Requirements related to accessibility for maintenance in service by authorised persons	No live work permitted
Requirements related to accessibility for extension in services by authorised persons	None
Method of functional units connection	Default
Protection against direct connect with hazardous live internal parts during maintenance	Default – no live work permitted
<b>Current carrying capability</b>	
Rated current of the Assembly	Refer to design drawings
Rated current of circuits	Refer to design drawings
Rated diversity factor	Default
Ratio of the cross section of the neutral conductor to phase conductors	100%

**Building Main Switchboard – DB-2**

Characteristics	User Requirement
Electrical System	

Earthing system	Multiple earthed neutral (MEN) / TN-C-S (MEN at Site Main Switchboard) running earth from SMSB
Nominal voltage (V)	Default
Transient overvoltages	Overvoltage category III
Temporary overvoltages	Default
Rated Frequency	Default
Additional on site testing requirements	Default
<b>Short-circuit withstand capability</b>	
Prospective short-circuit current at supply terminals (kA)	Refer to design drawings
Prospective short-circuit current in the neutral	Default
Prospective short-circuit current in the protective circuit	Default
SCPD in the incoming functional unit requirement	No. Load break main switch
Co-ordination of short-circuit prospective devices including external short-circuit protective devices details	Full discrimination
Data associated with loads likely to contribute to the short-circuit current	N/A
<b>Protection of persons against electric shock</b>	
Type of protection against electric shock – basic protection	Protection via insulation and escutcheon panels – dead front. Lockable door
Type of protection against electric shock – fault protection	Default
<b>Installation environment</b>	
Location type	Outdoors
Protection against ingress of solid foreign bodies and ingress of water	Refer design drawings
External mechanical impact (IK)	Protection against accidental impact
Resistance to UV radiation	Outdoors
Resistance to corrosion	To suit 25-30 year life location Outdoors
Ambient air temperature – Lower limit	To suit Outdoor
Ambient air temperature – upper limit	Default
Ambient air temperature – Daily average maximum	Default
Maximum relative humidity	Outdoor
Pollution degree	Default
Altitude	Default
EMC environment	B
Special service conditions	N/A
<b>Installation method</b>	
Type	Default
Stationary/moveable	Stationary
Maximum overall dimensions and weight	Maximum allowable height 2000mm Maximum preferred width 1100mm Maximum preferred depth 300mm

External conductor(s)	Refer design drawings
Direction of external conductors	Refer design drawings
External conductor material	Refer design drawings
External phase conductor, cross sections and terminations	Refer design drawings
External PE, N, PEN conductor, cross sections and terminations	Refer design drawings
Special terminal identification requirements	None
<b>Storage and handling</b>	
Maximum dimensions and weight of transport units	Default
Methods of transport	Default
Environmental conditions	Default
Packing details	Default
<b>Operating arrangements</b>	
Access to manually operated devices	Lockable door. Access restricted to authorised persons
Location manually operated devices	Accessible
Isolation of load installation equipment items	Default
<b>Maintenance and upgrade capabilities</b>	
Requirements related to accessibility in services by ordinary persons	Lockable door
Requirements related to accessibility for inspection and similar operations	Visual inspection and switching. Dead-front with escutcheon panels
Requirements related to accessibility for maintenance in service by authorised persons	No live work permitted
Requirements related to accessibility for extension in services by authorised persons	None
Method of functional units connection	Default
Protection against direct connect with hazardous live internal parts during maintenance	Default – no live work permitted
<b>Current carrying capability</b>	
Rated current of the Assembly	Refer to design drawings
Rated current of circuits	Refer to design drawings
Rated diversity factor	Default
Ratio of the cross section of the neutral conductor to phase conductors	100%

## 46.14 CUSTOM-BUILT SWITCHBOARD CONSTRUCTION

### 46.14.1 SWITCHBOARD MANUFACTURER

General: Use only switchboard manufacturers employing experienced switchboard personnel with more than 10 years' experience in the design of switchboards in WA.

Either one of the manufacturers outlined in the below shall be deemed acceptable to design and construct the electrical switchboards, no other manufacturers shall be considered:

- Price Trandos Engineering
- CPE Switchboards
- ARC Switchboards
- PGS
- Ray Brookes
- Pope Switchboards

All switchboards must be completed by the same manufacturer.

#### **46.14.2 SWITCHBOARD CONNECTION**

Type: Front connected.

#### **46.14.3 ENCLOSURE**

Default material:

- Indoor: Metallic-coated sheet steel.
- Outdoor: Metallic-coated sheet marine grade aluminium.

#### **46.14.4 SEPARATION**

Default:

- Form 2 for switchboard less than 800Amps

#### **46.14.5 METERING**

Requirement: To the *Low voltage power systems*.

#### **46.14.6 MAIN SWITCHBOARD MAIN SWITCHES**

Spare capacity: Provide at least 25% spare capacity in the ratings main switch/isolators.

#### **46.14.7 INTERNAL CABLING**

Internal cabling from main switches and/or the service protective device to outgoing functional units may be utilised in the following situations: -

- Where the switchboard is rated at no more than 160 Amps.
- Where there are no more than three outgoing functional units within the switchboard.

In all other situations proprietary insulated busbar systems shall be utilised for interconnection of devices.

#### **46.14.8 BUSBARS**

General: Incorporate proprietary insulated busbar systems for the interconnection of isolators, circuit breakers and other circuit protective devices.

Busbar fault rating: Rated to meet the prospective fault current for 1 second or a minimum rating of  $\geq 18\text{kA/second}$ , whichever is the greater.

#### **46.14.9 SPARE CAPACITY**

Default spare poles:  $\geq 20\%$ .

Main switchboard incoming busbar:  $\geq 25\%$ .

#### **46.14.10 SURGE PROTECTION**

General: Provide surge protection as documented.

#### **46.14.11 EARTHING**

General: Make provision for connection of communication systems CET at switchboard earth bar to AS/CA S009.

**46.14.12 IP RATING**

Weatherproof: IP56 minimum.

Be designed to operate in the ambient environmental conditions. Where located externally, provide sun shield to top of switchboard/distribution board.

**46.14.13 EQUIPMENT LAYOUT**

General: Position equipment to provide safe and easy access for operation and maintenance. Group devices by function.

Connection: Front connected.

Compartments: Separate shipping sections, subsections, cable and busbar zones, functional unit modules and low voltage equipment compartments using vertical and horizontal steel partitions which suit the layout and form of separation.

Form 2 enclosures: Separate into compartments with partitions at 1.8 m maximum centres.

Equipment on doors: Set out in functional unit groups and to allow access without the use of tools or keys.

**46.14.14 SEGREGATION**

General: Segregate Safety Services and essential equipment from non-emergency equipment with metal partitions designed to prevent the spread of a fault from non-emergency equipment to emergency equipment in accordance with section 7.2 of AS3000.

**46.14.15 SUPPORTING STRUCTURE**

Assemblies:

- Wall mounted: Maximum 2 m<sup>2</sup>.
- Floor mounted: Greater than 2 m<sup>2</sup>.

**46.14.16 OTHER REQUIREMENTS**

Where installed externally, be provided with a tubular heater, (one heater per 2000mm length of switchboard or part thereof) and thermostat located within the switchboard enclosure, set to turn the heater(s) on, when the ambient temperature is less than 5° Celsius. The heaters and controls shall be protected by a dedicated circuit breaker or cartridge fuse. Where a circuit breaker chassis is not provided within the switchboard and the level of fault current at the board prevents the use of an MCB, protection shall be provided by means of an HRC fuse.

Be positioned to ensure 1000mm clear access is provided in front of the switchboard

Have brass or copper neutral and earth links with the same number of terminals as there are active poles and numbered to correspond.

Have full size neutral conductors and bus bars.

Have a minimum 25% spare space capacity for future circuit protection and control devices.

Where installed externally, provided with a chamfered concrete foundation base, the top of which shall be 100mm above the finished ground surface. The concrete base shall extend beyond the switchboard base a minimum of 150mm in all directions.

Where installed in a position which causes the switchboard to be obstructed by a cupboard door mullion, designed so that the escutcheons are arranged to be positioned either side of a spacer which aligns with the mullion and the gap between the escutcheons is greater than the thickness of the door mullion

Switchboards and Distribution boards shall not be constructed until detailed Shop drawings of each switchboard have been reviewed by the Superintendent and comments arising from the review have been received by the switchboard manufacturer.

**46.14.17 VENTILATION**

General: Required to maintain design operating temperatures at full load.

**46.14.18 ENCLOSURE MATERIALS**

General: Fabricate from sheet metal of rigid folded and welded construction. Obtain approval for non-welded forms of construction.

Material:

- Metallic-coated sheet marine grade aluminium.

Material thickness:

- Diagonal dimension:
  - < 900 mm: Minimum 1.6 mm.
  - ≥ 900 mm: Minimum 2.0 mm.

Coating class:

- Z450.

#### **46.14.19 INSECT PROOFING**

General: Cover ventilation openings with non-combustible and corrosion resistant 1 mm mesh.

#### **46.14.20 EQUIPMENT MOUNTING PANELS**

General: To support the weight of mounted equipment.

Metallic panels: Construct from metal greater than or equal to 3 mm thick with heavy metal angle supports or plates bolted or welded to enclosure sides.

Non-metallic panels: Provide non-metallic to support the weight of the mounted equipment and design the mounting structure for stability and stiffness.

Non-metallic boards: To IEC 60893-1.

#### **46.14.21 EQUIPMENT FIXING**

Spacing: Provide 50 mm minimum clearance between busbars for the following:

- Lifts, fire services and building emergency services.
- General installation services busbars.
- Equipment.

Mounting: Bolts, set screws fitted into tapped holes in metal mounting panels, studs or proprietary attachment clips. Provide accessible equipment fixings which allow equipment changes after assembly commissioning.

Installation: For lightweight equipment, provide combination rails and proprietary clips.

#### **46.14.22 EARTH CONTINUITY**

General: Strip painted surfaces and coat with corrosion resistant material immediately before bolting to the earth bar. Provide serrated washers under bolt heads and nuts at painted, structural metal-to-metal joints.

#### **46.14.23 CONSTRUCTION**

Lifting provisions: For assemblies with shipping dimensions exceeding 1800 mm high x 600 mm wide, provide fixings in the supporting structure and removable attachments for lifting.

Supporting structure: Provide concealed fixings or brackets to allow mounting and fixing of assemblies in position without removing equipment.

Floor-mounting: Provide mild steel channel plinth, galvanized to class Z600, for mounting complete assemblies on site. Drill M12 clearance holes in assembly and channel and bolt assemblies to channel. Prime drilled holes with zinc rich organic primer to AS/NZS 3750.9.

#### **46.14.24 CABLE ENTRIES**

##### **General**

Requirement: Provide non-ferrous cable entry facilities within assembly cable zones for incoming and outgoing power and control cabling. Provide sufficient clear space within each enclosure next to cable entries to allow incoming and outgoing cables and wiring to be neatly run and terminated, without unnecessary bunching or sharp bends.

##### **Cover and Gland Plates**

Cover plates: Provide 150 mm maximum width cover plates butted together and covering the continuous cable entry slot.

Gland plates: Provide removable gland plates fitted with gaskets to maintain the degree of protection.

Materials: Conform to the following:

- Generally: 1.5 mm thick steel, 5 mm thick composite material or laminated phenolic.

#### **46.14.25 DOORS**

##### **General**

Requirement: Provide lockable doors with a circuit card holder.

##### **Door layout**

Maximum width: 900 mm.

Minimum swing: At least 100°.

Door stays: Provide stays to outdoor assembly doors.

Adjacent doors: Space adjacent doors to allow both to open to 100° at the same time.

Designed not to clash with cupboard door mullions and the like.

##### **Door construction**

Protection: Provide single right angle return on all sides and fit suitable resilient sealing rubber to provide the documented IP rating and prevent damage to paintwork.

Hinges: Provide the following:

- Generally: Corrosion-resistant pintle hinges or integrally constructed hinges to support doors.
- For removable doors: Staggered pin lengths to achieve progressive engagement as doors are fitted.
- For doors higher than 1000 mm: 3 hinges.
- For non lift-off doors: Restraining devices and opposed hinges.

Door hardware: Provide the following:

- Corrosion resistant lever-type handles, operating a latching system with latching bar and guides strong enough to withstand explosive force resulting from fault conditions within the assembly.
- Dual, edge mounted, corrosion resistant T handles with provision for key locking cylinder.
- Captive, corrosion resistant knurled thumb screws as an alternative to handles.

Locking: Incorporate cylinder locks in the latching system. Key alike, 2 keys per assembly.

Door mounted equipment: Protect or shroud door mounted equipment and terminals to prevent inadvertent contact with live terminals, wiring, or both.

Earthing: Maintain earth continuity to door mounted indicating or control equipment with multi-stranded, flexible earth wire, or braid of equal cross-sectional area, bonded to the door.

#### **46.14.26 COVERS**

Maximum dimensions: 900 mm wide and 1.2 m<sup>2</sup> surface area.

Fixing: Fix to frames with at least 4 fixings, using corrosion-resistant acorn nuts with serrated washers.

Rest cover edges on the cubicle body or on mullions. Do not provide interlocked covers.

Handles: Provide corrosion-resistant D type handles.

##### **Escutcheons**

General: For doors enclosing circuit breakers, provide escutcheon plates as barriers between operating mechanisms and live parts.

##### **Escutcheon Plates**

General: Provide plates or removable covers with neat circuit breaker toggle cut-outs allowing interchangeability of 1, 2 and 3 pole circuit breakers. Provide corrosion-resistant lifting handles or knobs. Provide unused circuit breaker toggle cut-outs with blanking infill pole covers.

Circuit breaker cut-outs shall be designed to enable circuit breaker protective settings to be viewed without removing the escutcheon. Maximum dimensions: 900 mm wide and 1.2 m<sup>2</sup> surface area.

#### **46.14.27 FACTORY FINISHES**

##### **General**

Standard: To AS 2700.

Extent: Apply protective coatings to internal and external metal surfaces of assembly cabinets including covers, except to stainless steel, galvanized, electroplated, or anodised surfaces and to ventilation mesh covers.

Finish coats: Thermoset powder coating to AS 4506 or two-pack liquid coating of AS/NZS 3750.13 primer and proprietary or epoxy acrylic full gloss spray finish.

#### **Factory Finish Colours**

Mounting structure (brackets): To match enclosure.

Enclosure - indoor:

- Indoor assemblies: Orange X15 unless otherwise indicated.
- Assembly interior: White.

Enclosure - outdoor:

- Outdoor assemblies: Western Power Green unless otherwise indicated.
- Assembly interior: White.

Escutcheons - removable equipment panels:

- Internal assemblies: White.
- External assemblies: Off white Y35.

Doors: To match enclosure.

Plinths: Black or galvanised finish.

#### **46.14.28 BUSBARS**

##### **General**

Requirement: Provide main circuit supply busbars within assemblies, extending from incoming supply terminals to the line side of protective equipment for outgoing functional units and for future functional units.

Standards: To AS 3768, AS 3865 and AS 60890.

##### **Custom-built Busbar Construction**

Material: Hard-drawn high-conductivity electrolytic tough pitched copper alloy bars, designation 110.

Temperature rise limits - active and neutral conductors:

- Maximum rated current temperature rise limits:  $65 \pm 1.5^\circ\text{C}$  by type test or calculation to AS 3768 or AS 60890.
- Maximum short-circuit withstand current temperature rise limits:  $160^\circ\text{C}$  by calculation to AS 3865.

Cross section: Rectangular. Remove sharp edges of rectangular busbar by filing the edge or use radiused edges.

Supports: Sufficient to withstand thermal and magnetic stresses due to maximum prospective fault currents.

Support material: Non-hygroscopic insulation capable of holding busbars at  $105^\circ\text{C}$ .

##### **Proprietary Busbars**

Type: Multi-pole proprietary insulated busbar assemblies or busbar systems, verified for short circuit capacity and temperature rise-limits by type tests.

##### **Phase Sequence**

General: For main busbars and connections to switching devices, set-out phase sequence for phases A, B and C, from left-to-right, top-to-bottom and front-to-back when viewed from the front of the assembly.

##### **Colour Coding**

General: Provide 25 mm minimum width colour bands permanently applied to busbars at 500 mm maximum intervals with at least one colour band for each busbar section within each compartment.

Active busbars: Red, white and blue respectively for the A, B and C phases.

Neutral busbar: Black.

MEN link: Green-yellow and black.

Protective earth busbar: Green-yellow.

Restrictions: Do not provide adhesive type colour bands.

**Current Carrying Capacity**

Active conductors: Take into account thermal stresses due to short circuit current, assuming magnetic material enclosures located indoors in well-ventilated rooms and 90°C final temperature.

Neutral conductors: Size to match incoming neutral conductor current carrying capacity.

Protective earth conductors: Size for at least 50% of the rated short circuit withstand current for 100% of the time duration.

**Tee-off Busbars Current Rating**

For individual outgoing functional units: Equal to maximum frame size rating of the functional unit.

For multiple functional units: Equal to the diversity factors of AS/NZS 61439.1, based on frame size rating.

**MEN Links**

MEN links > 10 mm<sup>2</sup> in cross-section: Bolted removable busbar links stamped MEN LINK, located in the incoming compartment, between neutral and earth busbars.

**Fault Current Limiters**

General: Rate busbars connected to fault current limiters to 100% of the indicated fault current limiter circuit breaker frame size or fuse base rating.

**Busbar Links**

General: For current transformers, provide removable busbar links less than or equal to 450 mm long.

**Cable Connection Flags**

General: Provide and support busbar flags for equipment with main terminals too small for cable lugs. Provide flags sized to suit cable lug termination, with current rating of at least the maximum equipment frame size.

Phase isolation: Provide phase isolation or barriers between flags where the minimum clearance distances phase-to-phase and phase-to-earth are below the component terminal spacing.

**Future Extensions**

General: Pre-drill the main circuit supply busbar for future extensions and extend busbar droppers into future functional unit locations.

**Jointing**

General: Use multiple bolted joints on all overlapping busbars with a minimum of two bolts per joint.

Type: High tensile steel bolts, washers and nuts, with lock nuts or spring washers. Do not use tapped holes and studs or the like for jointing current carrying sections.

**Custom-built Busbar Insulation**

Active and neutral busbars and joints: Select from the following:

- Polyethylene: At least 0.4 µm thick with dielectric strength of 2.5 kV r.m.s for 1 minute, applied by a fluidised bed process in which the material is phase coloured and directly cured onto the bars.
- Close fitting busbar insulation mouldings at least 1 mm thick.
- Heat shrink material: Only on rounded edge busbars.

Taped joints: Apply non-adhesive stop-off type tape, coloured to match adjacent insulation and half lapped to achieve a thickness at least that of the solid insulation.

Damaged insulation: Repair damaged insulation before energising.

**46.14.29 NEUTRAL LINKS AND EARTH BARS****Terminals**

General: Provide terminals for future circuits.

**Links**

Assembly capacity > 36 poles: Provide neutral links and earth bars at the top and bottom of the circuit breaker section.

Assembly capacity ≤ 36 poles: Provide links and bars at the point of entry of incoming supply cables.

Mounting: Mount neutral links on an insulated base.

Control circuits: Provide separate neutral links and earth bars.

Labels: Provide labels for neutral and earth terminals.

Cables > 10 mm<sup>2</sup>: Provide bolts or studs.

Communications earth: Make provision for connection of communications systems earth at switchboard earth bar to AS/CA S009.

#### 46.14.30 INTERNAL WIRING

##### Wiring

Cable type: 0.6/1 kV Copper cables. Provide V-90HT insulation where directly connected to active and neutral busbars.

##### Cable Interconnections

General: For the main circuit supply, provide cable interconnections as follows:

- $\geq 1.5$  mm<sup>2</sup> internal cables, with minimum V90 insulation rating with stranded copper conductors rated to AS/NZS 3008.1.1. Provide cables with current ratings suitable for the internal assembly ambient air temperature and for temperature rise limits of equipment within the assembly.
- Run cables clear of busbars and metal edges.
- Provide cables capable of withstanding maximum thermal and magnetic stresses associated with relevant fault level and duration.
- Run cables neatly. Provide slotted trunking sized for future cables or tie at 150 mm maximum intervals with ties strong enough to withstand magnetic stresses created at the specified fault current. Do not provide adhesive supports.
- Provide for installation of wiring for future equipment without removal of existing equipment.
- Identify power and control cables at both ends with neat fitting ring type ferrules agreeing with record circuit diagrams. Mark to AS/NZS 4383 series.
- Terminate control cables and motor control circuits in tunnel terminals or, if necessary, provide suitable palm type lugs and correct crimp tool.
- For equipment mounted on hinged doors run cables on the hinge side to avoid restricting the door opening. Bundle cables with spiral wrap PVC and secure to door.
- If recommended by device manufacturers, provide shielded wiring.

Adjacent circuit breakers: If suitable proprietary multi-pole busbar assemblies are available to link adjacent circuit breakers, do not provide cable interconnections.

##### Cables > 6 mm<sup>2</sup>

Terminations:

- Tunnel terminals: Single cables.
- Other connection points or terminals:  $\leq 2$  cables.

Doors: Do not run cables to hinged doors or removable panels.

Supports:

- Spacing at enclosure:  $\leq 200$  mm from a termination.
- Spacing generally:  $\leq 400$  mm.
- Strength: Capable of withstanding forces exerted during fault conditions.

Single core cables rated  $\geq 300$  A: Do not provide ferrous type metal cable saddles.

Terminals marked: Terminate marked cables for connection to external controls in correspondingly marked terminals within the assembly.

##### Control and Indication Circuits

General: Provide conductors sized to suit the current carrying capacity of the particular circuit.

Minimum size: 1 mm<sup>2</sup> with 32/0.2 stranding.

##### Cable Colours

General: Colour code wiring as follows:

- A phase: Red.
- B phase: White.
- C phase: Blue.
- Neutral: Black.
- Earthing: Green-yellow.

**46.14.31 TERMINATIONS****Submains, Light and Power Circuits**

General: Connect direct to the control equipment terminals.

Shipping breaks: Provide terminal blocks for interconnecting wiring on each side of shipping breaks.

**46.14.32 MARKING AND LABELLING****General**

Requirement: Provide labels including control and circuit equipment ratings, functional units, notices for operational and maintenance personnel, incoming and outgoing circuit rating, sizes and origin of supply.

Labels shall be:

- Laminated plastic engraved to approved size, wording and design, clearly indicating the function and/or circuit designation of the component
- Of white background white with black machine engraved lettering for general items
- Of red background with white machine engraved lettering for safety purposes (e.g. DANGER and FIRE SERVICES labels)
- Provided with bevelled edges.
- Fixed by drilling and tapping at a minimum of at least two points. Self-tapping screws, adhesive application or otherwise methods of fixing are NOT acceptable.
- Not be fixed to removable covers and lids.
- Of 5mm minimum lettering height.

**Labels on Assembly Exteriors**

Switchboard identification label to include:

- Manufacturer's name
- fault rating
- form of segregation
- full load rating
- consumers mains or incoming submain details
- size and origin of supply
- date of manufacture

Assemblies: Label with essential markings.

Designation labels: For other than main assemblies, provide designation label stating source of electrical supply. Identify separate sections of enclosures.

Assembly controls: Label controls and fault current limiters, including the following:

- Circuit designation for main switches, main controls and submains controls.
- Details of consumer's mains and submains including cross sectional area.
- Use different colours on labels to distinguish operational requirements such as normal operation, operation under fire or emergency conditions.
- Incoming busbar or cable rating to first tee-off.
- Fuse link size.

**Labels on Assembly Interiors**

General: Provide labels for equipment within assemblies. Locate so that it is clear which equipment is referred to, and so that lettering is not obscured by equipment or wiring.

Moulded case circuit breakers: If circuit breaker manufacturer's markings are obscured by operating handle mechanisms or motor operators, provide additional markings open to view on, or next to, the circuit breaker.

Arrestors: Label each group of primary arrestors, stating their purpose and the necessary characteristics.

**Protection Device Settings**

The protection settings of each protection device (circuit breaker, fuse etc) shall be clearly visible on the front elevation of each switchboard without removing escutcheons or other fixed covers. Where

protection settings are obscured by escutcheons or covers provide permanent fixed labels adjacent the protection device to identify size of device (e.g. circuit breaker frame size or fuse holder capacity) and protection settings (including all circuit breaker trip settings and installed fuse sizes).

#### **Submain Identification Label**

Provide a label fixed to the front elevation of each switchboard adjacent each protective device protecting a submain, to identify outgoing submain size and type, and load supplied.

#### **Service Protection Device Labelling**

Provide an engraved label at the Service Protection Device to read 'CAUTION - Safety (Emergency) Systems on site may be disabled by operating this device' in compliance with WAER 2015 Section 6.2.2.

#### **Danger, Warning and Caution Notices**

Busbars: If polymer membrane coating is used without further insulation, provide warning notices on the front cover near the main switch or local main switch and on rear covers, indicating that busbars are not insulated.

Fault current limiters: In assembly sections containing fault current limiter fuses provide caution notices fixed next to the fault current limiters, stating that replacement fuse links are to match the installed fuse link ratings, make and characteristics. Provide separate label stating make and fault current limiting fuse ratings.

Externally controlled equipment: To prevent accidental contact with live parts, provide warning notices for equipment on assemblies not isolated by main switch or local main switch.

Stand-by power: Provide warning notices stating that assemblies may be energised from the stand-by supply at any time.

Anti-condensation heaters: To prevent accidental switching off, provide caution notices for anti-condensation heaters.

Insulation and shrouding: For insulation or shrouding requiring removal during normal assembly maintenance, provide danger notices with appropriate wording for replacement of insulation shrouding before re-energising assemblies.

Positioning: Locate notices so that they can be readily seen, next to or, if impracticable, on busbar chamber covers of functional units and behind the front cover of functional units. Provide circuit identification labels in the cabling chamber of each functional unit, located next to external terminations.

#### **Switchboard Legend**

General: For general light and power distribution assemblies, provide legends of minimum A4 size, with printed text showing the following as-installed information:

- Submain designation, rating and short-circuit protective device.
- Light and power circuit numbers and current ratings, cable sizes and type and areas supplied.
- Mounting: Mount legend in a holder fixed to the inside of the assembly or cupboard door, next to the distribution circuit switches. Protect with hard plastic transparent covers.

#### **Single-line Diagrams**

Main switchboards and distribution switchboard assemblies: Provide single-line diagrams.

Format: Non-fading print, at least A3 size, showing the system as installed.

Mounting: Laminate and wall mount close to assembly or internally within a separate holder to the legend sheet.

### **46.14.33 THERMOGRAPHIC SURVEY**

Engage an approved qualified Company prior to Practical Completion and again prior to expiry of the Defects Liability Period, to carry out a survey of all busbar, equipment, cable joints and connections within all switchboards. The survey shall be conducted under maximum load conditions. Survey report must indicate all maximum load conditions at the time of testing.

All hotspots indicated shall be rectified and those particular areas resurveyed to the satisfaction of Superintendent. Test results shall be submitted to the Superintendent with all applicable photographs and data.

A copy of these results / photographs shall be included in Operating and Maintenance Handbook.

#### **46.14.34 SHOP DRAWINGS**

Provide shop drawings detailing the switchboard design, as specified elsewhere in this document, of all manufactured switchboards, complete with comprehensive parts list for inspection prior to construction,

All switchboard designs shall be endorsed by the Switchboard Manufacturer.

Show all label wording, positions, details, and clearly indicate the fault ratings of all protective devices and busbar assemblies on shop drawings. Submit detailed control diagrams for all control circuits, complete with termination and cable schedules.

Shop drawings shall be produced using AutoCAD or an equivalent electronic drafting package, be of minimum 1:10 scale and include the following information, as a minimum;

- Manufacturer's drawing sheet title block identifying the project name, project number and drawing number,
- Fault rating
- Form of segregation,
- Equipment materials list with part numbers
- Label schedule including size and colour of lettering and background,
- Switchboard general arrangements including front elevations with escutcheons fitted and without escutcheons, vertical and horizontal sections,
- Diagrams for all control equipment, (e.g., lighting controls) complete with terminal strip numbers;
- Schedule of construction details, including material type dimensions, paint finishes, handle types, locks and all hardware.
- Locations of cupboard door mullions where mullions are to be located in front of switchboards.

All switchboard shop drawings must be checked and endorsed as approved by the Contractor prior to submission to Superintendent.

#### **46.14.35 EMERGENCY LIGHTING TEST FACILITIES**

Supply and install all emergency lighting test facilities in accordance with AS 2293 and as further indicated within the specification.

The following equipment shall be installed as a minimum requirement:

- Phase failure relays.
- Timers.
- Pushbutton reset devices

#### **46.14.36 MAINTENANCE**

##### **General**

Standard: To AS 2467.

Requirement: Carry out the following:

- 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.

### **46.15 SWITCHBOARD COMPONENTS**

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#### **46.15.1 RESPONSIBILITIES**

##### **General**

Requirement: Provide switchboard components, as documented.

#### **46.15.2 DESIGN**

##### **Statutory Authority's Equipment**

General: Liaise with the electricity distributor about the installation and coordinate with their protective and control equipment in accordance with Western Power standards.

### 46.15.3 INTERPRETATION

#### Abbreviations

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

- MSB: Main switchboard
- SPD: Surge protection device.

### 46.15.4 SUBMISSIONS

#### Operation and Maintenance Manuals

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

#### Products and Materials

Requirement: Submit manufacturer's technical data for all components.

## 46.16 COMPONENTS / DEVICES

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### 46.16.1 REQUIREMENTS

#### General

Selection: To AS/NZS 3000 clause 1.7 and Section 2.

Rated duty: Uninterrupted.

Rated making capacity (peak):  $\geq 2.1 \times$  fault level (r.m.s.) at assembly incoming terminals.

Utilization category: To AS/NZS IEC 60947.1 clause 4.4 and the recommendations of Annex A.

- Circuits consisting of motors or other highly inductive loads: At least AC-23.
- Other circuits: At least AC-22.

Coordination: Select and adjust protective devices to discriminate under overload, fault current, and earth fault conditions.

Enclosure: IP4X minimum.

### 46.16.2 SWITCH-ISOLATOR

#### General

Standard: To AS/NZS IEC 60947.1 and AS/NZS IEC 60947.3.

Poles: 3.

Operation: Independent manual operation including positive ON/OFF indicator.

Shrouding: Effective over range of switch positions.

#### Fault Make/Fault Break Switch-Isolators

Rated breaking capacity: To AS/NZS IEC 60947.3 Table 3.

Rated short-time withstand current: As defined in AS/NZS IEC 60947.1 clause 4.3.6.1 and the manufacturer's recommendation for the prospective fault current conditions.

Rated short-circuit making capacity: As defined in AS/NZS IEC 60947.1 clause 4.3.6.2, to conform to the manufacturer's recommendation for the prospective fault current conditions.

Rated short-circuit breaking capacity: To AS/NZS IEC 60947.1 clause 4.3.6.3 and the manufacturer's recommendation for the prospective fault current conditions.

#### Load Make/Load Break Switch-Isolators

Rated making and breaking capacity: As defined in AS/NZS IEC 60947.1 clause 4.3.5 to conform to AS/NZS IEC 60947.3 Table 3 and the manufacturer's recommendations for the prospective fault current conditions.

Rated short-time withstand current: As defined in AS/NZS IEC 60947.1 clause 4.3.5, to conform to the manufacturer's recommendation for the current conditions.

### 46.16.3 OVERLOAD AND FAULT PROTECTION GENERALLY

#### General

Requirement: Provide overload and fault protection devices, including full discrimination and cascade protection, and grade with the electricity distributor's incoming supply protection system and the downstream site protection devices.

Cascade protection: Provided by either fault current limiting fuses or fault current limiting circuit breakers.

### 46.16.4 MOULDED CASE AND MINIATURE CIRCUIT BREAKERS

#### General

Moulded case breakers: To AS/NZS IEC 60947.1 and AS/NZS IEC 60947.2.

Miniature circuit breakers: Interrupting capacity classification to AS/NZS 60898.1 or AS/NZS 3111.

- For general building services: Type C.
- For motor protection: Type D.

Operation: Independent manual operation including positive ON/OFF indicator.

Trip type: Conform to the following:

- Moulded case breakers: Adjustable thermal, fixed magnetic. Electronic where indicated
- Miniature circuit breakers: Fixed thermal and fixed magnetic.

Isolation facility: Required.

Mounting: Mount circuit breakers so that the ON/OFF and current rating indications are clearly visible with covers or escutcheons in position. Align operating toggles of each circuit breaker in the same plane.

Utilisation category: Moulded case breakers:

- Final subcircuits category: Category A.
- Mains and submains: Category B.

Trip settings: Set as documented, seal, and label.

Interchangeable trip units: Connect trip units so that trip units are not live when circuit breaker contacts are open.

Fault current limiting circuit breakers: Select breaker frame sizes from one manufacturer's tested range of breakers to give cascade and discrimination protection within the switchboard and downstream switchboards as required.

Circuit breakers shall be used for all circuit protection unless otherwise shown on the drawings or specified herein.

Moulded Case Circuit Breakers shall be used for protection of all circuits of 100A rating or greater and for all protective device provided for the protection of submains.

Select all circuit breakers to ensure the device will operate in a fault condition, based on the maximum fault current which is able to flow at in the circuit. Due consideration shall be taken to identify the maximum fault current which may be present at the device located at the furthest point from protective device when, selecting the protective device and, in the case of adjustable circuit breakers, commissioning the settings of the device. Where necessary provide electronic trip units to protective devices to ensure compliance with this requirement.

The documented power distribution infrastructure is designed based on the deployment of Schneider Electric protective devices. Alternative manufacturers' equipment may be presented for consideration. Presentation of alternative equipment must be supported by a comprehensive power distribution design, modelled using PowerCalc software, or similar manufacturer specific modelling software, which shall incorporate the selected cable types, cable lengths and power source characteristics of the installation. Where alternative protective equipment necessitates the increase in size of cables, all associated costs shall be included within the fixed tender price.

#### Miniature Type

Miniature Circuit breakers shall have the following requirements:

- Fault rating capacity shall be selected based on the device selection and shall not be less than 10,000 Amps at 240VAC.

- Shall be DIN type moulded case type.
- Enable full discrimination and cascading with upstream/downstream breakers of the same manufacturer.
- Be inter-changeable with a combined single module 30mA RCD/MCB of same overcurrent trip setting
- Be identified with an I.P.A. marker showing correct colour coding and circuit number.
- Non-Auto MCBs shall not be used as isolators.
- Shall have "C" curve tripping characteristics unless otherwise shown on the drawings.
- MCB types shall be of the same manufacturer for the whole project.

#### **46.16.5 ELECTRICITY DISTRIBUTOR'S SERVICE PROTECTIVE DEVICES**

##### **General**

Low voltage service protective devices: To AS/NZS 3000, the electricity distributor's requirements and the Service and Installation Rules.

Service protective devices > 100 A: Provide fault current limiting circuit breakers with adjustable overload and short circuit current facilities with full discrimination and cascade protection between the incoming supply protection systems and the downstream protection systems.

#### **46.16.6 RESIDUAL CURRENT OPERATED CIRCUIT BREAKERS (RCBO)**

##### **General**

Standard: To AS/NZS 3190.

Integral non-overload protection type: To AS/NZS 61008.1.

Integral overload protection type: To AS/NZS 61009.1.

Modular type: To AS/NZS IEC 60947.2.

- Type A.
  - Default tripping current: 30 mA.

#### **46.16.7 DISCRIMINATION**

Select the protective devices in order that in the event of any condition of over-current or short circuit occurring on the load side of any protection device(s) or final circuit equipment device(s), the protection effectively discriminates with the downstream device(s).

Ensure that the loss of power to any electrical device on the site does not occur due to non-selectivity of circuit protective devices.

Certify in writing to the Consulting Engineer the full compliance with discrimination of manufacturers equipment prior to any construction and installation of any equipment.

Some brands of switchgear may require upgrading of circuit breaker sizing and cabling to achieve full discrimination of all devices installed throughout the site, the cost of which shall be included within the tender. Refer to the drawings for the nominated circuit breaker design.

#### **46.16.8 FUSES WITH ENCLOSED FUSE LINKS**

##### **General**

Standards: To IEC 60269-1, IEC 60269-2 and AS 60269.2.1.

Fuses with fuse links for the protection of semiconductor devices: To IEC 60269.4.

Fuses with fuse links used as fault current limiters: Coordinate fuse type and rating with the protection switchgear manufacturer's recommendation if used downstream of the fault current limiters. Provide labels adjacent to the fuse holder stating FAULT CURRENT LIMITER and fuse size.

Fuse links: Enclosed, high rupturing capacity type mounted in a fuse carrier.

Breaking range and utilisation category:

- Distribution/general purpose: gG.
- Motors: gM.

Fuse holders: Mount fuse holders so that fuse carriers may be withdrawn directly towards the operator and away from live parts. Provide fixed insulation which shrouds live metal when the fuse carrier is withdrawn.

Barriers: Provide barriers on both sides of each fuse link, preventing inadvertent electrical contact between phases by the insertion of screwdriver.

Spare fuse links: Provide 3 spare fuse links for each rating of fuse link on each assembly. Mount spares on clips within the spares cabinet.

Spare fuse holder carriers: Provide 3 spare fuse holder carriers for each size of fuse holder carrier on each assembly. Mount spares on clips within the spares cabinet.

Busbar mounted fuse holders: Provide fuse carriers with retaining clips, minimum fuse holder 32 A.

#### **Protection of Final Subcircuits**

General: Provide series connected surge filter comprising metal oxide varistor based primary SPDs, a low pass LC filter and secondary metal oxide varistor based SPDs.

Maximum discharge current ( $I_{max}$ ): 20 kA (8/20  $\mu$ s) phase to neutral and 10 kA neutral to earth.

Voltage protection level ( $U_p$ ): < 600 V at 3 kA and < 700 V at 500 A.

Visual indicator: Provide visual indication of SPD status.

Maximum continuous operating voltage ( $U_c$ ): 340 V a.c.

Enclosure and installation: House SPD in electrical switchboard or panel.

Enclosure mounting: DIN rail mounted.

#### **46.16.9 SURGE PROTECTION DEVICES (SPD)**

##### **General**

Standard: To IEC 61643-11 and IEC 61643-12.

Installation: To AS/NZS 3000 Appendix F.

##### **Primary Protection (Cat C Point of Entry)**

General: Provide shunt connected metal oxide varistor based SPDs between each phase and neutral at assembly incoming supply terminals, on the load side of incoming functional units.

##### **Type I SPD**

Surge rating ( $I_{max}$ ) per phase to neutral:  $\geq 150$  kA.

Surge rating ( $I_{max}$ ) neutral to earth if remote from the MEN earthing system:  $\geq 100$  kA.

Residual voltage: < 800 V at 3 kA.

Visual indicator: Provide visual indication of SPD status and life visible from the switchboard front panel.

Alarm contacts: Provide one set of normally closed dry contacts indicating status.

Enclosure and installation: House SPD in a metal enclosure and protect with a suitable rated circuit breaker or 63A HRC fuse.

##### **Type II SPD**

Surge rating ( $I_{max}$ ) per phase to neutral:  $\geq 100$  kA.

Surge rating ( $I_{max}$ ) neutral to earth if remote from the MEN earthing system:  $\geq 100$  kA.

Nominal discharge current: 40 kA (8/20 $\mu$ s).

Residual voltage: < 800 V at 3 kA.

Visual indicator: Provide visual indication of SPD status and life visible from the switchboard front panel.

Alarm contacts: Provide one set of normally closed dry contacts indicating status.

Enclosure and installation: House SPD in a metal enclosure and protect with a suitable rated circuit breaker or 63A HRC fuse.

Provide parallel type transient voltage surge suppression between each phase and earth, each phase and neutral and neutral and earth, nominally referred to as "4 Mode Protection devices" for the main switchboard in accordance IEC61643-1 and AS1768.

##### **Operation**

The Surge device shall operate at a nominal system voltage of ( $V_{rms}$ ) 240/415V, 50Hz

##### **Alarms and Indication**

The surge diverter shall have visual status indication (even when powered off) and voltage free contacts.

The alarm shall be raised when there is 50% depletion of the surge material on any line.

The alarm shall be raised when there is a loss of one or more incoming phases.

The alarm shall be raised when the neutral is disconnected.

### Wiring

It is essential to provide a fuse or circuit breaker ahead of the SPD to provide safe disconnection for maintenance or to replace failed SPD. As per AS/NZS1768

The wire length of the active and neutral or earth connections for each surge diverters should not exceed 600mm and such connection should be a minimum of 16mm<sup>2</sup> copper conductors (or to suit upstream circuit breaker or fuse) and be as short as practicable. For optimal protection and performance the total length of the individual connections should not exceed 300mm.

### Secondary Protection (Cat B Sub-boards)

General: Provide shunt connected metal oxide varistor based SPDs between each phase and neutral and a gas discharge tube between neutral and earth at assembly incoming supply terminals, on the load side of incoming functional units and upstream of RCD devices.

### Type III SPD

Surge rating ( $I_{max}$ ) per phase to neutral:  $\geq 50$  kA.

Surge rating ( $I_{max}$ ) neutral to earth:  $\geq 20$  kA.

Residual voltage:  $< 800$  V at 3 kA.

Visual indicator: Provide visual indication of SPD status and life.

Alarm contacts: Provide one set of normally closed dry contacts indicating status.

Enclosure and installation: House SPD in a metal enclosure and protect with a suitable rated circuit breaker or 32A HRC fuse. Connecting lead lengths should not exceed 300 mm.

### Combined Primary and Secondary Surge Reduction Filter Protection

General: Provide series connected surge reduction filter comprising metal oxide varistor or triggered spark gap based primary SPDs, a low pass LC filter and secondary metal oxide varistor based SPDs.

Surge rating ( $I_{max}$ ) per phase to neutral primary protection:  $\geq 100$  kA.

Surge rating ( $I_{max}$ ) neutral to earth if remote from the MEN earthing system:  $\geq 100$  kA.

Residual voltage:  $< 600$  V at 20 kA.

Visual indicator: Provide visual indication of SPD status and life.

Alarm contacts: Provide one set of normally closed dry contacts indicating 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.

Provide parallel type transient voltage surge suppression between each phase and earth, each phase and neutral and neutral and earth, nominally referred to as "4 Mode Protection devices" for Distribution switchboard and Sub Boards in accordance IEC61643-11 and AS1768 .

### Operation

The Surge device shall operate at a nominal system voltage of ( $V_{rms}$ ) 240/415V, 50Hz

### Alarms and Indication

The surge diverter shall have visual status indication (even when powered off) and voltage free contacts.

The alarm shall be raised when there is 50% depletion of the surge material on any line.

The alarm shall be raised when there is a loss of one or more incoming phases.

The alarm shall be raised when the neutral disconnected.

### Wiring

It is essential to provide a fuse or circuit breaker ahead of the SPD to provide safe disconnection for maintenance or to replace failed SPD. As per AS/NZS1768

The wire length of the active and neutral or earth connections for each surge diverters should not exceed 600mm and such connection should be a minimum of 16mm<sup>2</sup> copper conductors (or to suit upstream circuit breaker or fuse) and be as short as practicable. For optimal protection and performance the total length of the individual connections should not exceed 300mm.

**Protection of Final Subcircuits (Cat A or B)**

Provide series connected surge filter protection devices to the final circuits, at the respective distribution board, for the following items of equipment:

- Fire Indicator Panel power supply circuits.
- EWIS Panel power supply circuits.
- MATV headend circuits.
- CCTV system power supply circuits.
- All communications cupboard power circuits.
- All power circuits serving intelligent lighting control equipment power supply circuits.
- Access control system power supply circuits.

General: Provide series connected surge filter comprising metal oxide varistor based primary SPDs, a low pass LC filter and secondary metal oxide varistor based SPDs.

Operating voltage ( $U_n$ ): 220 – 240V at 50 Hz.

Maximum discharge current ( $I_{max}$ ): 20 kA (8/20  $\mu$ s) phase to neutral and 10 kA neutral to earth.

Voltage protection level ( $U_p$ ): < 600 V at 3 kA and < 700 V at 500 A.

Visual indicator: Provide visual indication of SPD status.

Maximum continuous operating voltage ( $U_c$ ): 340 V a.c.

Enclosure and installation: House SPD in electrical switchboard or panel and protect with a suitable rated circuit breaker equal to or less than the load current rating of the SPD.

Enclosure mounting: DIN rail mounted.

**Alarms and Indicators:**

The surge reduction filter shall have voltage free contacts to indicate failures.

The status of both the primary & secondary surge protection stages shall have visual diagnostic status indication.

**46.16.10 CONTACTORS****General**

Standard: To AS/NZS IEC 60947.4.1.

Type: Enclosed, block type, air break, electromagnetic.

Poles: 3.

Rated operational current: The greater of:

- Full load current of the load controlled.
- 16 A.

Mechanical durability: 10 million cycles to AS/NZS IEC 60947.4.1.

Electric durability:  $\geq$  1 million operations at AC-22 to AS/NZS IEC 60947.4.1.

Mounting: Mount with sufficient clearance to allow full access for maintenance, removal and replacement of coils and contacts, without the need to disconnect wiring or remove other equipment.

Auxiliary contacts: Provide auxiliary contacts with at least one normally-open and one normally-closed separate contacts with rating of 6 A at 230 V a.c., utilisation category AC-1.

Slave relay: If the number of auxiliary contacts exceeds the number which can be accommodated, provide separate slave relays.

**46.16.11 CONTROL DEVICES AND SWITCHING ELEMENTS****Standards**

General: To AS/NZS IEC 60947.1 and AS/NZS IEC 60947.5.1.

Switching elements:

- Electrical emergency stop device with mechanical latching function: To AS/NZS IEC 60947.5.4.
- Electromechanical control circuit devices: To AS/NZS IEC 60947.5.1.
- Proximity switches: To AS/NZS IEC 60947.5.2.

**Rotary Switches**

General: Cam operated type with switch positions arranged with displacement of 60°.

Off position: Locate at the 12 o'clock position. Test positions must spring return to off position.

Rated operational current: At least 6 A at 230 V a.c.

Escutcheon plates: Provide rectangular plates securely fixed to the assembly panel. Identify switch position and function.

**Time Switches**

Type: 7 day fully programmable with holiday override function.

Daylight saving switch: Required.

Mains failure operation: 100-hour minimum operating capacity.

Contact rating:  $\geq 16$  A at 230 V a.c. resistive load.

Construction: Provide readily accessible means of adjustment. Provide operational settings which are clearly visible when switch cover is fitted.

Dial: Digital with hour and minute display.

Override switch (manual): Required.

**Control Relays**

Standard: To AS/NZS IEC 60947.5.1.

Requirement: Provide heavy duty fixed mounted type 3 relays.

Operation: Suitable for continuous operation.

Construction: Plug-in types. Receptacle bases with captive clips which can be operated without using tools.

Type: Modular block.

Contact elements: Electrically separate, double break with silver alloy, non-welding contacts.

Configuration: For standard relays, provide assemblies with  $\geq 2$  sets of contacts and expandable to 8 sets of contacts in the same assembly. Provide at least one normally-open and one normally-closed contact.

Plug-in types: If required provide the following:

- Receptacle bases with captive clips which can be operated without using tools.
- Changeover type contacts to allow either normally-open or one normally-closed configuration.

**Time Delay Relays**

Adjustable range: Adjustable over the full timing range with timing repeatability within  $\pm 12.5\%$  of nominal setting.

Electronic relays: Incorporate light emitting diodes indicating energisation states of relays.

**Phase Failure Relays**

General: Provide separate solid-state phase failure relays conforming to the following:

- Detect less than 85% of normal voltage.
- Detect single phase failure.
- Detect reverse phase sequence after an appropriate time delay.
- Automatic reset on detection of normal power supply.

Sensing circuit: To reject induced voltage spikes and disturbances with frequencies other than 50 Hz.

Back-up protection: Provide high rupturing capacity fuses to each phase.

**46.16.12 ANTI-CONDENSATION HEATERS****General**

Rating: Provide heaters rated at not less than 20 W/m<sup>2</sup> of total external area including top of weatherproof enclosure.

Type: Black heat type with surface temperature less than or equal to 50°C, mechanically protected and thermostatically controlled.

**46.16.13 EMERGENCY LIGHTING TEST FACILITIES**

Supply and install all emergency lighting test facilities in accordance with AS 2293 and as further indicated within the specification.

The following equipment shall be installed as a minimum requirement:

- Phase failure relays.
- Timers.
- Pushbutton reset devices

**46.16.14 MARKING AND LABELLING****General**

Requirement: Provide labels including control and circuit equipment ratings, functional units, notices for operational and maintenance personnel, incoming and outgoing circuit rating, sizes and origin of supply.

Labels shall be:

- Laminated plastic engraved to approved size, wording and design, clearly indicating the function and/or circuit designation of the component
- Of white background white with black machine engraved lettering for general items
- Of red background with white machine engraved lettering for safety purposes (e.g. DANGER and FIRE SERVICES labels)
- Provided with bevelled edges.
- Fixed by drilling and tapping at a minimum of at least two points. Self-tapping screws, adhesive application or otherwise methods of fixing are NOT acceptable.
- Not be fixed to removable covers and lids.
- Of 5mm minimum lettering height.

**46.16.15 MAINTENANCE****General**

Standard: To AS 2467.

**46.17 LIGHTING**

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**46.17.1 RESPONSIBILITIES****General**

Requirement: Provide lighting and control systems, as documented.

**46.17.2 STANDARDS****General**

- EMC compliance: To AS/NZS CISPR 15.
- Energy efficiency for ballasts and lamps: To AS/NZS 4783.2.
- Fixed general purpose luminaires: To AS/NZS 60598.2.1.
- Floodlights: To AS/NZS 60598.2.5.
- Harmonic limits: AS/NZS 61000.3.2.
- Luminaires, general requirements and tests: To AS/NZS 60598.1.
- Luminaires: To AS/NZS 60598.1.
- Recessed luminaires: To AS/NZS 60598.2.2.
- Radio interference limits: To AS/NZS CISPR 15.

**Minimum Energy Performance Standards (MEPS)**

General: To AS/NZS 4782.2, AS/NZS 4783.2, AS 4934.2.

**46.17.3 INTERPRETATION****Abbreviations**

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

- CCT: Correlated colour temperature.
- CRI: Colour rendering index.
- EEI: Energy efficiency index.
- EMC: Electromagnetic compatibility.
- LED: Light-emitting diode.
- PIR: Passive infra-red.
- RCD: Residual current device.

**Definitions**

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

- Control system (lighting): A lighting control system comprising a combination of some or all of the following: Automatic sensing and control components;
  - Timers.
  - Manual overrides.
- Proprietary luminaires: Luminaires available as a catalogue item.

**46.17.4 SUBMISSIONS****Operation and Maintenance Manuals**

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

**Products and Materials**

Lighting: Submit technical data on the following:

- Luminaires.
- Control gear or driver.
- Lighting control systems.
- All accessories.

Type test: Submit photometric test results from a registered testing authority as evidence of luminous efficacy for the applicable CCT for the following:

- Light-emitting diode luminaires.

**Samples**

Lighting: Submit samples of all luminaires and accessories complete with lamp, control gear and three core flex and plug.

**Shop Drawings**

Lighting: Submit shop drawings for the following:

- Lighting columns, cross arms and spigots.
- Lighting column foundations.
- Lighting column mounting bases.
- Non-proprietary luminaires.
- Non-standard fixing brackets.

**46.18 LIGHTING SYSTEMS**

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**46.18.1 GENERAL**

Supply and Install the lighting system complete in all respects, including luminaires, control gear, battens, brackets, fittings, fixings, accessories, connections, ancillary work, and equipment guarantees as applicable to luminaires. Refer to the luminaire schedule for full details of the specified light fittings.

Although luminaires may be specified by trade names and catalogue numbers, all such luminaires shall comply with the requirements of this specification, where necessary modify the luminaire to meet the full requirements of this document.

Where a particular type and make of fitting is specified, the exact luminaires type shall be supplied unless the superintendent has approved an alternative.

Luminaires and associated drivers and other control gear shall display a Regulatory Compliance Mark (RCM) placed on the external surface of the equipment in accordance with AS/NZS 4417.1.

Set out the positions of all light fittings. Cut out holes in suspended ceilings and provide suitable blockouts in concrete soffits for recessed luminaires.

Confirm ceiling type prior to order – for tender purposes, where no ceiling is indicated allows for surface and/or recessed-plasterboard fittings as most appropriate for the area.

#### **46.18.2 PROPRIETARY LUMINAIRES**

##### **General**

Requirement: Provide proprietary luminaires complete with luminaire control equipment, lighting control equipment, and accessories for a complete installation.

##### **Proprietary Equipment**

General: The requirements of this worksection for drivers and luminaire control equipment over-ride the specifications inherent in the selection of a particular make and model of luminaire.

#### **46.18.3 LIGHT-EMITTING DIODE (LED) LUMINAIRES**

##### **General**

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

Provide LED Luminaires complete with proprietary drivers and control gear as nominated on the drawings. Luminaires and control gear should have a minimum LM70 lumen maintenance life of 50,000 hours for internal installations and 100,000 hours for external application luminaires.

All LED light sources shall be of an approved colour temperature, as detailed in the luminaire schedule. Colour temperature tolerance shall be +/- 150° Kelvin (i.e. equal to MacAdams 3). The colour accuracy of the light shall have a CRI of no less than 80.

Lumen depreciation of LED light sources shall be equal to, or less than, 90% of the initial output at 6000 hours of operation.

LED luminaires shall be from by a reputable manufacturer/supplier, Philips, Ruud, Cree, or equal and approved.

All control gear shall be suitable for the luminaires utilised in accordance with manufacture's recommendations and shall sustain LED condition at voltages within Authority Supply Guidelines (nominal 240V ± 6%).

LED luminaire drivers shall have an earth leakage current not exceeding 0.5mA/per luminaire.

LED luminaires shall incorporate a passive cooling system utilising convection.

##### **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: 4000K for internal locations and 3000K or external location unless otherwise documented.

#### **46.18.4 CONTINUOUS LIGHTING SYSTEMS**

Continuous lighting systems shall be in continuous lengths with fixed LED lighting modules as shown on drawing, installed in straight lines and suspended or recessed horizontally.

Continuous lighting systems shall be fitted with diffusers/louvres as specified.

The continuous lighting systems shall be complete with proprietary connection accessories, cover plates, and caps, wall brackets and the like. The systems shall be installed to eliminate light gaps and any light leakage from any join between sections, or from end caps.

There shall be no gaps between diffusers and any part of the continuous lighting system.

Make connection using white flex from an adjacent ceiling rose and fix to the wire suspension.

Provide shop drawings of the continuous lighting system for review, prior to manufacturing.

#### 46.18.5 CONTROL GEAR ENCLOSURE

##### General

Requirement: Provide control gear support enclosure within the body of the luminaire, except where remotely mounted control gear is documented or required by the manufacturer.

Enclosures and control gear mounting assemblies: Provide heat dissipation facilities to dissipate heat from the luminaire.

Control gear enclosure: Form a barrier against direct contact with live parts of the control gear and the area of the luminaire containing the lamp and lamp support holders.

Separate control gear enclosures: If separate control gear enclosures external to the luminaire are required, conform to the above requirements.

Fixing: Screw fixed.

#### 46.18.6 WIRING

##### External flexible Cords

Recessed luminaires: Provide flexible cord in conformance with the following:

- Length:  $\geq 1.5$  m.
- Cross sectional area:  $0.75 \text{ mm}^2$ .
- Type: 3-core V90 (minimum) PVC/PVC, connected to a 10 A 3-pin moulded plug to AS/NZS 3112 or multi-pin plug, as documented.

Other fittings: Provide external flexible cord in conformance with the following:

- Cross sectional area:  $\geq 1 \text{ mm}^2$ .

#### 46.18.7 TIME CLOCKS

Time clocks shall be digital with LCD display and switching contacts rated at 10 Amps or greater. Unless otherwise detailed time clocks shall be 24hr / 7 day.

Time clocks shall include internal algorithm such that entering the longitude, latitude and date will enable it to determine sunrise and sunset (e.g. Legrand AlphaRex Time Switch D22 Astro).

Time clocks installed in the Perth metropolitan shall be set at 30 degrees latitude and 120 degrees longitude respectively.

#### 46.18.8 PHOTO-CELL LIGHTING CONTROLS

Provide an ambient light sensor to switch external lighting and as otherwise shown on the drawings. Circuits designated to be controlled by the photo cell device shall be switched by contactor(s).

Unless otherwise shown install the Photo cell switch at roof level of the building, ensuring that its operation remains unaffected by shadows and artificial light, and as close as practical to the switchboard containing lighting controls.

Provide a manual override switch on the switchboard containing the lighting controls, or as otherwise specified.

#### 46.18.9 MOTION SENSORS

##### General

Provide a lighting control system comprising BEG, or approved equivalent, manufactured standalone (non-networked) hardwired occupancy motion and presence detectors and switching equipment as noted on the contract drawings.

##### System Design

The motion and presence detector layout shown on the drawings shall be verified by the product supplier to confirm the appropriate detector model is used for the required coverage and control is achieved.

Provide devices to suit the final layout.

##### CE Declaration of Conformity

All Motion and Presence Detector products comply with the EU Electromagnetic Compatibility (EMC) Directive 2004/108/EC and the EU Low Voltage Directive (LVD) 2006/95/EC and RCM approval.

**Motion Sensors**

Motion sensors shall be selected for area/application and shall be equal in performance to the following devices: -

General area model BEG **PD2-M**, voltage (230 VAC), general area type, 10m sensor range with integrated PE cell, Passive Infrared surface or recessed mounting optional 2 channel, Remote programmable option DALI or analogue outputs, supports slave networks

For mounting requirements (surface or recessed) refer to drawings.

Motion sensor finish colour:

- White where installed to white ceilings
- Black where installed to non-white, feature or timber ceilings

**Shop Drawings**

Submit the detector layout shop drawings, as confirmed by the supplier, in AutoCAD DWG and PDF format to the engineer for approval. Different detector models shall be uniquely identified using the symbology on the original design drawings for each individual model. The detector control shall concur with the light switching operation identified in this specification and shown on the drawings.

If the detector layout has been altered from the original design, coordinate the detector locations with other services and the architectural aspects of all spaces prior to the issue of the final detector layout shop drawings to the engineer.

Colour coded locations on drawings referencing the colour coded product boxes for installation.

**Testing and Commissioning**

Testing and commissioning of the system shall be carried out by the authorised supplier. The following test shall be conducted under the witness of the Superintendent:

- Walk through test on lighting control of each room.
- Remote control programming of select range of detectors

Installed sensors shall comply with NCC Specification J6.3 and as further specified by the Engineer

**46.18.10 LIGHTING POLES****General**

Requirement: Provide lighting pole systems, as documented.

Unless otherwise specified, poles shall be steel.

Poles shall be base-plate mounted unless specified otherwise.

Poles, bases, footings and holding down bolts shall be designed in accordance with the appropriate Australian Standard to suit the soil and wind loading conditions of the site and shall be certified by a practicing structural engineer. A sand and cement screed shall be installed between the top of the concrete foundation and the underside of the pole baseplate.

Where installed in area of block paving or concrete finishes, the pole foundation shall be formed in order that the finished depth of the baseplate is concealed below the surface finish.

All metal components below ground, including baseplate and holding down bolt, shall be coated with a bituminous coating prior to backfill.

Poles shall be complete with all necessary brackets, spigots and ferrules to suit light fittings and crossarms, etc.

Lighting poles shall be complete with the following:-

- Constructed from galvanised steel
- Designed to withstand wind velocity for area, as per Australian Standard
- Complete with internal catenary to support cabling within
- Mounted on concrete plinth with ragbolt assembly
- Weather proof 250mm x 400mm access panel, 450mm from the base, to internal junctions at low level, secured with tamper-proof screws.
- Within the opening, install a mounting bracket suitable for protective devices and associated cabling.
- Each pole shall be structurally designed to support the physical load imposed by the light fitting(s), cross arms and all accessories.

- Ensure that spigots are the correct size to suit the luminaire entry.
- Supply ragbolt assemblies complete with nuts and washers required to erect and plumb poles.
- Grind smooth all welds ground with continuous seams complying with relevant parts of AS 1554.
- All steelwork shall be hot dip galvanised, powdercoat paint finish to Superintendent's approval.
- Treated with anti-graffiti paint to 2.2m above finished ground level.

**Standards**

- Structural Design Actions: To AS 1170
- Structural Steel Code (where applicable); To AS4100
- Preferred dimensions for lighting columns and bracket arms: To AS1798
- Galvanising: To AS4680
- Welding: To AS1554

**Structural Design and certification**

Engage a qualified and practicing structural engineer to design and certify the pile footings and light pole design. Provide certification prior to ordering the materials and ensure the structural engineer witness the footings prior to the concrete pour and provide separate certification for installation compliance as a result.

The certification is to include, ground conditions, proposed design considerations, wind loading, wind region and location.

**Pole lighting fused cut outs**

Provide pole lighting cut outs within the base of each pole, the lighting cut out are available from IPD group and shall be:

- 25A rated single phase 415V.
- Be complete with loop in and loop out connector terminals
- Complete with integral HRC fuse rated to 5 Amps.
- Installed in a first-class neat manner.
- Provide a sample for approval.
- Original style as per the data sheet below:

Underground Distribution  
Fuse Service Equipment

Product data

Low force lever release style

Overall Dimensions

Height: 150mm  
Width: 67mm  
Projection: 49mm

Wiring Facilities

Basic Cutout accepts single phase cables only.  
Terminals suitable for terminating up to 25mm<sup>2</sup> Solid Aluminium or stranded Copper conductors.

To use with 3 phase cables

This requires additional loop in connectors and terminal shrouds. For each cutout it is necessary to use 4 loop-in connectors plus 4 shrouds.

Loop in/out Connector Terminals

**Incoming** – Loop in/out up to 35mm<sup>2</sup> aluminium or copper conductors.

**Outgoing** – two ways for up to 16mm<sup>2</sup> Stranded Copper.

For armoured cables up to 16mm<sup>2</sup> 4-core

An armour bond kit is available, comprising: - clamp, ferrules, lead-strips and fixing screws. Suitable for loop in/out cables.

Product Code	Description
54715-18	SNE Single Pole
54715-20*	CNE Single Pole
54715-22	CNE Double Pole
54715-40**	SNE Single Pole with IPC
54715-41**	CNE Single Pole with IPC
54718-15	Armour Bond Kit
54718-20	Loop In Connector
54718-25	Terminal Shroud

\* Supplied with anti shrink-back clips to prevent exposure of the cable cores in the event of sheath

Original style

Overall Dimensions

Height: 145.5mm  
Width: 73.9mm  
Projection: 56.9mm

Wiring Facilities

Basic Cutout accepts single phase cables only.  
Terminals suitable for terminating up to 25mm<sup>2</sup> Solid Aluminium or 16mm<sup>2</sup> stranded Copper conductors.

To use with 3 phase cables

This requires additional loop in connectors and terminal shrouds. For each cutout it is necessary to use 4 loop-in connectors plus 4 shrouds.

Loop in/out Connector Terminals

**Incoming** – Loop in/out up to 35mm<sup>2</sup> aluminium or copper conductors.

**Outgoing** – two ways for up to 16mm<sup>2</sup> Stranded Copper.

For armoured cables up to 16mm<sup>2</sup> 4-core

An armour bond kit is available, comprising: - clamp, ferrules, lead-strips and fixing screws. Suitable for loop in/out cables.

Product Code	Description
54715-03	Type 1 Cutout (SNE)
54715-04	Type 2 Cutout (CNE)
54718-20	Loop In Connector
54718-25	Terminal Shroud
54718-15	Armour Bond Kit
54718-30	Spare Fuse Carrier



Low Force Lever Release model



Low Force Lever Release model with clear cover



Original model

46.18.11 POLE MOUNTED EQUIPMENT

Circuit protective and isolation devices positioned within the base of a pole shall be contained within an IP65 rated enclosure as Clipsal 56CB4N or approved equivalent. The pole access door is not considered to provide sufficient IP rating.

46.18.12 NETBALL COURT FLOODLIGHTS

General

Provide the flood lights and all components for a complete installation. Liaise with the lighting manufacture to identify all attachments necessary for a complete installation in accordance with their calculations, Australian Standards & this technical specification.

Install floodlights to lighting pole as recommended by the manufacturer / lighting supplier. The number of floodlights is indicated on the drawings and aiming of the floodlights are to be determined by the lighting manufacture upon completion of the works.

Note, there are no on-site storage facilities provided. Floodlights delivered to site must be installed within the same day. No uninstalled floodlights are to remain on site.

Following the completion of the installation allow for testing of the floodlighting installation during the hours of darkness with the floodlight manufactures representative present. Supply and install all equipment necessary including access platforms, control for testing, re-aligning, aiming of the floodlights and the like. Allow for each floodlight to be individually tested, re-aligned, aimed and the like. Provide manual calculation results upon completion endorsed by the floodlight manufacturer.

Refer to the appendices of this specification for the proposed sports lights that can be utilised for the project, all floodlights must be from the same manufacturer and be of the exact same type and model.

Provide 36 months (Three Years) warranty for the floodlights and associated control components.

Night tests will be witnessed by the Shire of Chittering, where the system requires further re-aiming to meet the technical specification, Australian Standards, and the Shire of Chittering. Additional aiming costs are to be paid by the contractor in full.

**Installation Requirements**

The lighting installation shall be supplied and installed complete in all respects, including luminaries, lamps, battens, brackets, fittings, fixings, accessories, connections, ancillary work, and equipment guarantees as applicable to luminaries and lamps. Refer to the luminaire requirements in the section above.

Provide metallic heavy-duty anaconda / flexible conduit with overall UV rated PVC sheath to protect all cabling from the light poles to the existing and proposed floodlights to prevent damage from birds. All accessories to be in accordance with the manufacture's recommendations.

**Control Gear Enclosure**

Control gear trays are to be fused and located in an accessible location within the lighting column. Provide additional access hatches where required for ease for installation and maintenance from ground level.

**Lighting Poles**

Provide new 10m high lighting pole systems from the court finished floor level.

Provide fully detailed pole shop drawings for client comment prior to construction.

Unless otherwise specified, poles shall be galvanised steel.

Poles shall be base-plate mounted unless specified otherwise.

Poles, bases, footings and holding down bolts shall be designed in accordance with the appropriate Australian Standard to suit the soil and wind loading conditions of the site and to a minimum of category 2, 44m/s wind load and shall be certified by a practicing structural engineer.

All metal components below ground, including holding down bolt, shall be coated with a bituminous coating prior to backfill.

Pole footings are to be finished in a neat manner and rise to 100mm above ground level on flat ground and 100mm minimum above sloping ground. Base plates shall be installed 80-100mm above the footing and finished floor level. Provide weep hole conduit from centrally within the pole above the footing to outside the grout screed to dissipate water. A flexible grout screed shall be installed between the top of the concrete foundation and the underside of the pole baseplate in a neat first-class manner.

Base plates are to be completed with a minimum of two bolts and two washers to each ragbolt fixing. 15mm of thread is to be exposed above the upper nut, provide PVC conduit over the nuts and exposed thread and painted black and filled with an epoxy resin.

Image of minimum standard below:



Poles shall be complete with all necessary brackets, spigots and ferrules to suit light fittings and crossarms, etc.

Lighting poles shall be complete with the following:-

Constructed from galvanised steel

Designed to withstand wind velocity for area, as per Australian Standard (minimum CAT 2, 44m/s.

Complete with internal catenary to support cabling within

Mounted on concrete plinth with rag bolt assembly

Provide a minimum of three weatherproof access panels to accommodate the load centers and lighting control gear, 450mm from the base at internals to suit installation and ease of maintenance, secured with tamper-proof screws.

Within each opening, install a heavy-duty mounting bracket suitable for load centers and associated control gear and cabling.

Each pole shall be structurally designed to support the physical load imposed by the light fitting(s), cross arms and all accessories and future requirements as documented herein.

Ensure that spigots are the correct size to suit the luminaire entry.

Supply rag bolts assemblies complete with nuts and washers required to erect and plumb poles.

Grind smooth all welds ground with continuous seams complying with relevant parts of AS 1554.

All steelwork shall be hot dip galvanised, complete with ultra-shield corrosion prevention provided to the base plated and up to 300mm up column from base plate to Superintendent's approval. Treatment to be provided by the pole manufacturer prior to delivery and further touched up on site to match the existing brand of product.

Each floodlight to be secured with M16 Marine grade stainless steel bolts, nuts, spring washers and flat washers.

Poles to be provided with a additional brackets at 8m above finished floor level to accept CCTV Cameras and PA Speakers.

**Standards**

- Structural Design Actions: To AS 1170
- Structural Steel Code (where applicable); To AS4100
- Preferred dimensions for lighting columns and bracket arms: To AS1798
- Galvanising: To AS4680
- Welding: To AS1554

**Pole footings**

All pole footings are to be pile type unless otherwise noted, each footing shall consist of:

- Concrete liners only within the pile footing opening to the depth required and to finished floor level.
- Heavy duty galvanised cage / rag bolt assembly to be installed within the concrete liners to structural design.
- 35mPa concrete as a minimum, actual type to structural design.
- All metal components below ground, including holding down bolt, shall be coated with a bituminous coating prior to backfill.
- Minimum 14 day cure process.

Metal liners will not be accepted. The concrete liners are to be exactly level and finish at the finished surface level.

**Pole Mounted Equipment**

Refer to the drawing details and load center requirements for the pole mounted equipment requirements.

**Structural Design and Certification**

Engage a qualified and practicing structural engineer independent from the pole manufacturer to design and certify the light pole footings and confirm the light pole design for all poles. Provide certification prior to ordering the materials as part of the shop drawings approval process and ensure the structural engineer witnesses the footings prior to the concrete pour and provide separate certification as a result to include both design and installation compliance to current standards.

The certification is to include, ground conditions, proposed design considerations, wind loading, wind region and location.

Concrete pour of footings is not permitted until written certification is provided from the structural engineer confirming compliance with current standards.

**Geotechnical Sampling and Report**

Allow to engage a Geotechnical Engineer to undertake site investigation work and sampling at the proposed pole locations.

The structural design and certification is to be based on the Geotech report and the report is to be referenced on all pole and footing shop drawings.

**Surveying**

Engage a qualified surveyor to mark out the pole locations and cable pit locations prior to installation and reconfirm location at the practical completion for as constructed documentation.

**Completion**

Requirement: Before the date of practical completion carry out the following:

Verify the operation of all luminaires.

Adjust aiming and controls for all luminaires under nighttime conditions to floodlight manufactures requirements.

Clean all luminaires free from debris and dust.

Programme the lighting control system to client's requirements.

Complete a dark hours Lux test in accordance with AS2560.2.3 to confirm actual lighting levels.

Provide 12 months warranty from date of Practical Completion on systems, fittings and 36 months warranty on the flood lights.

Confirm all labelling complete.

Provide Operator training as specified.

Complete all testing and commissioning.

Complete defects observed.

Issue as constructed manuals and drawings.

### Lighting Control

Provide a lighting control system as indicated on the drawings.

Provide all lighting control components for a complete installation. Final selection of contactors/relays shall be suitable for the intended load in accordance with Australian Standards and manufactures recommendations.

Allow to clearly label all devices with a clear concise description. In addition, provide a laminated plan and basic instruction on how to operate the system and submit to the engineer for approval prior to installation.

All lighting control system contactors / relays, time switches etc. shall be located in designated sections of the respective switchboard as indicated.

The system shall comply with the relevant CE standards for lighting and electronic control devices.

Each component of the Lighting Control System shall be clearly labelled using an engraved traffolite label. Relay units shall additionally be labelled to identify the switch group numbers served by the unit.

The Lighting Control System components shall be mounted to a DIN rail mount within the switchboard enclosures and all wiring within the enclosures shall be neatly bound to form wiring looms and fixed to the cable tray using PVC cable ties. The enclosures shall be provided with ventilation grilles to the top and bottom, each ventilation grille being provided with insect mesh.

Prior to commencing commissioning obtain the required commissioning configuration as determined by the Consulting Engineer.

### Lighting Control Equipment

Provide an 'Illuminator' floodlighting controller as indicated on the drawings. The illuminator is a complete system controller with full remote control of all functions. The illuminator shall be as follows:

- Dimensions 110(W) x 200(H) x 85(D)
- Weight 800g.
- Operating temperature 0-50C (provide a condensation heater as indicated on the drawings for control during the winter months).
- Input supply voltage 12V/ DC
- Input current 120mA.
- Up to 8 auxiliary inputs.
- 8 outputs with timers (1 per output), normally open volt free contacts rated to 1A 30V DC maximum.
- Capacity of 10,000 records.
- Time resolution – 1 second
- Download format – CSV, compatible with all spreadsheet programs.
- Communication interface – 10base-T, RJ45 connector, Built in NextG & RS-232C.
- Complete with external **flat** antenna – antenna to be located externally to the switchboard.
- Complete with 12V 7.2AH battery back- up.
- Complete with power supply to suit the control indicated on the drawings

Contact Halytech to purchase the controller, contact details below:

Mr Wil Parker

Halytech  
11/22 Lexington Drive  
Norwest Business Park  
PO Box 6983  
Baulkham Hills Business Centre  
NSW 2153 Australia

Tel: +612 8814-5235

Fax: +612 8814-6108

Web: [www.halytech.com.au](http://www.halytech.com.au)

Include all works for a complete working system in full accordance with the manufactures recommendations and programme to the Shire of Chittering requirements.

Refer to appendices of this specification for manufactures brochure and operating instructions.

#### **Method of Control**

The control method for the existing oval lighting and the new netball court lighting is summarised as follows:

The illuminator lighting control system will provide a volt-free contact for each lighting switch group, the volt free contact will open and close to pre-set time nominated by the principal and programmed by the contractor.

The illuminator system shall have automatic off at a preset set time to be confirmed by the principal.

#### **46.18.13 EXTERNAL LIGHTING**

External lighting shall be installed in accordance with manufacturer's recommendations and complete with the following: -

- Secure fixing to site (e.g. concrete plinth for in-ground up-lighters, bollards, etc).
- Free from moisture.
- Vandal resistant screws.
- Vandal resistant materials.
- UV Stabilised.
- Where painted, final colour shall be to Superintendents approval and paint shall be anti-graffiti full height.

#### **46.18.14 SUPPORTS**

##### **General**

Requirement: Install luminaires on proprietary supports by means of battens, trims, noggings, roses and packing material.

##### **Surface Mounted Luminaires**

General: Fit packing pieces to level luminaires and prevent distortion of luminaire bodies. Provide packing strips to align end to end luminaires.

Fixing: Conform to the following:

- Generally: Provide 2 fixings at each end of linear luminaires.
- Luminaires less than 150 mm: A single fixing at each end in conjunction with 1.6 mm backing plates may be used.
- Provide battens and support for the fitting.
- Do not direct fix solely into plasterboard.

##### **Recessed Luminaires**

General: Install recessed luminaires in trimmed openings in the suspended ceiling.

Standard: To AS 2946.

**46.18.15 WIRING CONNECTION****General**

Each recessed light fitting shall be connected via a fixed 10 Amp, 3 pin earth socket and plug top with 1800mm long flexible cable. Surface mounted linear light fittings shall be directly wired to a terminal block within the light fitting.

Circuit wiring shall terminate in compatible socket outlets fixed to the structure within the ceiling space.

**46.18.16 ACCESSORIES MINIMUM STANDARDS****General**

Manufacturer: If of a similar finish, provide electrical accessories from the same manufacturer throughout the project and for interchangeability of subcomponents such as switch modules in wall plates.

**Lighting Outlets**

Pin arrangement: Conform to the following:

- Standard: 3 flat pin with looping terminal.
- Luminaires with integral emergency light or special switching: If required, a 4 or 5 pin plug or a second lighting outlet plug of alternative pin configuration to differential the functions or supply.

**Lighting Switches**

General: Provide light switches, as documented.

Standard: To AS/NZS 3133.

Type: Unbreakable polycarbonate rocker.

Colour: White.

Minimum: 10 A, 230 V a.c.

**46.18.17 COMPLETION****General**

Requirement: Before the date of practical completion carry out the following:

- Verify the operation of all luminaires.
- Adjust aiming and controls for all luminaires under night time conditions.
- Aim luminaires to superintendent direction.
- Clean all luminaires free from debris and dust.

**46.18.18 TESTING AND COMMISSIONING**

Test and commission the lighting installation. Commissioning shall include setting of lighting controls, focussing and aiming luminaires.

Clean all fittings and equipment at Practical Completion as recommended by equipment or fitting manufacturer.

Provide 12 months warranty from date of Practical Completion.

In addition, complete the following:

- All luminaires to be tested to ensure correct operation of luminaires and switch groups.
- All fittings to be focussed as directed by Superintendent.
- All adjustable fittings to be oriented and aimed as directed by Superintendent.
- All accessories to be fitted as directed by the Superintendent.
- All motion sensor timeout settings to be adjusted as directed by the Superintendent.
- All time clock settings to be adjusted as directed by the Superintendent.
- Preparation of outstanding defects list.
- Agree program for outstanding works completion.
- Confirm all labelling complete.
- Provide Operator training as specified.
- Complete all outstanding defects.

- Handover Maintenance Manuals, As-Built drawings and spare equipment to Client.

#### 46.19 TELECOMMUNICATIONS CABLING – VOICE & DATA COMMUNICATIONS

##### 46.19.1 RESPONSIBILITIES

###### General

Requirement: Provide a passive telecommunications cabling network system, as documented.

###### System Performance

Application class: To AS/NZS 11801 clause 6.3 Class E.

Balanced system: To AS/NZS 11801 clause 7 (data/voice) Category 6.

System warranty: 15 years minimum.

##### 46.19.2 STANDARDS

###### General

Authorities: To the requirements of the Australian Communications and Media Authority (ACMA).

- Cabling products: To AS/CA S008 and AS/NZS 11801.
- Installation of cabling: To AS/CA S009, AS/NZS 11801, AS/NZS 3084, SAA HB 252 and AS/NZS ISO/IEC 14763.2.
- Installation of small office/home office cabling: To AS/CA S009, AS/NZS ISO/IEC 15018 and AS/NZS ISO/IEC 14763.2.
- Cable management and documentation: To AS/NZS 3085.1.
- Communication Manual: HB29
- Electromagnetic compatibility (EMC): To AS/NZS 11801.
- Wiring Rules: To AS3000
- Telecommunications installations - Generic cabling systems - Specification for the testing of balanced communication cabling: To AS/NZS 3087.1:
- Telecommunications installations - Generic cabling systems - Specification for the testing of patch cords in accordance with AS/NZS 11801; To AS/NZS 3087.2:
- Communications Cabling Manual, Module 1: Australian regulatory arrangements: To HB 243
- Telecommunications installations - Integrated telecommunications cabling systems for
- AS/CA Regulations and Standards: To AS/NZS 3086:
- Communications Cabling Manual (CCM): To HB 29
- General premises and domestic cable installer's license and inspection requirements: To TS 010
- Abbreviations, definitions and terms used in Technical Standards: To TS 011

##### 46.19.3 INTERPRETATION

###### Abbreviations

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

- CES: Communication earth systems.
- EMI: Electromagnetic interference.
- EMR: Electromagnetic radiation.
- IDC: Insulation displacement connection.
- RU: Rack unit.
- TRC: Telecommunications reference conductor.
- UTP: Unscreened twisted pair.

##### 46.19.4 SUBMISSIONS

###### Certification

Requirement: Submit certification for product and installation.

Copper cable termination distributors: Provide vendor certification (including the warranty period) for the integrated voice/data copper cabling systems.

**Operation and Maintenance Manuals**

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

**Products and Materials**

Telecommunications cabling: 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.
- Patch panel module.
- Cable management for racks.
- Rack.
- Fly leads.

**Samples**

Product data and samples: Submit for the telecommunications outlet.

**Shop Drawings**

Telecommunications cabling: Submit the following:

- Layouts of equipment racks.
- Cross-connect layout.
- Cabling diagram for complete system.
- Cable management system.

**Warranties**

Provide a voice and data cabling and outlet system to comply with ISO/IEC 11801 Class E - Category 6 Applications - Structured Cabling System to AS11801.

All components in the installation shall be warranted from defect for a minimum of fifteen-(15) year's post the end of the project contract defects period. The system guarantee must apply to any protocol sanctioned by standards bodies for use with the category of cable installed in the system.

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**46.20 COMMUNICATIONS INFRASTRUCTURE**

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**46.20.1 TELSTRA HEADWORKS**

Prepare and submit an application to Telstra for the installation of the new lead in service cable.

Provide underground conduit from the Telstra point of connection to the Communications Cabinet, as shown on the drawings and in accordance with Telstra requirements.

Undertake mandrel testing of all conduits which are required to form the entry path to the Communications Cabinet, from the point of attachment pit located in the public footpath or road. Where the mandrel test indicates an obstruction in the conduit, undertake remedial works to correct the defect. Mandrel testing shall be conducted in accordance with the Communications Alliance Specification Industry Guideline G645:2011 – Fibre ready pit and pipe specifications for Real Estate Development Projects (section 5.10 and 8.1).

Submit a copy of the mandrel testing results to the Telstra representative and include a copy within the maintenance manual.

Liaise with Telstra representatives for the co-ordination of the installation of Telstra's lead-in service cable.

Allow the PROVISIONAL SUM scheduled in the PRELIMINARIES for Telstra Headworks.

**46.20.2 CARRIER LEAD IN CABLE**

Within one month of the contract acceptance notify Telstra and arrange for the incoming lead-in cable to meet the building program. Continue to liaise with the Telstra representative throughout the course of the works to ensure the target dates are achieved. Notify the Superintendent immediately in the event Telstra indicate the target may not be achievable.

Provide a copy of the notification to Telstra to the Superintendent.

**46.20.3 SCOPE**

Provide a voice and data cabling and outlet system to comply with ISO/IEC 11801 Class E - Category 6 Applications - Structured Cabling System to AS11801.

All components in the installation shall be warranted from defect for a minimum of fifteen-(15) year's post the end of the project contract defects period. The system guarantee must apply to any protocol sanctioned by standards bodies for use with the category of cable installed in the system.

The communications system is summarized as follows: -

- Conduit for the lead in cable from Telstra network pit to the Communications Cabinet.
- Communications equipment rack (CER) for integrated voice/data solution.
- Communications outlets and cabling.
- TRC system earthing.
- Testing and Commissioning.
- As constructed documentation.

**46.20.4 ACTIVE COMPONENTS**

Switches, servers and telephony equipment will be supplied and installed by the Principal near the end of the contract. Liaise with the Principal and provide attendance during installation and commissioning of the equipment.

Provide adequate rack space on the floor distributor and building distributor for equipment.

**46.20.5 COMMUNICATIONS EARTH SYSTEM (CES)**

Install a Communications Earth System in accordance with AS/CA S009.

Provide a Communications Earth Terminal (CET) at the Communications Cabinet. Provide connection from the Communications Earth Terminals, to the building main earth bar using method 1, as defined in AS/CA S009. Provide labels to all CET earth bars, and to all earth cables, in accordance with AS/CA S009.

Complete the following tests on the Telecommunication reference conductor:

- resistance from Communications Cabinet to ground

**46.20.6 EQUIPMENT RACKS**

Dimension and type: Conform to the following:

- Equipment racks: 19 inch wide industrial type, 800 mm wide RUs:
- 24 RU: Floor mounted, 800 mm or 1000 mm depth.
- Patch panels – Copper CAT 6 cables: 800 mm wide and 800 mm deep.
- Access location: Front, sides or rear.
- Cable tray: Locate within outer cabinet void.
- Doors: Provide transparent safety glass, lockable doors.
- Power provision: Minimum 10 socket outlet power rail for every rack.
- Cable management: Provide as follows:
- 1 module for every 2 patch panels.
- 1 module for each fibre termination panel.
- Location: Vertically, on both sides of the panel.

Provisions for active equipment: 25% minimum, 1 fixed shelf for every 4RU of active equipment space.

Ventilation: Fan assisted, four fan tray exhaust.

Earthing: CES earth bar required.

Fixing: Conform to the following:

- Floor mounted: Firmly fix to floor, bolt together multiple racks using standard kit accessories. Although fixed provide heavy duty castors to prevent the rack directly sitting on the finished floor.
- Floor/Wall mounted: Firmly fix to floor and wall.

#### **46.20.7 CROSS CONNECT PATCH PANELS (COPPER CABLES)**

General: Provide the following:

Provide patch panels at each Distributor cabinet to match the number of telecommunication outlets, voice and data, plus 10% spare.

Patch panels (including all connectors) shall be rated at 250 MHz and conform to the specifications for UTP connecting hardware (Category 6 - Class E Applications) as detailed in AS/NZS 11801. Patch panels shall be 24 way and be complete with metal rear cable management and Velcro ties unless otherwise nominated on drawings. The patch panels shall be suitable for mounting in 19" frames and shall be fixed using securing bolts and captive nuts at either side.

Terminate each cable at each patch panel using an 8-position modular RJ45 connection T568-A Wiring Sequence, compliant with connector clauses of this specification.

Arrange panels from the top (typically, unless otherwise shown on drawings): 1RU spare, Voice TP, Field Cabling, Equipment shelving. TPF backbone blocks shall be at the bottom of the cabinet.

Panels shall accommodate full labelling of every connector.

Cables terminating in connectors shall be dressed in the panel with due consideration to minimum bending radii. The cable dressing shall not cause permanent indentation of cable sheath.

Sufficient cable reserve shall be installed such that re-termination of connectors can occur in addition to an allowance for removal and inspection of the complete panels.

Protect cables entering panels by appropriate protective glands or grommets. Strain relief shall be provided at each termination such that any strain on the cable is not transferred to the electrical contacts in the connector.

Supply and install horizontal and vertical brackets (cable tidy's) for cable management of patching leads. Horizontal brackets shall be provided between every 2RU of patch panels and shall be open ring type with minimum dimensions 40mm x 60mm.

Equip each patch panel, to its full capacity, with RJ45 Cat 6 type modular sockets.

#### **46.20.8 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.

#### **46.20.9 CABLES**

Install cables in accordance with AS/CA S009- Communications Wiring Rules (ACMA Mandated) and in a manner, which eliminates any possibility of strain on the cable or terminations. Installation practices shall not deform the cable shape.

Cables shall not be installed within 100mm or parallel with power cables or within 10m of any sources of high-energy emissions such as transformers, generators etc. Any possible conflict with this requirement shall be referred to the Superintendent for instruction.

All cables are to be run via the shortest practical route to minimise cable length. Backbone UTP cabling shall not exceed 90 metres in length unless specifically for voice applications only. Due to the constraints of Category 6 cabling excess length in 4pair cables shall be kept to a minimum.

Slack retention at termination points shall be restricted to the amount of cable required for re-termination (less than 1 meter). The storage of cable shall comply with the minimum bend radius for that cable type as per manufactures specifications.

All cabling is to be handled, drawn in and fastened with care to ensure that physical damage is not caused to the cable. Cables shall not be subject to excessive draw forces during installation. Wherever possible cable shall be fed and drawn at the same time to avoid excessive strain on the cable. Any cable damaged during installation is to be replaced in its entirety. All sections of damaged

cable are to be removed as part of the replacement process. Cable shall not be left under tension at any point. Particular note should be taken of the entry/exit from the ceiling space, conduits, cable trays, catenary wires and vertical ducting. Where cables enter or leave pathways, they are to be protected from damage by use of suitable grommets or protective strips.

Joints or splices shall not be permitted in any installed cable.

Penetrations through fire-rated partitions or floors are to maintain the designated fire-rating.

Ensure that all Velcro cable ties are not drawn excessively tight. The cable ties should be installed in a manner so as not to distort the cable/s in any way. All cable ties are to be dressed neatly after installation.

Conduit or other type of cable enclosure shall not be mounted and exposed on wall surfaces, without written approval by the Superintendent unless otherwise specified.

#### **46.20.10 CABLE PATHWAYS**

Cabling is not to be embedded in plaster, concrete or similar materials. Where cable has to be routed through these materials, the cable is to be contained in conduit, or similar, which allows for easy reticulation of cables. Cable and horizontal pathways are to be routed to avoid ceiling space services such as light fittings and air-conditioning ducting.

Support cabling in ceiling spaces by cable trays or catenary wires. Cabling shall not be attached to ceiling support struts nor is it to rest on suspended ceiling surfaces.

Catenary wires may be used from the end of cable trays to the point where cabling is reticulated through vertical ducting. Cabling is to be secured to the catenary wires at regular intervals using Velcro ties. Support must be provided where cabling is reticulated from horizontal pathways to vertical ducting to carry the weight of the cables.

Where ever possible, cabling is to make use of vertical conduit or cavity walls, suitable for the reticulation of cable. Vertical ducting or service poles are to be supplied and installed wherever conduit or similar ducting is of insufficient size to accommodate the required cable bundle.

Where cables are run through steel noggins or studs, appropriate grommets shall be provided to protect the cables. Cable entry into a wall cavity shall be directly above or below the physical location of the information outlet location. The cable entry hole into the cavity should be sufficient to permit free running of all cables and a minimum of 20% spare capacity for additional cable.

#### **46.20.11 HORIZONTAL CABLING**

Provide Horizontal cabling to each outlet and other designated locations as indicated on the drawings.

The horizontal cabling to each outlet shall consist of two 4 pair 100 ohm UTP cables rated at 250 MHz and conform to the specifications for Category 6 - Class E Applications UTP Cable as specified in AS11801.

The total length of any UTP cable run from the telecommunication outlet to the patch panel is not to exceed 90 metres, and 100 metres including patch cords and fly leads.

Subject to above clauses – 2 metres of courtesy cable is to be left at both ends of each cable to allow re-termination if necessary. Where telecommunication outlets are located on skirting or similar ducting, sufficient additional cable is to be left in ceiling void to allow the removal of the outlet for servicing. Large service loops (500mm diameter minimum) are to be used to store excess cable.

UTP cables shall be reticulated and bundled in groups not exceeding Twenty four (24) cables.

Care is to be taken that UTP cabling is not bent at a radius less than that recommended by the supplier, and not less than ten (10) times the outside diameter of the cable during installation. "At rest" diameter can be four (4) times outside diameter.

All horizontal cabling is to maintain a separation from power cabling in accordance with AS/CA 009-2001.

Cable must be laid on the racks in a manner which does not impede the mounting of equipment in the rack.

#### **46.20.12 COPPER**

Standard: To AS/CA S008, AS/CA S009, AS/NZS 11801 and AS/NZS ISO/IEC 14763.2.

Campus and building voice backbone cables: Multicore CAT 3 UTP cable as documented or to suit the voice outlet density at each building or floor distributor, with 30% spare capacity allowance.

Horizontal cabling voice and data: CAT 6 UTP cabling to each floor outlet.

Balanced system cables: UTP.

Cable end length: Provide a 5 m cable loop at each end of the cable.

#### **46.20.13 EXTERNAL CONSIDERATIONS**

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

#### **46.20.14 SURGE PROTECTION DEVICES (SPD)**

##### **General**

Requirement: Provide all mode metal oxide varistor based series connected SPD to protect equipment in racks and cabinets, as documented.

Standard: To AS 4262.1 and AS 4262.2.

Surge rating ( $I_{max}$ ):  $\geq 20$  kA (8/20  $\mu$ s) phase to neutral and 10 kA neutral to earth.

Voltage protection level ( $U_p$ ):

- < 600 V at 3 kA.
- 700 V at 500 A.

Visual indicator: Provide visual indication of SPD status.

Supply and install approved surge line protector devices to all incoming and outgoing telephone and data lines at the communications rack, including carrier incoming lines.

##### **Test Standards**

IEC61643-11

#### **46.20.15 TELECOMMUNICATIONS OUTLETS**

##### **General**

Terminate horizontal cabling at an RJ45 connector using an Insulation Displacement Contact (IDC). RJ45 connectors are to be rated at 250 MHz and conform to the specifications for UTP Connecting Hardware (Category 6 - Class E Applications) as detailed in AS/NZS 11801.

RJ45 connectors shall be configured with a pin/pair assignment in accordance with T568A as detailed in AS/NZS 11801.

For twin telecommunication outlets, the horizontal data cable should be terminated on the right-most or lower RJ45 connector, and the horizontal voice cable should be terminated on the left-most or upper RJ45 connector.

The installation of the face plate and RJ45 connector should make allowance for each telecommunication outlet to be easily and distinctly identified and labelled as to its allocated use.

Outlets shall be of the same manufacturer and colour as adjacent power socket outlets.

Range: consistent with electrical service outlet range.

#### **46.20.16 FLY LEADS**

Provide one fly lead for every outlet shown on the plans. Fly leads shall be 2m long for 80% of cables; the remaining 20% shall be 4m long.

Fly Lead performance level shall be verified by the manufacturer to be a minimum of Category 6 when tested in accordance with AS/NZS 3087.2: Telecommunications installations - Generic cabling systems – Part 2: Specification for the testing of patch cords in accordance with AS/NZS 11801.

The fly leads shall be:

- constructed of a flexible (stranded/bunched connector) 4-pair cable conforming to the specifications for UTP cross-connect jumpers and patch cords (category 6) as detailed in ISO/IEC 11801;
- Terminated according to connector's section of this specification.
- Fly leads are to be supplied in a quantity to match the number of telecommunication outlets plus 10%.
- The length of the fly lead is to be clearly identified on the cable at both ends. The label is to be attached flush with the cable sheath and be colour coded according to length.
- Coordinate with the telephone vendor for system specific requirements.

Type: Stranded.

Length: 1200 mm.

Quantity: Provide fly leads to 100% of outlets installed.

#### **46.20.17 PATCH LEADS**

##### **General**

##### **UTP Patch Leads**

Provide patch cables in a quantity to match the number of telecommunication outlets plus 10% spare.

Patch cord performance level shall be verified by the manufacture to be a minimum of Category 6 when tested in accordance with AS/NZS 3087.2: Telecommunications installations - Generic cabling systems – Part 2: Specification for the testing of patch cords in accordance with AS/NZS 11801:

Patch cords shall be;

- Constructed of a flexible (stranded/bunched conductor) 4-pair cable conforming to the specifications for UTP cross-connect jumpers and patch cords (Category 6) as detailed in ISO/IEC 11801;
- Terminated according to AS/NZS 11801 (T568-A)
- The length of the patch cable is to be clearly identified on the cable at both ends. The label is to be attached flush with the cable sheath and be colour coded as follows:
  - Blue
  - Type: Stranded.
  - Length: 900 mm.
  - Quantity: 100% of outlets installed with 10% additional spare patch cords.
  - Termination: Registered jacks.

#### **46.20.18 TESTS**

##### **General**

Production tests: Complete as follows:

- Balanced cabling systems: To AS/NZS IEC 61935.1.
- Patch cords: To AS/NZS IEC 61935.2.
- Solder less connections: To AS/NZS 11801 Annexure C.
- Free and fixed connections: To AS/NZS 11801 Annexure C.
- Other connecting hardware: To AS/NZS 11801 Annexure C.

#### **46.20.19 LABELS**

##### **General**

Label telecommunication outlets, cables, and patch panel ports and IDC type blocks.

Provide mechanically printed Traffolyte labelling (7mm high), with 4mm high black lettering for the labelling of all telecommunication outlets, patch panels, and patch panel ports, using the colour coding convention established in AS/NZS 11801;

- Blue background for horizontal wiring (including telecommunication outlets and patch panels); and
- White background for system connections (including cross-connects, equipment rooms and to telecommunication cabinets).

Identify all outlets sequentially.

Identify all IDC type blocks using printed labels in proprietary holders.

Each horizontal cable shall be labelled 150 mm from each end and, at a minimum, marked with a permanent pen in a legible manner using a surface mounted label, which sits flush with the cable sheath.

Each bundle of up to 24 data cables shall be labelled at all locations where the horizontal pathways divide.

##### **Voice Backbone Cabling**

Labels patch panels, at which multi-pair cables from the TPF IDC Disconnect Modules are terminated, to reflect the pair's assignments for each RJ45 outlet.

Each group of 2-pairs is to occupy a sequential range of pairs on the TPF B side IDC Disconnect Module commencing from pair 1 e.g. Row 1 Port 1 is terminated on pairs 1-2, Row 1 Port 2 is

terminated on pairs 3-4 etc. Confirm with telephone vendor exact pair termination arrangement prior to commencing.

All other IDC Disconnect Modules and cables shall be labelled in accordance with standard telephone cabling practices and conventions.

#### **Patch Panel Labelling**

The numbering of each patch port is to commence at the left-hand side of the patch panel with 01 and proceed towards the right. DO NOT repeat numbers on different panels at the same rack. Leading zeros are to be included.

#### **46.20.20 DOCUMENTATION**

Produce and maintain accurate records of all cables and terminations undertaken as part of the installation process.

Provide backbone cable records such that each pair is clearly identifiable at each end and all cross jumpering is clearly shown.

Provide complete and up to date documentation to the Superintendent upon handover of the cabling system.

The documentation is to include, but not be limited to:

- a comprehensive list which identifies all components;
- a table, located in the equipment room, identifying all horizontal and vertical cables and their length;
- a detailed floor plan showing outlet locations and their identification label;
- a schedule detailing all tests undertaken and the results obtained for copper cables; and
- Cable records showing the pair assignments and all jumpering on all IDC-type blocks.
- Floor plans shall be provided in AutoCAD 2015 format.

#### **46.20.21 TESTING AND COMMISSIONING**

##### **General**

All components comprising the structured cabling system must be recognised as a Certified System. Proforma transmission performance testing reports and graphical results by an approved testing house must be made available to the superintendent prior to commencement of works.

Individual cable runs, terminations, and other system components are to be tested at the time of installation, and the complete system tested in its entirety prior to handover.

Test procedures must be designed to verify 100% end-to-end operation of the system, and in the case of UTP and fibre cables and componentry, Compliance Testing shall be in accordance with AS/NZS 11801.

##### **UTP Cabling Testing**

Test all UTP Cable using a level III tester as defined by AS/NZ3087.1.

Category 6 cabling and associated componentry shall be tested using Permanent Link configuration to Class E requirements as specified by AS/NS11801 for compliance testing and the electronic test results shall include full plot data. Submit the test results in soft copy, in the tester manufacturers' native format. Test reports are not acceptable in TXT, CSV and PDF formats

Replace any cable or system component, found to be damaged or identified as not meeting specifications or test requirements. Provide the necessary replacement with cost to the Principal.

Test all horizontal data cables are to be tested for termination and pair integrity (continuity, polarity, pin-assignment and colour code).

Inspect, all UTP cables to ensure that each pair has retained the required twist rate up to the point of termination - maximum amount of untwisting in a pair as a result of termination to connecting hardware shall be no greater than 13mm.

In addition to any other test considered necessary by the installer, the following end-to-end tests are to be carried out on the horizontal and vertical UTP cabling using the appropriate test set-up and apparatus and undertaken in accordance to compliance testing requirements of AS/NZS 1180111801 and AS/NZS3087, including: -

- Insertion Loss
- NEXT,

- PSNEXT,
- ACR,
- PSACR,
- ELFEXT,
- PSELFEXT,
- DC Loop Resistance,
- Skew,
- Length,
- Wiremap,
- Continuity of conductors,
- Return Loss;

#### **Test Results**

Provide all appropriate documentation and test results to the Superintendent, prior to Practical Completion.

All test results shall include: -

- Testers officers name
- Verification that tester is calibrated and using the correct version of firmware for the nominated test
- Time and Date of when each test was carried out
- A summary page with Directors signature

#### **46.20.22 COMPLETION**

##### **Cable Management**

General: Before the date for practical completion, submit log books for each distribution frame with details of cable terminations and provisions for recording cable, line and jumper information.

#### **46.21 TELEVISION DISTRIBUTION SYSTEMS**

##### **46.21.1 GENERAL**

Supply and install a complete MATV system to serve the outlets indicated on the drawings. Include for all equipment necessary, including but not limited to:

- Active and passive components including distribution amplifiers, filters and splitters.
- Distribution cabling.
- Outlets.
- Wiring termination.
- Labelling and records.
- 240 Volt power outlets necessary for amplifiers not shown on the electrical drawings but required for the system to operate.

The MATV system shall be suitable for reception and distribution of the full range of broadcast free to air digital television signals.

##### **46.21.2 STANDARDS AND REGULATIONS**

The system shall comply with the following standards:

AS 3000	SSA Wiring Rules
AS 1367	Multiple Outlet Distribution System – Sound and Vision
AS 1417	Receiving antenna for radio and television in the
frequency range 30 MHz to 1 GHz	

The system shall produce picture and sound where the impairment to any single parameter shall not be less than Grade 4 on the five grade impairment scale (CCIE recommendation 500-1, Kyoto 1978 Vol XI).

### 46.21.3 COMPONENTS

#### Cable

Cables shall have solid, foam or cellularised polymer dielectrics. Air spaces, semi-air spaced cables or multi-strand centre conductor cables shall not be used.

Ends of cables shall be sealed during installation to minimise moisture take-up.

Cables shall be 75ohm quad-shield flexible coaxial type with a layered construction and a minimum braid coverage of 60% (inner) and 40% (outer).

Install all cables clear of other services, maintain a minimum of 400mm where MATV cables run parallel to power cables.

All co-axial cables and other signal cables shall be run continuously from the originating point to termination and no joints or connectors will be permitted.

All connections shall utilise 'F' type connectors.

Bending radius: Conform to the minimum bending radius manufacturer's recommendations for the size of cable.

#### Television Outlets

All television outlets shall be fitted within wall plates matching the socket outlet, as detailed elsewhere in this specification.

- Female F connector drop cable connection
- AC isolation
- 240 volt insulation

### 46.21.4 AMPLIFIERS/SPLITTER

Amplifiers/splitters shall be selected to suit the system requirements for signal amplification and filtering. Amplifiers and splitters shall be located with designated communication cupboards.

### 46.21.5 ANTENNAE

Provide a suitable antennae array, mounted to the building structure at roof level. Provide all mounting brackets and fixings to secure the antennae array, all brackets and fixings shall be galvanised steel.

Conduct a survey of the signal reception on site to determine the optimum location at which to position the antennae. Submit details of the proposed location to the Superintendent, for approval, prior to commencing installation.

### 46.21.6 COMMISSIONING

Test system after installation to demonstrate satisfactory performance. Measure and record signal level for each channel at all outlets. Demonstrate acceptable reception quality on TV and radio receivers. Signals shall be free from hum, distortion, ghosting, cross-modulation and other visual or audible faults. Where signal quality is unable to achieve the parameter prescribed herein, provide digital to analogue converters to enable reception of the inferior channel signals in digital form.

Provide all equipment, instrument, signal level meter, television receivers (standard domestic unit) and labour required to carry out system adjustments and testing.

Following commissioning tests, separate acceptance tests shall be carried out in the presence of the Proprietor's Representative at a selection of outlets nominated by the Proprietor's Representative. Provide two days notice of acceptance tests.

Complete test reports and submit three certified copies to Proprietor's Representative. Include statement of maximum and minimum signal levels recorded at outlets.

### 46.21.7 GUARANTEE AND WARRANTIES

Provide a performance guarantee on the MATV system. The guarantee shall warrant satisfactory operation of the system for the defects liability period.

## 46.22 EMERGENCY EVACUATION LIGHTING

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### 46.22.1 RESPONSIBILITIES

#### General

Requirement: Provide single point monitored emergency lighting and exit signs, as documented.

### 46.22.2 STANDARDS

#### General

- System design, installation and operation: AS 2293.1.
- Inspection and maintenance: To AS/NZS 2293.2.
- Emergency escape luminaires and exit signs: To AS 2293.3.
- National Construction Code (NCC/BCA)

### 46.22.3 SUBMISSIONS

#### Operation and Maintenance Manual

Standard: To AS 2293.1, Section 8.

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

#### Products and Materials

Emergency evacuation lighting: Submit technical data for each type of luminaire and exit sign including the following:

- Maximum luminaire spacing for a given mounting height.
- Luminaire classification to AS 2293.3.

#### Samples

Emergency evacuation lighting: Submit samples of all luminaires and exit signs.

#### Tests

General: Submit test results to demonstrate system compliance with AS2293.

## 46.23 EMERGENCY LIGHTING SYSTEMS

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### 46.23.1 GENERAL

Provide an emergency lighting system as shown on the drawings and specified herein. The completed system shall comply with the requirements of AS2293, AS2676 and AS3000 latest editions as applicable.

All emergency lighting fittings shall be of the performance classification specified in the luminaire schedule and shall be of the single point type.

Provide test facilities for conducting a discharge test on all emergency luminaires and exit signs without necessitating disconnection of supply to the normal lighting. Such facilities shall comply with the latest Australian Standards and shall be installed on the appropriate distribution board(s).

### 46.23.2 SINGLE-POINT SYSTEM LUMINAIRES

Self-contained emergency luminaires shall be type tested in accordance with AS2293 and NCC. Duration of operation shall be minimum 2 hours.

Battery chargers and inverters shall be located away from heat sources.

Single point emergency lighting fittings shall be connected to an unswitched active of their relevant lighting circuit to sense power failure. Operation, both on power failure and power restoration, shall be automatic.

Visual indicator lights: Provide a red indicator, readily visible when the luminaire is in its operating location, which indicates that the battery is being charged.

Inverter system: Provide protection of the inverter system against damage in the event of failure, removal or replacement of the lamp, while in normal operation.

Local test switches: Provide a momentary action test switch, accessible from below the ceiling, on each luminaire to temporarily disconnect the mains supply and connect the battery to the lamp.

Common test switches: Provide a common test switch on the local distribution board which disconnects main supply to the luminaires and tests for discharge performance and automatically reverts to normal operating mode after testing.

#### **46.23.3 ILLUMINATED EXIT SIGNS**

Illuminated exit signs shall comply with all other clauses of this specification section.

Emergency exit signs shall be LED unless otherwise specified.

Emergency exit sign shall be mounted at a height of not less than 2000mm and not higher than 2700mm above finished floor. Where exit signs are shown to be located above a door, the sign shall be mounted 150mm above the top of the door frame.

#### **46.23.4 BATTERIES**

Type: lithium iron phosphate batteries capable of operating each lamp at its rated output continuously for at least 2 hours during commissioning tests and 1.5 hours during subsequent tests.

Battery life: At least 3 years when operating under normal conditions at an ambient temperature of between 10°C and 60°C and subject to charging and discharging at 6 monthly intervals.

Marking: Indelibly mark each battery with its date of manufacture.

#### **46.23.5 CLASSIFICATION OF EMERGENCY LIGHTING FITTINGS**

All lighting fittings, which include emergency operation, shall be fully tested and classified by a NATA registered laboratory in accordance with the requirements of AS2293 and the Building Regulations.

Where emergency lighting forms part of a project lighting fitting or an adaptation of a previously certified lighting fitting, then full NATA testing for re-certification shall be carried out.

AS2293 classification certificates from an approved NATA laboratory shall be lodged for each type of emergency lighting fitting and illuminated exit sign.

#### **46.23.6 IDENTIFICATION**

General: Label each luminaire with a unique identifying number. Provide a label which is permanently fixed, indelible and readable at a distance of 1 m.

Emergency evacuation lighting schedule: Record the number and luminaire location in an emergency evacuation lighting schedule and as constructed drawings included in the operation and maintenance manual.

#### **46.23.7 MANUAL TESTING FACILITIES**

Supply and install a test facility to enable a manual initiation of a discharge test of the emergency luminaires and exit signs to comply with the following:

The test facility shall provide for the operation of the relevant group of emergency luminaires and exit signs by simulating a supply failure.

The test facility shall be capable of being manually reset, but shall automatically revert to the normal state after the required duration. NOTE: Provision may be made for continuance of the discharge test beyond the required duration. Switch shall be similar to Clipsal VETR 2031.

The test facility shall be located within the associated distribution board enclosure.

The function of the test facility shall be clearly engraved: "Emergency Lighting Test Switch".

#### **46.23.8 TESTS**

##### **General**

Requirement: Carry out tests, including out-of-hours tests, to demonstrate the emergency and evacuation system's performance. Include the following:

- Test components for correct function and operation.
- Demonstrate illumination performance on site, to at least the level stated in the manufacturer's recommendations for performance for that device.
- Test operation of battery discharge test and control test switch functions, including discharge and restoration.
- Demonstrate system functions under mains fail condition.

- Demonstrate operation of the battery and charger including a full discharge/recharge over the designated time.

**Mains Supply**

General: Before commissioning, make sure mains supply has been continuously connected for at least 24 hours.

**46.24 ELECTRONIC SECURITY**

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**46.24.1 RESPONSIBILITIES****General**

Requirement: Provide electronic security systems, as documented.

**System Components**

Requirement: Provide the following components:

- Remote monitoring system.
- Access control system.
- Intruder detection system.
- Closed circuit television system.

Security classification: As documented.

System communications: As documented.

**System Provider**

Electronic security system provider: A licensed security organisation only.

All works shall be performed by a suitably licensed Contractor in compliance with the W.A. Police Department Criminal Investigations Bureau and the requirements of AS2201.1 -3.

**46.24.2 STANDARDS****Intruder Alarm Systems**

- General: To AS/NZS 2201.1.
- Alarm transmission system: To AS/NZS 2201.5.
- Internal detection devices: To AS 2201.3.

**CCTV Systems**

General: To AS 4806.2.

Remote monitored systems: To AS 4806.4.

**46.24.3 SUBMISSIONS****Operation and Maintenance Manuals**

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

**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.
- Duress alarm switches.
- Motion detectors
- External alarm devices
- Visual indicators
- Cameras

**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.
- Fixing provisions for cameras and monitors.

**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.
- Monitors, cameras and associated equipment.
- Cameras.

**46.25 ACCESS CONTROL AND INTRUDER DETECTION**

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Provide and monitor a combined Security System to protect the building envelope and to control access to selected areas within the building. The system shall be Tecom Challenger, Inner Range Concept 4000, Gallagher, or equal and approved to match the principals existing systems.

Provide all labour, materials and accessories necessary for a complete and fail safe working system to the general arrangement as indicated on the scheduled drawings and scheduled below.

The work includes but not limited to the following:

- Control and communications equipment
- Data gathering panels
- Intrusion detection devices
- Smoke Detectors
- Electric locking devices & associated access control
- Local audible alarms.
- Tamper circuit monitoring.
- Supply of access keys
- All interconnecting cabling and hardware
- Battery backup (6.5-Hour Minimum) and power supply.
- Training and tuition.
- Testing and Commissioning.
- 12 months defects and liability support and operational maintenance.
- Connection to off-site security monitoring, including first 12 months monitoring.

Cabling shall be provided to match the specifications of the manufacturer.

**46.25.1 SYSTEM REQUIREMENTS****Control Equipment**

Provide the security system headend control equipment at location shown on drawings. The controller shall provide but not be limited to the following features:

- Allow independent operation of up to 16 areas with extended memory.
- Support a minimum of 16 arming/disarming stations.
- Support supervised duress zones.
- 24 hour alarm zones (programmable).

- Front panel indication of system status at each arming/disarming station.
- Entry warning low level audible indication at arming stations.
- Individual zone bypass facilities.
- Adjustable entry and exit delay, available to each of the areas controlled by arming stations.
- Programmable entry path sequence.
- Outputs to activate new external devices.
- Alarm memory log.
- Programmable user codes with user number to be identified at the monitoring station.
- Complete with independent battery supported power supply unit.
- Be downloadable to allow remote system management and programming changes.

#### **46.25.2 ELECTRONIC EQUIPMENT REQUIREMENTS**

Provide electronic equipment as detailed below:

- Operate in ambient temperatures from 5 degrees C to 55 degrees C.
- Cooling shall be by natural ventilation.
- All switching contacts shall be rated by the component manufacturer for 1,000,000 operations.
- Relay coils shall be suitable for operation from their respective supply voltage +20%, -25% in battery powered equipment and at +15% in mains only powered equipment.
- Frequency of 1000 HZ shall be used for test and reference purposes in audio circuits.
- Mains operated equipment shall be suitable fused and suitable for operation from a single phase in accordance with WAER.
- Cabling shall be protected against damage by overloads.
- Cable liable to bending during service or maintenance shall be of a flexible type.
- Plugs and sockets shall be labelled with the circuit they connect.
- Cabling within equipment shall be neatly laced and tied and supported on metal brackets as necessary.
- Interconnections between equipment and internal modules shall be via plug socket connections.
- All indication lamps shall be L.E.D.
- Be protected from transient voltages caused by lightning strikes, power surges, etc.

#### **46.25.3 SOFTWARE**

Provide a licensed copy of the latest release software, for operation and management of the security system. Provide instruction of the Client's Representative in the operation of the system.

#### **46.25.4 POWER SUPPLIES**

The access control system shall be designed for operation from mains in accordance with WAER. All circuitry shall operate from a DC voltage derived from the mains. The DC voltage shall be battery supported via fully sealed lead acid batteries with sufficient capacity to maintain full operation of the system, including retaining integrity of locking devices, for at least eight (8) hours following mains power failure.

The batteries shall be maintained in a fully charged condition by a constant voltage battery charger.

The charging conditions shall be in accordance with the battery manufacturer's specifications.

The charging rate shall be capable of fully recharging the battery from a fully discharged condition, in not more than twenty four (24) hours.

The date of installation of the battery shall be clearly and indelibly marked on the body of the battery.

The changeover to battery operation shall be completely automatic without initiation of any alarm signal.

Provide all 240 Volt socket outlets as required for the access control system, in addition to those indicated on drawings. General-purpose outlets shall be on a suitably protected separate final subcircuit.

Note: Power supply equipment is to be contained with equipment enclosures or in independent enclosures to approval. Exposed plug in step down transformers are not acceptable.

#### **46.25.5 TERMINATION IDENTIFICATION**

All cables shall be numbered in accordance with an approved system. Each junction box shall be supplied with cable schedule, clearly setting out the interconnections between cables in that box and their final destination and fitting identification

#### **46.25.6 EGRESS BUTTON**

Egress buttons shall be provided as momentary action push buttons installed as shown on the drawings. The architrave switch shall be a Clipsal metal range, brushed stainless steel flat style plate engraved to read "PRESS TO EXIT" in black lettering.

#### **46.25.7 PROXIMITY CARD READERS**

Readers shall be located as shown on the drawings or detailed in the schedules, and be mounted 1000mm above finished floor unless otherwise specified or where indicated on bollards. Ensure that readers are positioned a minimum 75mm from the end of door swing.

The access control readers shall be vandal resistant, high security type with red and green lights, HID Proxpoint Plus or equal and approved.

The installation of the proximity reader shall be in accordance with the manufacturers' installation guidelines and recommendations.

Card readers mounted in car park areas or external walls shall be mounted directly to the surface of the wall, or via stainless steel wall plates. Mounting card readers to plastic wall plates will not be accepted.

#### **46.25.8 KEY CARDS**

Key cards shall be as HID ISO PROX II, 125 kHz proximity type and shall enable direct or transfer printing auto cards.

Provide a quantity of 50 key cards; include programming of all cards as directed by the Principal.

#### **46.25.9 SMOKE & THERMAL DETECTORS**

Provide smoke and thermal detectors as part of the security system to provide coverage as indicated on the contract drawings. Smoke detectors shall comply with AS 12239 or AS3786 and thermal detectors with AS 1603.3.

Detector finish colour (confirm with Superintendent prior to order); -

- When installed to white ceilings – finish white.
- When installed to timber or feature ceilings – finish black.

#### **46.25.10 DOOR CONTACT SWITCHES**

Provide door contact switches as noted on the contract documents to suit the item to be secured. Provide minimum one switch per opening component i.e. one per door leaf.

Contact switches to internal doors shall be 3/4" end-on-end concealed type. Surface mounted contact switches shall only be utilised where concealed type cannot be accommodated and with approval from the Superintendent.

Provide heavy duty reed switches to roller shutters as DAS Sentrol or equivalent.

#### **46.25.11 MOTION DETECTORS**

Movement detectors shall be of an approved passive infra-red type and with integral LED.

The passive infra-red detection range shall not decrease as room temperature nears body temperature. The range/type of detector shall provide coverage to the total area in which it is shown and shall have individual outputs for the signalling of alarm, tamper and trouble.

The detection sensitivity shall be adjustable.

The motion sensor shall signal an alarm when its alarm relay is de-energised (N.C.). Tamper switch shall be closed, when the equipment is fully assembled.

An alarm-indicating LED on the sensor shall be capable of being disabled, but shall indicate trouble by flashing, even when disabled. Provide sufficient cable cores (normally 6 cores) to each PIR to allow individual or group disablement of LED operation, via remote terminal.

Seal all cable entry and mounting holes, after installation, to prevent ingress of insects, draughts, etc.

Install mounting brackets where corner or direct wall mounting does not provide optimum detector performance.

#### **46.25.12 AUDIBLE ALARM AND VISUAL INDICATOR**

Provide an approved external weatherproof siren and visual indicator to the building.

The exact location of audible alarm and visual indicator shall be reviewed on site with the Architect and Electrical Engineer before installation of conduits and cabling.

#### **46.25.13 TAMPER ALARM**

Unauthorised tampering with detectors, cabling, equipment and readers shall cause a tamper alarm. The tamper circuit shall operate twenty four (24) hours per day, regardless of whether the system is 'sealed' or 'unsealed'.

#### **46.25.14 ELECTRIC DOOR LOCKS**

Supply electric locks comprising of mortice deadlocks, as indicated on the drawings and employ an experienced locksmith to install and commission all electric locks.

The electric mortice deadlock shall provide an output that is activated when the door handle is used.

The locks shall be 12VDC operating with continuously rated coil, and power to lock or open operation shall be selectable.

Interconnect all mortice lock tongue sense monitoring switches and separate door reed switch to provide positive indication of door status being closed and locked. Install reed switch to all doors as further specified. Inspect the installation of mortice locks and advise in writing that installation tolerances are acceptable.

Locks shall be set for fail-safe mode for tender purpose. Confirm all settings prior to installation.

Coordinate installation of all devices to ensure the completion of the whole system.

#### **46.25.15 MAGNETIC LOCKS**

Provide magnetic locks consisting of electromagnet and armature plate, located at the top of the door unless otherwise noted.

Locking device shall fail safe, however shall be connected to the battery backup of the security system.

Locks shall be monitored by the security system.

External locks (e.g. for gate) shall be IP67, and complete with a stainless steel housing.

#### **46.25.16 BREAK GLASS DOOR RELEASE STATIONS**

Break Glass Door Release Stations shall be semi recessed devices (15mm maximum protrusion from surface of wall) white in colour and directly break power to the associated door, releasing the door, and produce a separate alarm on the headend/system.

Activation of a Breakglass station shall operate a local audible alarm which shall remain active until the glass is replaced, reset, or the alarm is isolated by the operator.

Clearly label station "Emergency door release" to approval.

#### **46.25.17 DATA GATHERING PANELS**

Provide data gathering panels with adequate capacity to monitor and separately communicate all alarm points shown.

DGP enclosure shall be constructed in compliance with AS 2201.1 and protected by the tamper circuit.

#### **46.25.18 REMOTE ARMING STATION**

Provide keypad remote arming station at the location(s) indicated on the drawings.

The keypad shall:

- Have LCD alphanumeric display.
- Support the alarm system as shown on drawing.
- Be assembled in a neat, compact housing.
- Have a durable key pad for pin number entry.
- Show alarm status of all alarmed areas.
- Have front panel indication of system status.

#### **46.25.19 EXTERNAL SIREN**

Provide wall mounted external strobes complete with weatherproof and vandal resistant housing, internal sounder and anti-tamper switch.

The location noted on the contractor documents shall be utilised for tender purposes only; include costs to relocate the siren enclosure within 4m of the noted location, as directed by the Superintendent.

Provide sample for approval and position on site as directed by the Superintendent.

#### **46.25.20 COMMISSIONING AND HANDOVER**

##### **Testing**

Test the complete alarm system.

Testing will not take place until the Architect is satisfied that the system has operated free of faults for seven (7) days following commissioning of the installation.

Materials and workmanship shall comply with the requirements of the following standard specifications and codes:

- AS 3000
- AS 2201 (Parts 1 and 2)

##### **Handbooks**

Supply three (3) neatly bound service handbooks for the installation and equipment supplied in the security and access control systems. These handbooks shall give complete and detailed information on the installation and shall contain at least the following information:

- Block diagrams which shall show the interconnection between major pieces of equipment.
- Circuit diagrams which shall be annotated with voltages present, under no signal conditions, at salient points in the equipment.
- Layout diagrams, which shall indicate the location of major pieces of equipment and the location of each component within each piece of equipment.
- Cabling diagrams which shall indicate the layout of all cables, including colour codes and details of the terminations of all cables.
- Where pieces of equipment or parts of equipment are identifiable by model numbers, those numbers with the make, shall be stated.
- A complete component list, listing all components with their appropriate ratings and/or part number, shall be given.
- An operational description of each circuit shall be given.
- Operating instructions, which shall clearly set out the operation of each piece of equipment.

The above literature shall be of a professional standard, both in format and presentation.

##### **Programming/Training**

Fully configure the system software to the Principal's requirements.

Train users in system operation and programming. Include in tender price for 2 hours training for group (minimum of 4 representatives).

Train personnel, to be nominated by Superintendent, during each programming phase. Provide 2 off overview instruction sheets, laminated, including:

- Instructions for arming/disarming whole system
- Instructions for arming/disarming individual partitions
- Instructions for contacting monitoring service

- Instructions for responding/resetting duress alarm

#### **46.25.21 SYSTEM MONITORING**

Provide remote monitoring of the system for a period of 12 months from the date of practical completion. Pay all fees and any ongoing costs. The monitoring system shall be a Grade 1 central monitoring station in accordance with AS2201-1992.

The system shall provide options for reporting alarms and other information as required to a remote and/or local Central Monitoring Station.

#### **46.26 CCTV SYSTEM**

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##### **46.26.1 GENERAL**

Design, supply, install and commission an IP CCTV Surveillance system consisting of colour CCTV cameras, monitors, network video recorders, network switch and associated equipment in locations shown on drawings.

The system shall be as specified within the following clauses, or as per the manufacturer's current product and software range.

The system shall be sourced and warranted through the manufacturer's authorised Australian distributor.

The CCTV surveillance shall consist of high definition cameras, monitors, network video recorders and associated controls providing good visual coverage of all parts of the areas under surveillance.

The systems shall include all necessary equipment and expertise required to provide the effective and reliable operation of the total integrated system.

The work consists of the design, supply, delivery, installation, testing and commissioning of a complete system with all necessary associated equipment and cabling in accordance with this specification. The work shall include, but not be limited to, the following: -

- IP CCD colour cameras
- Housings for CCTV cameras
- Network video recording units and control equipment
- Controls complete with interface to intruder alarm/access system
- Colour HD LCD monitors and security system server maintenance operator/terminals
- Control, power, audio and video signal cabling and cable management
- 19" racks with space for additional equipment to be installed
- 2 off remote access terminals
- Dedicated LAN
- Training
- Commissioning
- Maintenance
- Other miscellaneous items

The system shall include the recording of all cameras for a 31-day period. Refer to subsequent requirements for recording.

The GUI Video Management Software package shall include the following capability:

- All-in-one alarm centre station
- Matrix features for camera management and control
- Full remote control
- Playback features
- Multicasting
- Available with pre-configured hardware

**46.26.2 APPROVED INSTALLERS**

All works shall be performed by a suitably licensed Contractor in compliance with the W.A. Police Department Criminal Investigations Bureau and the requirements of AS2201.1 -3.

The Installer shall be confirmed by the tenderer at the time of the tender submission and shall be a certified installer at that time.

**46.26.3 SYSTEM CAPACITY**

The CCTV system shall be supplied and installed to suit the number of documented cameras. Provide sufficient allowance with software, storage and hardware enclosures.

**46.26.4 CCTV SITE TESTING**

Carry out a lens selection test for each camera location. These tests are further detailed under the Camera Lens clause. When the tests meet the approval of the Superintendent, approval will be given in writing to proceed with the final installation.

**46.26.5 CCTV IMAGE CAPTURE**

Prior to award of Practical Completion provide a 3 minute video capture of each CCTV camera commencing at the following times on the same day;

0600Hrs

1200Hrs

1630Hrs

Provide the above video for review and acceptance by the Superintendent and adjust camera settings and position as directed. Provide a copy of the final video capture at Practical Completion to the Superintendent with a duplicate copy within each manual.

**46.26.6 NETWORK DEVICES**

Provide active network devices to transmit and control the CCTV installation over the security LAN generally as noted below:

**46.26.7 NETWORK VIDEO RECORDER (NVR)**

Provide NVR's as Hikvision DS-7716NI-I4-16P or equivalent. The NVR shall incorporate, although not be limited to:

- Up to 12MP resolution recording.
- HDMI and VGA output at up to 1920 x 1080 resolution.
- Plug and play with 16 independent PoE network interfaces.
- 4 SATA HDD interface up to 4TB each.
- HDD quota and group management.
- Hard drive sized to suit video storage requirements and as further described.
- 16-ch 720P synchronous playback, and support picture capture and playback.
- Operate with third-party network cameras.

The network video recorder (NVR) shall be a high-quality recorder capable of recording as many as 16 IP cameras at no less than 4CIF. The maximum recording resolution shall be up to 12MP.

The NVR shall be rack mounted with the communications equipment rack and include monitor, remote control and mouse for playback and recoding function.

The NVR image storage requirements shall be based on the following criteria. Provide data storage calculations for acceptance as part of the shop drawing submission process.

- 31 days storage.
- Record on motion detection at 30fps, 1080P resolution and high quality per camera.
- Record 25 seconds prior and after any motion detection.
- Continuous recording when no motion detected at a rate of 30fps.
- Motion detection shall be based on 50% motion per day (12 hours) across all cameras.
- Stored image resolution of 1080P.

**46.26.8 NETWORK SWITCHES**

Provide network switches and configure to accepted required quantity of CCTV inputs allowing for the designated spare allowances.

The network switches shall be rack mounted within secure locations as approved by the Superintendent.

**46.26.9 MONITORS**

Provide 20" LED CCTV playback monitor to the centralized security equipment rack.

Monitors shall be minimum commercial high definition LED displays and include desktop brackets as appropriate.

Final configuration of screen display and sequencing to be confirmed with Superintendent prior to programming. Superimpose all images with the locations of camera being displayed.

**46.26.10 ALARM INTERFACE UNIT**

Provide an alarm interface unit to the intruder detection system.

**46.26.11 VIDEO TAMPER/LOSS DETECTION**

Provide a video tamper/loss detection unit to detect variation in scene contrast below a pre-set level, video and sync loss.

**46.26.12 EQUIPMENT RACKS****Headend Equipment**

The CCTV system control equipment shall be housed in the communications equipment rack.

**46.26.13 CAMERAS****General**

Provide cameras to positions generally as shown on the drawing. The exact location shall be determined on site in conjunction with lens selection testing.

The following camera types shall be provided or an equivalent approved. Where an alternative manufacturer or type is included this should be declared at the time of tender.

Camera finish colour (confirm with Superintendent prior to order); -

- When installed to white ceilings – finish white.
- When installed to timber or feature ceilings – finish black.
- When installed externally – white or black.

**Internal Camera Locations**

Cameras shall be fully compatible with the system NVR and comprise of motorised varifocal dome network cameras as Hikvision DS-2CD2786G2T-IZS series IK10 rated vandal resistant dome cameras (8MP). The cameras shall incorporate, although not limited to the following features:

- The network camera shall offer three video streams with up to 8MP resolution (3840x2160) in progressive scan CMOS format, with H.264+ video compression.
- The camera shall include a motorised varifocal lens 2.8 – 12mm.
- The network camera shall provide true & day night (ICR) low-light capabilities with sensitivity down to 0.01Lux @(F1.2,AGC ON), 0 Lux with IR & 0.014Lux @(F1.4,AGC ON), 0 Lux with IR
- The network camera shall feature 120dB wide dynamic range.
- The camera shall offer video compression of H.264, H.264+ and MJPEG. Dual H.264 streams shall be supported with independent resolution, bit rate and frame rates for the main and sub streams.
- The network camera shall include embedded Linux OS and support IE and client software for network preview, and be capable of performing firmware upgrades through a network using a software-based device utility or through the web interface.
- The network camera shall support standard IT protocols including: TCP/IP, ICMP, HTTP, HTTPS, FTP, DHCP, DNS, DDNS, RTP, RTSP, RTCP, PPPoE, NTP, UPnP, SMTP, SNMP, IGMP, 802.1X, QoS, IPv6, Bonjour(SIP optional).
- The network camera shall support industry standard Power over Ethernet (PoE) IEEE 802.3af for powering the camera over the network in addition to 12VDC local power.

**Physical Requirements**

Operating Conditions	-30 °C ~ 60 °C (-22 °F ~ 140 °F)
Humidity, all models	95% or less (non-condensing)
IR Range	Up to 20 metres
Impact rating	IK10
IP rating	IP66
Weight	1,000 g

**Construction**

Body Material	Aluminium alloy
Body Colour	Hikvision White
Screws	Stainless Steel, Security Torx

**46.26.14 EXTERNAL CAMERA LOCATIONS – DOME TYPE**

Dome type external cameras shall only be provided when mounted horizontal to the underside of a canopy. The use of dome type cameras in locations exposed to direct sunlight will not be permitted.

Cameras shall be fully compatible with the system NVR and comprise of surface mounted Fixed IR mini dome network cameras as Hikvision DS-2CD2786G2T-IZS series. The cameras shall incorporate, although are not limited to the following features:

- IP67 rated vandal resistant housing.
- Dual video streams with up to 8MP resolution (3840x2160) in progressive scan CMOS format, with H.264 video compression.
- Provide true & day night (ICR) low-light capabilities with sensitivity down to 0.07Lux @(F1.2,AGC ON), 0 Lux with IR
- Back-Light Compensation (BLC) with selectable zones.
- Video compression of H.264, MJPEG. Dual H264 streams shall be supported with independent resolution, bit rate and frame rates for the main and sub streams.
- Embedded Linux OS and support IE and client software for network preview, and shall perform firmware upgrades through the network using a software-based device utility.
- Support standard IT protocols including: TCP/IP, HTTP, DHCP, DNS, DDNS, RTP, RTSP, PPPoE, SMTP, NTP, UPnP, ICMP, IGMP, SNMP, FTP, QoS.
- Video motion detection with user defined areas and configurable sensitivity levels. In addition, the motion detection shall be supported by an arming schedule with the audible warning, surveillance centre notification, email, ftp upload, and alarm output triggered as supported events.
- Conform to ONVIF, PSIA and CGI standards for integration with 3rd party video management systems (VMS).
- Power over Ethernet (PoE) IEEE 802.3af for powering the camera over the network.

**Physical Requirements**

Operating Conditions	-30 °C ~ 60 °C
Humidity, all models	95% or less (non-condensing)
IR Range	20 metres
Dimension	140mm Dia x 100mm H
Weight	1Kg

**Construction**

Body Material	Aluminium alloy rated to IP67
Body Colour	White
Screws	Stainless Steel, Security Torx

**46.26.15 EXTERNAL CAMERA LOCATION – FULL BODY TYPE**

Cameras shall be fully compatible with the system NVR and comprise of pole mounted Fixed IR array bullet network cameras as Hikvision Darkfighter series ref DS-2CD2685G1-IZS. The cameras shall incorporate, although are not limited to the following features:

- IP67 rated vandal resistant housing.
- H.264 video compression.
- Provide true & day night (ICR) low-light capabilities with sensitivity down to 0.002Lux @(F1.2,AGC ON), 0 Lux with IR
- Full HD1080P video resolution to 60fps.
- Motorised VF lens with Smart Focus.
- 120dB WDR
- 100m IR Range.
- Built-in heater.
- Adjustable sun shield.
- Conform to ONVIF, PSIA and CGI standards for integration with 3rd party video management systems (VMS).
- Power over Ethernet (PoE) IEEE 802.3af for powering the camera over the network.

#### Physical Requirements

Operating Conditions	-30 °C ~ 60 °C
Humidity, all models	95% or less (non-condensing)
IR Range	50 meters
Dimension	100 x 103.9 x 311.8mm
Weight	2Kg

#### Construction

Body Material	Aluminium alloy rated to IP67
Body Colour	White
Screws	Stainless Steel, Security Torx

#### 46.26.16 CAMERA LENS

Camera lens shall be selected to best suit the field of view with regard to functional operations.

The lens shall also be selected with consideration given to the specific lighting levels within the operational areas, in particular to suit lighting variations while maintaining accurate images of the particular operations.

A lens selection test shall also determine the final location of cameras. The tests shall be carried out in the presence of the Superintendent.

The lens selection tests shall be carried out after all control equipment has been installed and is operational for viewing purposes.

Allow at camera locations 5 metres of control/video/power cable tails to allow final positioning of cameras to preferred selected location.

The final location of cameras within the 5 metre allowance shall not incur any additional cost to the contract.

#### 46.26.17 UPS

Provide a rack mounted Power Shield Commander online uninterruptible power supply for the CCTV headend rack mounted system. Battery capacity shall provide for 1 hour backup in case of mains failure at full load of all equipment, including spare PoE ports, plus 25% future growth.

#### 46.26.18 INSTALLATION

##### General

Supply and install all conduit, cabling, plugs, sockets, boxes and the like as required to complete the installation.

Conceal the complete installation.

The installation standards and materials used, shall be designed to provide reliable operation over long periods with minimum attention and shall provide appropriate protection against mechanical damage by intruders and vandals.

**46.26.19 CABLE MANAGEMENT**

Provide cable management in accordance with the general clauses of this specification.

Conduit exposed to the weather shall be galvanised screwed metallic conduit.

**46.26.20 INSTALLATION WIRING**

All cabling systems shall be supplied, installed and terminated in accordance with the general clauses of this specification.

Cable systems for control and communications signals shall be to the equipment manufacturer's specifications.

Cabling systems shall be in accordance with the manufacturers requirements, but in any instance a minimum grade of Cat 6.

Underground cable or cable exposed to the weather shall be external graded.

**46.26.21 CIRCUIT PROTECTION**

All external circuits except 240 Vac arriving at the equipment rack shall be protected with approved surge diverters (the surge diverters form part of this contract). Connect all surge diverters to a common earth busbar and connection to earth.

Surge diverters shall be located at both the camera and rack termination point and shall comprise of NOVARIS LAN protection RJ45 series devices.

All equipment external to the equipment rack except the cubicle mounted power supplies shall be earth free.

Metallic housings, cases, etc., shall be electrically isolated from signal circuitry and power circuitry. Exterior housing/brackets shall be connected to a local earth. Provide an earth lug connection for this purpose on each piece of equipment.

**46.26.22 TESTING****Test Equipment**

Supply all test equipment and personnel to setup, test, commission and demonstrate to the principal that the specified performance is achieved.

This test equipment shall remain the property of the contractor.

**Commissioning and Performance Testing**

Carry out fully comprehensive commissioning of the system:

- Fully programme the system including OSD names for cameras.
- Check that all equipment is installed, and operates correctly.
- Demonstrate the operation of the system and programming and selections.
- Verify the use and voltage/polarity of installed cables and complete final connections to equipment and energise equipment.
- Adjust camera views and motion detection masks with respect to direction and operating parameters.
- Set up software for LAN operation and recording resolution.
- Assist with the configuration of remote access.
- Return to site 1 month following handover and check each camera recording (day and night) to ensure false motion detection is limited and adjust as required. Confirm recording period is in excess of 31 days.

**46.26.23 FUTURE/SPARE INPUT/OUTPUTS**

Test the operation of all future or spare inputs and outputs and displays.

**46.26.24 CCTV EQUIPMENT**

At each camera location test/confirm:

- There are no obstructions to camera views
- Installed lighting is not flaring images at night
- Field of view covered as per superintendent's requirements.

- Camera is being recorded at specified frame rates and resolution.
- Motion detection zones have been configured to reduce false activation
- Power supply voltage.
- Glass has been cleaned.

#### **46.26.25 SERVICE HANDBOOKS**

Supply three neatly bound service handbooks for the installation and equipment. These handbooks shall provide complete and detailed information on the installation and shall contain the following as a minimum:

- Block diagrams which shall show the interconnection between major components.
- Circuit diagrams which shall be annotated with voltages present, under no signal conditions, at salient points in the system.
- Layout diagrams which shall indicate the location of major components and the location of each component within each piece of equipment.
- Cabling diagrams which shall indicate the layout of all cables, including colour codes and details of the terminations of all cables.
- Where pieces of equipment or parts of equipment are identifiable by model numbers, those numbers with the make, shall be stated.
- A complete component list, listing all components with their appropriate ratings or part number shall be given.
- An operational description of each system shall be given.
- A full listing of all software in the system free of copyright for use within the system. This listing may be on paper or an approved copy able storage medium.
- The commissioning report.

The above literature shall be of a professional standard both in format and presentation.

#### **46.26.26 TRAINING**

One onsite operator training session for a minimum of 1 hour shall be provided once the system is commissioned and before practical completion.

The training sessions shall include as a minimum the following topics:

- Logon/Off
- Overview of the installed system.
- Live camera selection.
- Multi-screen views.
- Search and review of recorded images.
- Play, REW, FF, pause, frame by frame controls.
- Time & date search.
- Activity search.
- Export of recorded video.

The security contractor shall provide a training handover document to be signed by both the security contractor and client stating that training has been delivered to a satisfactory level and that the above topics have been covered.

### **46.27 ELECTRICAL MAINTENANCE**

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#### **46.27.1 RESPONSIBILITIES**

##### **General**

Requirement: Maintain the electrical systems for the documented maintenance period so that the performance, reliability, service life, energy efficiency and safety of the system is equal to or better than that at the beginning of the maintenance period, in parallel with and including:

- Periodic and statutory maintenance, cleaning and replacement of consumables.

- Emergency repairs.
- Condition reporting.

Maintenance period: As documented.

#### **46.27.2 STANDARD**

##### **General**

- Electrical services: To AS/NZS 3000.

##### **Maintenance Required**

Minimum level: To the operations and maintenance manual and the manufacturer's recommendations.

#### **46.27.3 INTERPRETATION**

##### **Definitions**

General: For the purpose of this worksection the following definition applies:

- Consumable: Materials or components intended to be replaced within the service life of the associated plant or equipment. Periodic maintenance: Planned routine maintenance of plant and equipment (proactive), including fire safety measures and statutory requirements. Repairs: Unplanned/corrective maintenance (reactive).
- Replace/replacement: Replacement of components on a regular cycle on a like for like basis, e.g. repainting, replacement of air conditioning plant.

#### **46.27.4 SUBMISSIONS**

##### **Certification**

Annual certification: Inspect and submit certification for all items required to be inspected annually under statutory requirements including, but not limited to, fire detection and alarms, emergency evacuation lighting and early warning and intercommunication systems (EWIS).

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.

##### **Records**

Maintenance records: Conform to the *General requirements* worksection.

Periodic maintenance and performance report: At the frequency documented, submit reports 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 periodic maintenance. Exclude travelling time.
- Dates, number of site labour hours and nature of work for emergency repairs. 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.

#### **46.27.5 INSPECTION**

##### **Notice**

Requirement: Give notice so that an inspection may be held simultaneously with the final programmed maintenance visit.

**46.28 MINIMUM REQUIREMENTS**

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**46.28.1 GENERAL****Product Selection**

Proprietary items: Select products, as consumables or 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.

**46.28.2 EMERGENCY REPAIRS****General**

Requirement: Respond to call outs for breakdowns or other faults requiring emergency repairs. Rectify faults and replace faulty materials and equipment.

Remedial work: Carry out any remedial work, including temporary work, necessary to restore each system to safe and satisfactory operation. Verify each system is operating correctly before leaving the site. Do not leave the plant in an unsafe condition.

Temporary work: Promptly replace temporary work with permanent rectification.

**Contact Details**

General: Provide contact details including mobile phone numbers for normal working hours and emergency call outs.

**Response Time**

Emergency repair: Attend site for emergency service within the documented response time.

Response period: Starts at the time of notification to the contractor's nominated contact point.

**Failure to respond**

General: If the contractor fails to respond to site within the documented response time, 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.

**46.28.3 PERIODIC MAINTENANCE****General**

Routine visits: Make routine service visits at the frequency documented. Service items of equipment in conformance with the maintenance schedules in the operation and maintenance manuals.

Notification of defects: When defects in the installation are identified, give notice.

Requirement: Provide maintenance work including, but not limited to, the following:

- Attend to reported defects and complaints.
- Check for and repair corrosion.
- 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.

**Cleaning**

Requirement: At the end of the maintenance period:

- Remove waste and clean all parts of the installation.
- Remove temporary protective coatings, packaging and labels.
- Clean interior of switchboards, switchgear, contactors and other electrical contacts to remove dust and foreign matter.

Lighting fittings: Clean the interior of luminaires, including diffusers and louvres, annually.

**Electrical Systems**

Requirement: Perform the following:

- 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 conformance with manufacturer's recommended maintenance program.

**Standards**

Electrical equipment generally: To AS/NZS 3760.

Switchboards: To AS 2467.

**Switchboards**

Standard: To AS 2467.

General: Carry out the following:

- 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.

**Emergency Evacuation Lighting**

Requirement: To AS/NZS 2293.2.

Interval: Carry out the 6-monthly procedures before practical completion and again before the end of the maintenance period.

**Electronic Security**

Standard: To AS/NZS 2201.1.

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.

**46.28.4 END OF MAINTENANCE PERIOD SERVICE****General**

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

**46.28.5 COMPLETION****Maintenance Records**

Service records: Record maintenance undertaken in the schedules in the operation and maintenance manuals.

Maintenance reports: Prepare maintenance reports as documented.

**Restitution after Maintenance Tasks**

Requirement: Restore removed, damaged, contaminated or soiled services and building elements when the maintenance task is complete.

Standard: Equal to the condition of the original installation.

**46.29 TENDER FORMS**

The electrical services tender price shall be submitted in the following breakdown format. All fields must be filled in; 'included' or tender returns with blank fields will not be accepted.

**46.29.1 ELECTRICAL SERVICES TENDER BREAKDOWN****Muchea Recreation Centre**

Item	Tender Amount
Liaison with the client and design team	\$
Site establishment costs	\$
Demolition and removal of redundant services	\$
Site Main Switchboard	\$
LV switchboards	\$
LV submain cabling	\$
Underground conduits and cable pits	\$
Pump DB submain and conduits (Refer drawing E.03 – Note 4)	\$
Cables trays and other above-ground cable support systems	\$
General power distribution	\$
Power to mechanical services equipment	\$
Power to hydraulic equipment	\$
Lighting (Supply light fittings and control gear)	\$
Lighting installation	\$
Netball Courts Lighting (Supply light fittings and control gear)	\$
Netball Courts Lighting installation	\$
Emergency lighting	\$
MATV System	\$
Voice and data communications infrastructure	\$
Intruder detection and access control system	\$
CCTV System	\$
Commissioning	\$
As Constructed drawings and operation and maintenance manuals	\$
Maintenance during the defects liability period	\$
Sub Total	\$
Goods & Services Tax (GST)	\$
<b>TOTAL</b>	<b>\$</b>

<b>Rates</b>	<b>Normal Hours</b>	<b>After Hours</b>
Charge per hour per tradesman	\$	\$
Charge per hour per assistant	\$	\$
Charge per hour per apprentice	\$	\$
Mark up on actual cost (including normal trading discounts) to the contractor of materials	%	

**COMPLIANCE STATEMENT**

Select the applicable option below.

- We confirm that the tender submission fully complies with the tender documentation.

OR

- We confirm that the tender submission is not fully compliant with the tender documentation and varies from the requirements of the documentation as detailed upon the attached schedule.

Dated this ..... Day of ..... 2022

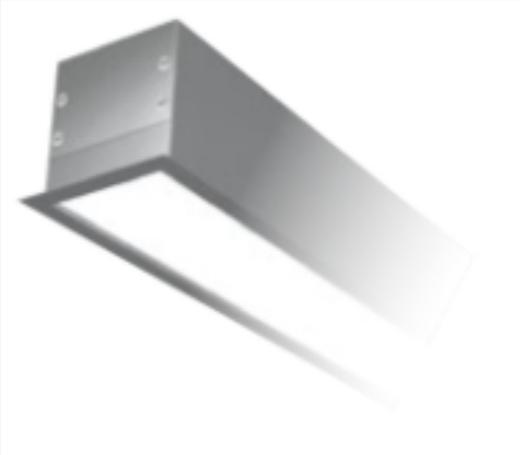
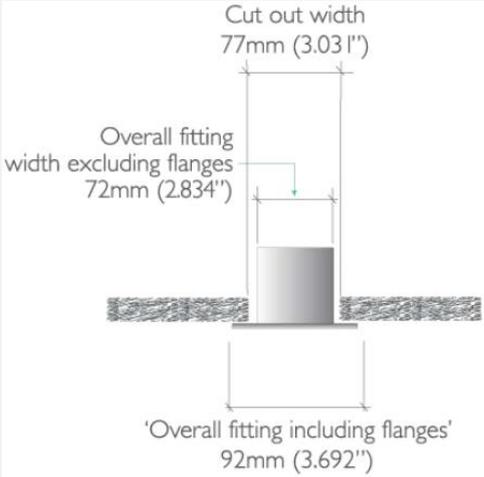
Name of Contractor: .....

Signed: .....Print Name: .....

**SCHEDULE OF PROPOSED SUB-CONTRACTORS AND SUPPLIERS**

Electrical Services	Subcontractor: _____
Switchboards	Manufacturer: _____
Voice/data communications	Subcontractor: _____
Intruder Detection and Access Control	Subcontractor: _____
CCTV	Subcontractor: _____

46.30 APPENDIX A – SCHEDULE OF LUMINAIRES

Luminaire Description	Luminaire Reference
<p>Continuous LED linear luminaire manufactured length to suit site requirements. Luminaire to be recessed.</p>	<h1>CL1</h1>
<p><b>Luminaire:</b></p> <p><b>Manufacturer:</b> Xero Lighting</p> <p><b>Product Reference:</b> XTA 3.0 Square</p> <p><b>Finish:</b> Powdercoat to architects approval</p> <p><b>Warranty:</b> 7 Years</p> <p><b>Protection Rating(s):</b> IP20 / IK04</p> <p><b>Mounting Arrangement:</b> Recessed</p>	
<p><b>Control Gear:</b></p> <p><b>Type:</b> Standard</p> <p><b>Location:</b> Integral</p> <p><b>Light Source:</b></p> <p><b>Type:</b> LED</p> <p><b>Wattage:</b> 23.67 W per meter</p> <p><b>Lumen output:</b> 2078 Lm per meter</p> <p><b>CRI / Ra:</b> 90+</p> <p><b>Beam Angle:</b> N/A</p> <p><b>Colour Deviation:</b> 3 SDCM</p> <p><b>Colour Temperature:</b> 4000 Kelvin</p>	
<p><b>Dimensions (mm):</b></p> <p>(L) *Custom    (W) 92    (D) 81</p>	
<p><b>Additional Information:</b> Luminaire complete with proprietary suspension fixings, support &amp; brackets</p>	
<p><b>Distributor Contact Details</b> Xero Lighting – Simon Buckingham 0437 999 127 sbuckingham@xerolighting.com.au</p>	

Luminaire Description	Luminaire Reference

Continuous LED linear luminaire manufactured length to suit site requirements. Luminaire to be recessed.

# CL2

### Luminaire:

**Manufacturer:** Xero Lighting

**Product Reference:** XTA 3.0 Square

**Finish:** Powdercoat to architects approval

**Warranty:** 7 Years

**Protection Rating(s):** IP20 / IK04

**Mounting Arrangement:** Recessed

### Control Gear:

**Type:** Standard

**Location:** Integral

### Light Source:

**Type:** LED

**Wattage:** 13.35 W per meter

**Lumen output:** 1225 Lm per meter

**CRI / Ra:** 90+

**Beam Angle:** N/A

**Colour Deviation:** 3 SDCM

**Colour Temperature:** 4000 Kelvin

### Dimensions (mm):

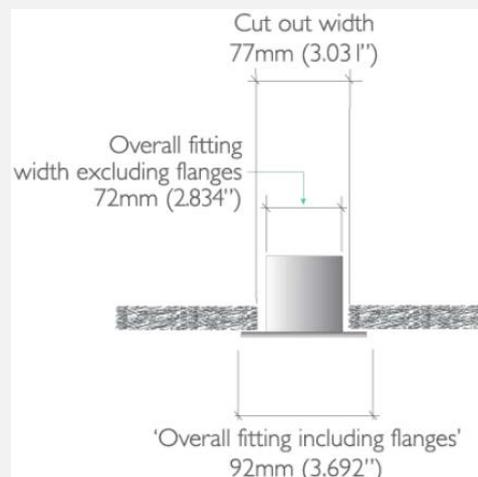
**(L)** \*Custom    **(W)** 92    **(D)** 81

### Additional Information:

Luminaire complete with proprietary suspension fixings, support & brackets

### Distributor Contact Details

Xero Lighting – Simon Buckingham  
0437 999 127  
sbuckingham@xerolighting.com.au



**Luminaire Description**

**Luminaire Reference**

Ceiling recessed LED downlight luminaire complete with a white trim.

**D1**

**Luminaire:**

**Manufacturer:** Zumtobel

**Product Reference:** Panos Infinity R200L (60818105)

**Finish:** White

**Warranty:** 5 Years

**Protection Rating(s):** IP44

**Mounting Arrangement:** Recessed

**Control Gear:**

**Type:** Standard

**Location:** Remote

**Light Source:**

**Type:** LED

**Wattage:** 15W

**Lumen output:** 1940 Lm

**CRI / Ra:** > 90

**Beam Angle:** N/A

**Colour Deviation:** 2 SDCM

**Colour Temperature:** 4000 Kelvin

**Dimensions (mm):**

(L) - (W) 200 (D) 81

**Additional Information:**

Luminaire complete with proprietary fixings, support & brackets to suit installation requirements.

**Distributor Contact Details**

ZG Lighting Australia – Fraser Nicol  
1300 139 965  
fraser.nicol@zumtobelgroup.com



Luminaire Description	Luminaire Reference
<p>Ceiling recessed circular IP65 LED downlight.</p>	<h1>D2</h1>
<p><b>Luminaire:</b></p> <p><b>Manufacturer:</b> Kopa Global</p> <p><b>Product Reference:</b> FR100 K0718 DA</p> <p><b>Finish:</b> White</p> <p><b>Warranty:</b> 5 Years</p> <p><b>Protection Rating(s):</b> IP65</p> <p><b>Mounting Arrangement:</b> Recessed</p> <p><b>Control Gear:</b></p> <p><b>Type:</b> Standard</p> <p><b>Location:</b> Remote</p> <p><b>Light Source:</b></p> <p><b>Type:</b> LED</p> <p><b>Wattage:</b> 10W</p> <p><b>Lumen output:</b> 992 lm</p> <p><b>CRI / Ra:</b> 80</p> <p><b>Beam Angle:</b> N/A</p> <p><b>Colour Deviation:</b> 3 SDCM</p> <p><b>Colour Temperature:</b> 4000 Kelvin</p> <p><b>Dimensions (mm):</b></p> <p><b>(Dia)</b> 100mm    <b>(D)</b> 75mm</p> <p><b>Additional Information:</b> N/A</p> <p><b>Distributor Contact Details</b> HI Lighting – Kim Bianchini (08) 9377 1322 kbianchini@hilighting.com.au</p>	

Luminaire Description	Luminaire Reference
<p>Ceiling recessed circular IP65 LED downlight.</p>	<h1>D3</h1>

**Luminaire:****Manufacturer:** Kopa Global**Product Reference:** FR100 K0718 DA**Finish:** White**Warranty:** 5 Years**Protection Rating(s):** IP65**Mounting Arrangement:** Recessed**Control Gear:****Type:** Standard**Location:** Remote**Light Source:****Type:** LED**Wattage:** 13W**Lumen output:** 1310 lm**CRI / Ra:** 80**Beam Angle:** N/A**Colour Deviation:** 3 SDCM**Colour Temperature:** 4000 Kelvin**Dimensions (mm):****(Dia)** 170mm    **(D)** 98mm**Additional Information:**

N/A

**Distributor Contact Details**HI Lighting – Kim Bianchini  
(08) 9377 1322  
kbianchini@hilighting.com.au

**Luminaire Description**

Ceiling recessed non maintained LED emergency luminaire complete with lithium nano phosphate battery backup.

**Luminaire Reference****EM1****Luminaire:****Manufacturer:** Clevertronics**Product code:** LLIFE-PRO**Finish:** White**Warranty:** 6 Years**Protection Rating(s):** IP20**Control Gear:****Type:** Emergency**Location:** Remote**Light Source:****Type:** LED**Wattage:** 2.7 Watt**Lumen output:** N/A**CRI / Ra:** N/A**Beam Angle:** N/A**Colour Deviation:** N/A**Colour Temperature:** N/A**Dimensions (mm):****Battery Pack****(L)** 232    **(W)** 40    **(D)** 40

60mm Head Diameter

**Additional Information:**

N/A

**Distributor Contact Details**

Clevertronics  
(08) 9248 3720  
b.hardie@clevertronics.com.au

**AS2293 Classification****C<sub>0</sub>=D80 C<sub>90</sub>=D80**

**Luminaire Description**

Ceiling recessed splashproof non maintained LED emergency luminaire complete with lithium nano phosphate battery backup.

**Luminaire Reference****EM2****Luminaire:****Manufacturer:** Clevertronics**Product code:** LLIFE-PRO-RECSP**Finish:** White**Warranty:** 6 Years**Protection Rating(s):** IP44**Control Gear:****Type:** Emergency**Location:** Remote**Light Source:****Type:** LED**Wattage:** 2.7 Watt**Lumen output:** N/A**CRI / Ra:** N/A**Beam Angle:** N/A**Colour Deviation:** N/A**Colour Temperature:** N/A**Dimensions (mm):****Battery Pack****(L)** 232    **(W)** 40    **(D)** 40

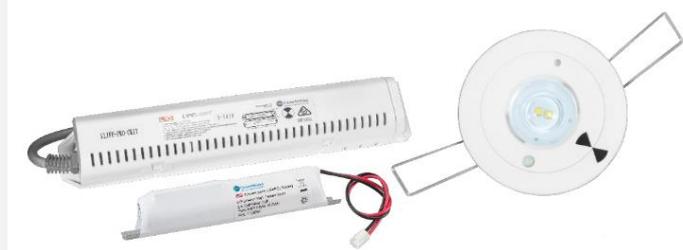
60mm Head Diameter

**Additional Information:**

N/A

**Distributor Contact Details**

Clevertronics  
(08) 9248 3720  
b.hardie@clevertronics.com.au



AS2293 Classification

C<sub>0</sub>=D80 C<sub>90</sub>=D80

**Luminaire Description**

Surface mounted maintained LED emergency exit luminaire complete with lithium nano phosphate battery backup.

**Luminaire Reference****EX1****Luminaire:****Manufacturer:** Clevertronics**Product code:** LUBPRO-SM**Finish:** White**Warranty:** 6 Years**Protection Rating(s):** IP20**Control Gear:****Type:** Emergency**Location:** Integral**Light Source:****Type:** LED**Wattage:** 3.7 Watt**Lumen output:** N/A**CRI / Ra:** N/A**Beam Angle:** N/A**Colour Deviation:** N/A**Colour Temperature:** N/A**Dimensions (mm):****(L)** 317    **(W)** 157    **(D)** 8.7**Additional Information:**

Luminaire complete with directional arrows to suit location.

**Distributor Contact Details**

Clevertronics  
(08) 9248 3720  
b.hardie@clevertronics.com.au



**Luminaire Description**

Surface mounted maintained LED emergency exit luminaire complete with lithium nano phosphate battery backup.

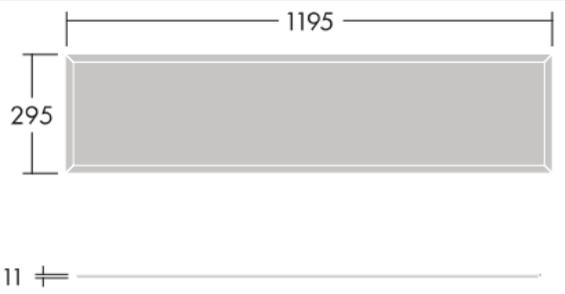
**Luminaire Reference****EX2****Luminaire:****Manufacturer:** Clevertronics**Product code:** LWEELED-WM**Finish:** White**Warranty:** 6 Years**Protection Rating(s):** IP66 / IK08**Control Gear:****Type:** Emergency**Location:** Integral**Light Source:****Type:** LED**Wattage:** 2.8 Watt**Lumen output:** N/A**CRI / Ra:** N/A**Beam Angle:** N/A**Colour Deviation:** N/A**Colour Temperature:** N/A**Dimensions (mm):****(L)** 380    **(W)** 130    **(D)** 190**Additional Information:**

Luminaire complete with directional arrows to suit location.

**Distributor Contact Details**

Clevertronics  
(08) 9248 3720  
b.hardie@clevertronics.com.au



Luminaire Description	Luminaire Reference
<p>Ceiling recessed LED panel luminaire complete with plaster mounting kit.</p>	<h1>L1</h1>
<p><b>Luminaire:</b></p> <p><b>Manufacturer:</b> Thorn</p> <p><b>Product Reference:</b> Royal LED (96648522)</p> <p><b>Finish:</b> White</p> <p><b>Warranty:</b> 5 Years</p> <p><b>Protection Rating(s):</b> IP40</p> <p><b>Mounting Arrangement:</b> Recessed</p> <p><b>Control Gear:</b></p> <p><b>Type:</b> Standard</p> <p><b>Location:</b> Remote</p> <p><b>Light Source:</b></p> <p><b>Type:</b> LED</p> <p><b>Wattage:</b> 22.8 W</p> <p><b>Lumen output:</b> 2703 Lm</p> <p><b>CRI / Ra:</b> 80</p> <p><b>Beam Angle:</b> N/A</p> <p><b>Colour Deviation:</b> 3 SDCM</p> <p><b>Colour Temperature:</b> 4000 Kelvin</p> <p><b>Dimensions (mm):</b></p> <p><b>(L)</b> 1197    <b>(W)</b> 297    <b>(D)</b> 11</p> <p><b>Additional Information:</b> Luminaire complete with proprietary fixings, support &amp; brackets to suit installation requirements.</p> <p><b>Distributor Contact Details</b> ZG Lighting Australia – Fraser Nicol 1300 139 965 fraser.nicol@zumtobelgroup.com</p>	<div style="text-align: center;">  </div> <div style="text-align: center; margin-top: 20px;">  </div>

Luminaire Description	Luminaire Reference
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Ceiling recessed LED panel luminaire complete with plaster mounting kit.

# L2

### Luminaire:

**Manufacturer:** Thorn

**Product Reference:** Royal LED  
(96648534)

**Finish:** White

**Warranty:** 5 Years

**Protection Rating(s):** IP40

**Mounting Arrangement:** Recessed

### Control Gear:

**Type:** Standard

**Location:** Remote

### Light Source:

**Type:** LED

**Wattage:** 13.8 W

**Lumen output:** 1608 Lm

**CRI / Ra:** 80

**Beam Angle:** N/A

**Colour Deviation:** 3 SDCM

**Colour Temperature:** 4000 Kelvin

### Dimensions (mm):

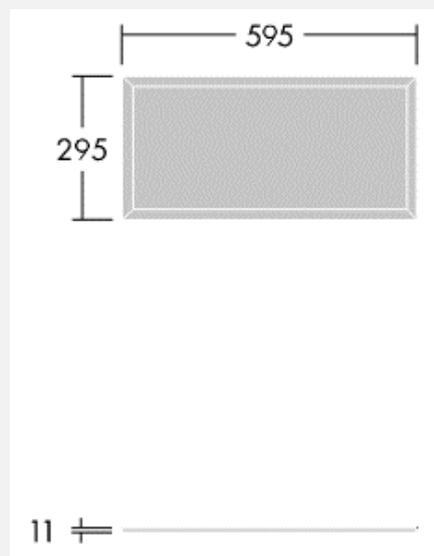
**(L)** 597    **(W)** 297    **(D)** 11

### Additional Information:

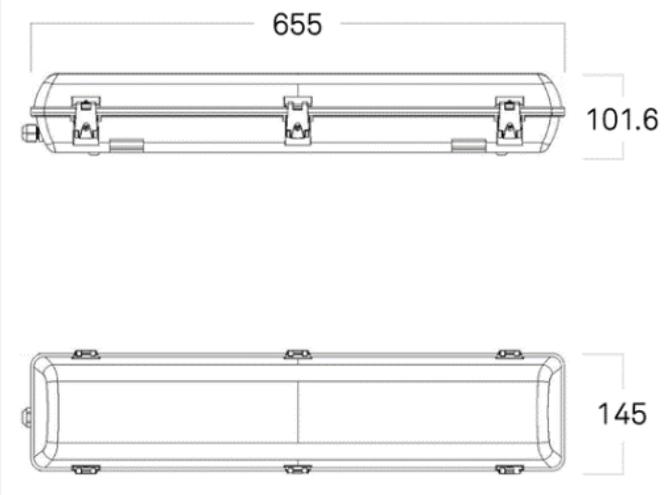
Luminaire complete with proprietary fixings, support & brackets to suit installation requirements.

### Distributor Contact Details

ZG Lighting Australia – Fraser Nicol  
1300 139 965  
fraser.nicol@zumtobelgroup.com



Luminaire Description	Luminaire Reference
<p>Ceiling mounted LED luminaire complete with polycarbonate body.</p>	<h1>L3</h1>
<p><b>Luminaire:</b></p> <p><b>Manufacturer:</b> Pierlite</p> <p><b>Product Reference:</b> BWP Pro 2 LED Lumen Select (BWP584E4)</p> <p><b>Finish:</b> Grey</p> <p><b>Warranty:</b> 7 Years</p> <p><b>Protection Rating(s):</b> IP65</p> <p><b>Mounting Arrangement:</b> Surface</p> <p><b>Control Gear:</b></p> <p><b>Type:</b> Standard</p> <p><b>Location:</b> Integral</p> <p><b>Light Source:</b></p> <p><b>Type:</b> LED</p> <p><b>Wattage:</b> 25 / 35 / 58W</p> <p><b>Lumen output:</b> 7199 Lm</p> <p><b>CRI / Ra:</b> 80</p> <p><b>Beam Angle:</b> N/A</p> <p><b>Colour Deviation:</b> 3 SDCM</p> <p><b>Colour Temperature:</b> 4000 Kelvin</p> <p><b>Dimensions (mm):</b></p> <p><b>(L)</b> 1265    <b>(W)</b> 145    <b>(D)</b> 102</p> <p><b>Additional Information:</b> N/A</p> <p><b>Distributor Contact Details</b> Pierlite – Mark Badman 08 9209 7100 mbadman@pierlite.com.au</p>	<div> </div> <div> </div>

Luminaire Description	Luminaire Reference
<p>Ceiling mounted LED luminaire complete with polycarbonate body.</p>	<h1>L4</h1>
<p><b>Luminaire:</b></p> <p><b>Manufacturer:</b> Pierlite</p> <p><b>Product Reference:</b> BWP Pro 2 LED Lumen Select (BWP352E4)</p> <p><b>Finish:</b> Grey</p> <p><b>Warranty:</b> 7 Years</p> <p><b>Protection Rating(s):</b> IP65</p> <p><b>Mounting Arrangement:</b> Surface</p> <p><b>Control Gear:</b></p> <p><b>Type:</b> Standard</p> <p><b>Location:</b> Integral</p> <p><b>Light Source:</b></p> <p><b>Type:</b> LED</p> <p><b>Wattage:</b> 10 / 25 / 35W</p> <p><b>Lumen output:</b> 4560 Lm</p> <p><b>CRI / Ra:</b> 80</p> <p><b>Beam Angle:</b> N/A</p> <p><b>Colour Deviation:</b> 3 SDCM</p> <p><b>Colour Temperature:</b> 4000 Kelvin</p> <p><b>Dimensions (mm):</b></p> <p><b>(L)</b> 655     <b>(W)</b> 145     <b>(D)</b> 102</p> <p><b>Additional Information:</b> N/A</p> <p><b>Distributor Contact Details</b> Pierlite – Mark Badman 08 9209 7100 mbadman@pierlite.com.au</p>	 

Luminaire Description	Luminaire Reference
<p>Ceiling mounted LED luminaire complete with polycarbonate body.</p>	

# L5

## Luminaire:

**Manufacturer:** Bega

**Product Reference:** 24 461 K4

**Finish:** Graphite

**Warranty:** 5 Years

**Protection Rating(s):** IP65 / IK07

**Mounting Arrangement:** Surface

## Control Gear:

**Type:** Standard

**Location:** Integral

## Light Source:

**Type:** LED

**Wattage:** 18.3W

**Lumen output:** 2012 Lm

**CRI / Ra:** 80

**Beam Angle:** N/A

**Colour Deviation:** 3 SDCM

**Colour Temperature:** 4000 Kelvin

## Dimensions (mm):

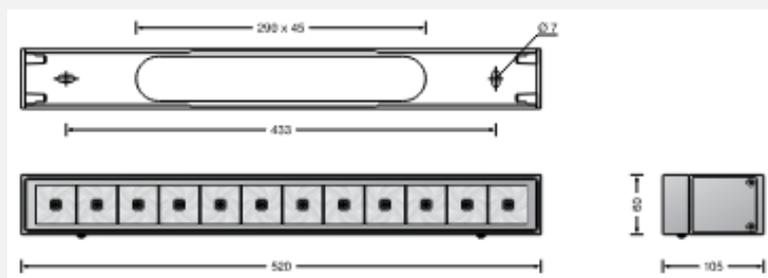
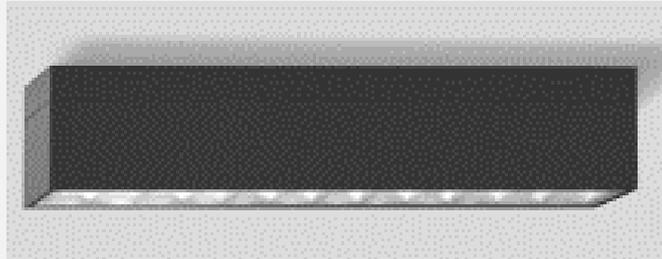
**(L)** 520    **(W)** 60    **(D)** 105

## Additional Information:

Ensure suitable concealed cable access is provided with veranda structure.

## Distributor Contact Details

Lighting Options – Steve Kennelly  
08 6142 4977  
steve@lightingoptions.com.au



**Luminaire Description**

Pole mounted LED sports floodlight luminaire.  
Aluminium construction with powdercoat finish.

**Luminaire:**

**Manufacturer:** Philips

**Product Reference:** BVP651 LED800

740 DX50

**Finish:** Powdercoat

**Protection Rating(s):** IP66 IK08

**Mounting Arrangement:** Mount to 10m  
hexagonal pole.

**Control Gear:**

**Type:** Electronic

**Location:** Integral

**Light Source:**

**Type:** LED

**Wattage:** 530 W

**Lumen output:** 63,999 Lm

**CRI / Ra:** 70

**Colour Temperature:** 4000 Kelvin

**Dimensions (mm):**

**(L)** 817    **(W)** 597    **(D)** 80

**Additional Information:**

Provide 10m hexagonal tapered light pole with bolted base plate and concrete footing.

**Distributor Contact Details**

HI Lighting – Kim Bianchini  
(08) 9377 1322  
kbianchini@hilighting.com.au

**Luminaire Reference****PM1**

**Luminaire Description**

**Luminaire Reference**

Pole mounted LED floodlight luminaire.  
Aluminium construction with powdercoat finish.

**PM2**

**Luminaire:**

**Manufacturer:** Bega

**Product Reference:** 84 582 K4

**Finish:** Graphite

**Protection Rating(s):** IP66 IK07

**Mounting Arrangement:** Mount to 6m cylindrical pole. Powdercoat finish.

**Control Gear:**

**Type:** Electronic

**Location:** Integral

**Light Source:**

**Type:** LED

**Wattage:** 31W

**Lumen output:** 4,668 Lm

**CRI / Ra:** 80

**Colour Temperature:** 4000 Kelvin

**Dimensions (mm):**

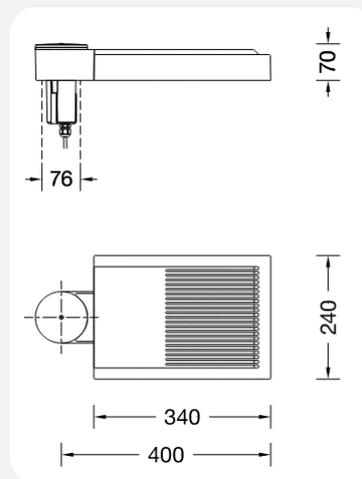
**(L)** 340    **(W)** 240    **(D)** 70

**Additional Information:**

Provide 6m cylindrical light pole with bolted base plate and concrete footing. Powdercoat finish.

**Distributor Contact Details**

Lighting Options – Steve Kennelly  
08 6142 4977  
steve@lightingoptions.com.au



**Luminaire Description**

**Luminaire Reference**

Pole mounted LED floodlight luminaire.  
Aluminium construction with powdercoat finish.

# PM3

**Luminaire:**

**Manufacturer:** Bega

**Product Reference:** 84 584 K4

**Finish:** Graphite

**Protection Rating(s):** IP66 IK07

**Mounting Arrangement:** Mount to 6m cylindrical pole. Powdercoat finish.

**Control Gear:**

**Type:** Electronic

**Location:** Integral

**Light Source:**

**Type:** LED

**Wattage:** 67W

**Lumen output:** 9,600 Lm

**CRI / Ra:** 80

**Colour Temperature:** 4000 Kelvin

**Dimensions (mm):**

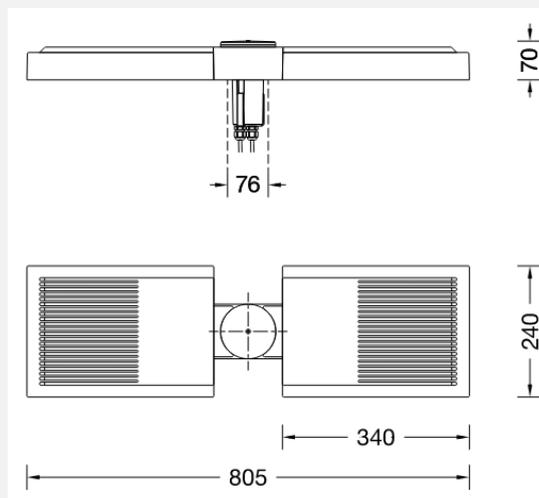
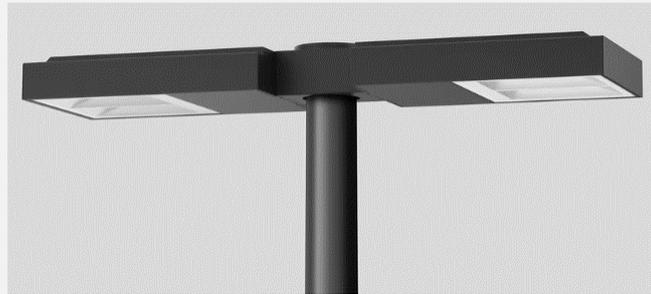
**(L) 340 (W) 240 (D) 70**

**Additional Information:**

Provide 6m cylindrical light pole with bolted base plate and concrete footing.  
Powdercoat finish.

**Distributor Contact Details**

Lighting Options – Steve Kennelly  
08 6142 4977  
steve@lightingoptions.com.au



**Luminaire Description**

Wall mounted LED luminaire complete with polycarbonate body.

**Luminaire Reference****V1****Luminaire:**

**Manufacturer:** Bega

**Product Reference:** 22 292 K4

**Finish:** Graphite

**Warranty:** 5 Years

**Protection Rating(s):** IP65 / IK09

**Mounting Arrangement:** Surface

**Control Gear:**

**Type:** Standard

**Location:** Integral

**Light Source:**

**Type:** LED

**Wattage:** 9.4 W

**Lumen output:** 662 Lm

**CRI / Ra:** 80

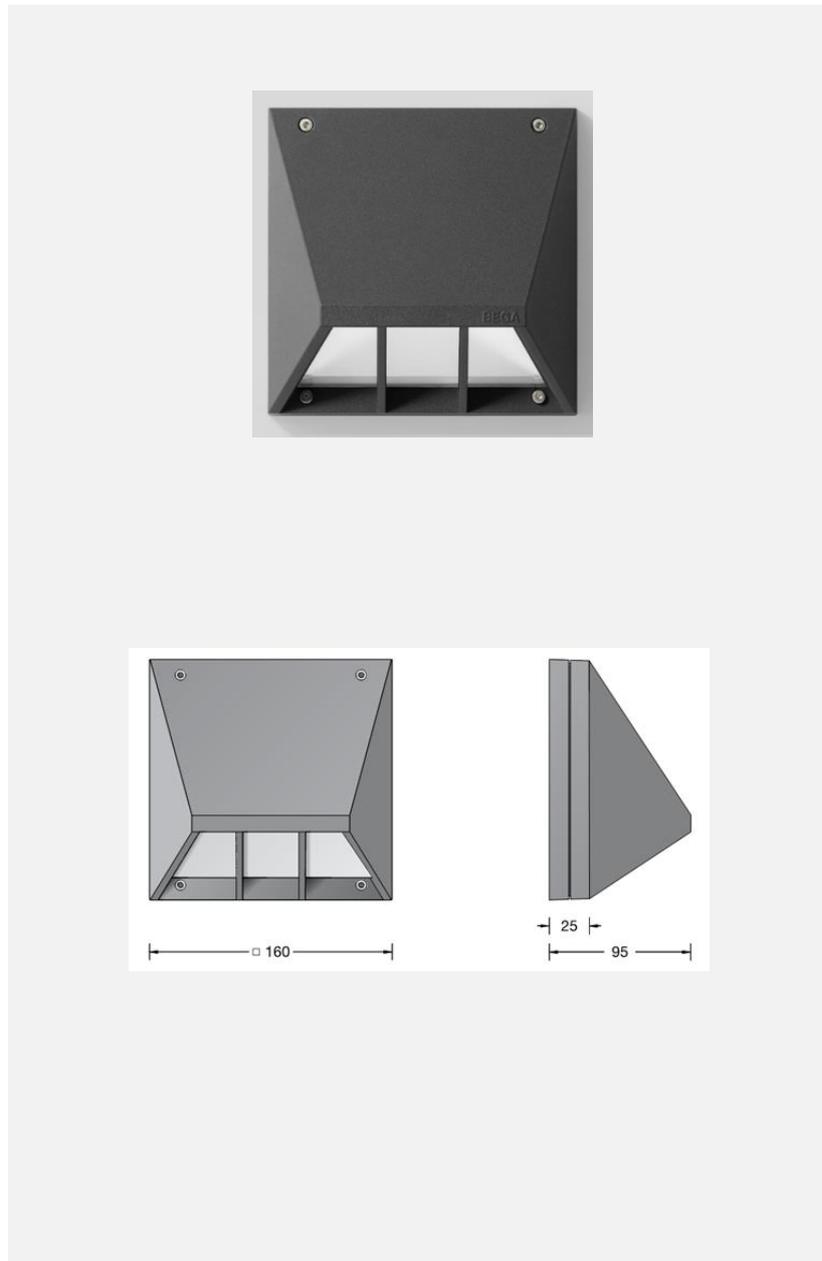
**Beam Angle:** N/A

**Colour Deviation:** 3 SDCM

**Colour Temperature:** 4000 Kelvin

**Dimensions (mm):**

**(L)** 160    **(W)** 160    **(D)** 95

**Additional Information:**

N/A

**Distributor Contact Details**

Lighting Options – Steve Kennelly  
08 6142 4977  
steve@lightingoptions.com.au



**47 HYDRAULIC SERVICES****47.1 GENERAL****47.1.1 DRAWINGS**

The Hydraulic Drawings do not show all the structural details, therefore all information and measurements required for setting out and installing the work hereinafter specified, must be obtained from the relevant Architectural and Structural Drawings.

The Hydraulic Design drawings depicting the works in this section are as scheduled hereinafter:

<b>Drawing No.</b>	<b>Title</b>
HS1	GENERAL INFORMATION AND DETAILS
HS2	DEMOLITION SITE PLAN – HYDRAULIC SERVICES
HS3	PROPOSED SITE PLAN – SEWER AND STORMWATER
HS4	PROPOSED SITE PLAN – WATER/GAS SERVICES
HS5	PROPOSED FLOOR PLAN – SEWER AND STORMWATER
HS6	PROPOSED FLOOR PLAN – WATER/GAS SERVICES

The details of hydraulic services shown on the contract drawings indicate the principles of design and design co-ordinated routes of piping. Notwithstanding the information shown on drawings or specified herein, co-ordinate the installation of all hydraulic services without conflict with structural elements, the services of other trades and in complete accordance with the requirements of all relevant Authorities.

**47.1.2 GENERAL CONDITIONS**

Refer to the “Preliminaries” section, which forms an integral part of this section.

**47.1.3 REGULATIONS**

The whole of the Sanitary Plumbing, Water Supply and Drainage work shall be carried out by or under the direct supervision of a PLB licensed Plumbing Contractor in direct accordance with the Water Corporation By-Laws, AS3500 Parts 1,2,3 & 4, the requirements of the Location Authority and the requirements of any other Authority having jurisdiction and to the entire satisfaction of the Superintendent.

**47.1.4 PERMITS AND CERTIFICATES**

Unless otherwise specified, the Contractor shall give all necessary notices and obtain all necessary permits so that the work hereinafter specified may be carried out and he shall furnish any certificates necessary as evidence that the work installed conforms to the laws and regulations of all Authorities having jurisdiction before the certificate of final payment is issued.

**47.1.5 WATER CORPORATION HEADWORKS CHARGES**

Water Corporation Headworks charges are not applicable to this project.

**APPLICATIONS TO AUTHORITIES**

Make application and pay all fees to the relevant Authority for the following items.

1. To the Local Authority Health Department/Department of Health for Aeration Treatment Unit (ATU) approval
2. To the Local Authority Health Department/Department of Health for leach drain effluent disposal approval approval
3. To Origin Energy for a 2.75kL fixed on site LP gas storage vessel installation, initial fill and one year operational costs.

**47.1.6 SETTING OUT**

The pipe runs shall be set out before the pouring of concrete including providing and setting any sleeves which may be necessary to avoid cutting holes in the finished work. All prefabricated sections must be fixed in position in ample time to avoid cutting holes in the finished work. All prefabricated sections must be fixed in position in ample time to avoid delay to any other trades.

The Contractor shall set out all pipe runs, sumps, outlets, etc. and check same against reinforcing steel.

Should there be a need for relocating any item due to interference the builder shall obtain Superintendents approval.

**47.1.7 PROTECTION**

All pipework shall be protected against the entry of foreign matter at all times. Sanitary fixtures are to be adequately protected against damage and any item not considered in first class condition on completion of the work shall be removed and replaced at the expense of the Contractor upon receipt of notice from the Superintendent.

**47.1.8 TESTING**

All pipework is to be tested at regular intervals or as required during the progress of the work.

Carry out all testing required by the Water Corporation Local Authority and other Authorities having jurisdiction over the work.

Sections of work not covered by Authorities shall be tested to the satisfaction of the Superintendent as specified hereafter.

Provide all equipment necessary to satisfactorily perform each testing operation and provide all personnel requested by the Authority or the Superintendent to assist in executing tests.

**47.1.9 AS CONSTRUCTED DRAWINGS**

Provide As Constructed drawings as computer data in AutoCAD Version 2014 format on CD in addition to bond copies of A3 sized reductions for inclusion in each Hydraulics Operating Manuals.

Mark up plans as pipe work is installed, clearly indicating dimensions of all pipework and valves with their respective alignments, depths and invert levels from fixed reference points prior to backfilling trenches.

These marked up drawings are to be kept on site for regular inspection by the superintendent and/or consultant.

The Licensed Plumber shall sign and certify all "As Constructed" drawings.

Allow a fixed sum of \$1,500 + GST to engage Construction Hydraulic Design to undertake the as-constructed drawings. Drawings are to be presented to CHD a minimum of 14 working days prior to PC.

**47.1.10 HYDRAULIC SERVICES OPERATING MANUALS**

The whole of the works shall be guaranteed against faulty workmanship and/or materials for a period of 12 months and faults shall be rectified immediately upon receipt of notice from the Superintendent.

At completion provide two (2) copies of a professional quality prepared operating manuals comprising of black heavy duty foolscap vinyl covered four (4) ring files with embossed lettering and clear removable envelopes containing –

- - Index
- - Labelled dividers indicating sections Eg. Hot Water, Fire Equipment, As Constructed Drawings, Warranties, Maintenance Procedures Etc.
- - Name, address and contact numbers of emergency contact persons in event of Warranty attendance during Defects Liability Period.
- - Dates of Practical Completion and Defects Liability termination.
- - Schedule resume of maintenance procedures.

- - Manufacturers pamphlets.
- - Warranty for each item of equipment installed.
- - Schedule resume of names and addresses for all suppliers of equipment
- - One (1) complete A3 set of Hydraulic services As Constructed drawings in each manual
- - Copy of water Corporation "Certificates of Completion and Compliance"
- - Copy of DFES Certificate of Occupancy

The schedule of resume and maintenance shall include (but not limited to) such items as:

- Water heaters general preventative maintenance recommendations.
- Emergency shut down and resetting procedures
- Cleaning out of trade waste arrestors and interceptors

The hydraulic services operating manuals shall have the name, address, phone, facsimile and email contacts of the Superintendents representatives, Hydraulic Services Consultant, Builder and Plumbing Sub-Contractor in that order on the inside leaf of the cover in letters no less than 20mm high.

Provide sample of Hydraulic services Maintenance Manual identification lettering prior to manufacture.

Provide with the Maintenance Manual, Two (2) sets of long handle manhole lifting keys to match covers installed, two (2) anti vandal tap key for each hose tap installed.

Liaise with site Superintendent to determine site operating hours and set all plant and equipment timers to correspond with these operating hours. Submit a schedule of these hours for approval to the consultant prior to programming timers. Copy the approved document into maintenance manuals.

Note: Final payment is conditional upon receipt of the above mentioned items.

#### **47.1.11 STANDARD SPECIFICATION AND CODES**

Where specified or implied Australian Standard Specification and/or Codes shall be of the latest revisions. A copy of such documents shall be provided on site by the Builder who shall make himself familiar with the context of the specification or code.

#### **47.1.12 IDENTIFICATION OF SERVICES**

Provide permanent identification to all Hydraulic Services in accordance with AS1345. Identification shall be of durable proprietary labels or painted sign writing on background colours, as specified.

Prior to ordering and setting out of identification, provide samples for approval by the Architect.

##### **(A) ABOVE GROUND PIPED SERVICES**

Provide permanent identification to all Hydraulic Services. Pipe identification shall be applied durable proprietary labels at 1500mm maximum centres in ducts and six metre maximum centres in basement car park, of 'BRADY' manufacture and style with labelling stating the type of service and together with directional flow arrows.

##### **(B) INGROUND SERVICES**

All inground Hydraulic Services shall be identified with a plastic service indicator tape with the appropriate service name facing upwards. Indicator tape shall have aluminium strip. Indicator wrapping shall be a minimum of 75mm wide and buried 300mm above the service.

##### **(C) VALVES AND METERS**

All valves and meters, whether below or above ground shall be identified by using 'BRADY' manufacture and style round custom brass valve tags - 50mm dia. secured to valve stem with 'BRADY' brass chain. Engraving shall identify purpose and extent of control and shall correspond with 'As Constructed' drawings information and schedules.

Unless otherwise specified, all items of mechanical and electrical equipment and each water tank shall be adequately identified by applied sign writing or tags as appropriate to identify function, extent of control or purpose.

**47.1.13 LOCATION OF EXISTING SERVICES**

Co-ordination with all other trades to ensure that problems arising from possible collision of work are solved before the work is installed.

Shut off existing services to connect new services at times agreed to in writing by the Architect and two working days written prior notification of shut downs shall be given to the Architect. Shut down times shall be kept to a minimum and notification shall include length of time required for services to be shut.

Locate existing services as necessary. Services to all existing fixtures and outlets and connections which are required shall be maintained throughout construction period.

Provide temporary services as necessary. Where required cut and seal existing services and remove redundant pipework as directed and make good to building and existing work and match adjacent finishes.

Any existing services shown on the drawings are indicative only and are not complete. Make allowance to locate services on site and excavate by hand where necessary to avoid causing damage to services.

The Plumbing Contractor shall suitably allow for locating the existing services, which under this contract require diversion, connection to and upgrading, within a six (6) metre radius and or 600mm depth from that indicated on the drawings and as the case may be.

**47.1.14 SCOPE OF WORKS**

Carry out all sanitary plumbing, hot water, cold water, non-potable water, LP gas & fire hydrant and hose reel services, industrial waste drainage, stormwater, property sewerage and stack work drainage as shown on the drawings, specified or as required in order to complete the work to the satisfaction of the Superintendent Representatives and the relevant authorities having jurisdiction.

The work in the Hydraulics Services contract includes the furnishing of all materials, products, accessories, tools, equipment, services, scaffolding, ladders, transportation, supervision, labour, excavation, backfill and other items which may not be mentioned but are necessary for the fabrication and completion of the Hydraulic Services installation.

- Inspect the sites, ascertain and include for all on site conditions.
- Provide and install all sanitary plumbing including sanitary fixtures and all necessary cleaning and inspection openings positioned as required in all discharge pipes & drains.
- Provide and install all property sewerage including access manholes, clean out points, traps, septic tank, effluent pump pit and inspection openings to connect into the new property sewer drainage system in locations indicated on the drawings.
- Provide and install all Stormwater drains, rainwater pipe connections and paving drains.
- Provide and install all potable & non-potable water services including taps, outlets, valves, valve boxes, water storage tanks, pressure pump system, filtration/treatment unit, branches and connections to fixtures, access panels to recessed valves and equipment.
- Provide and install hot water services including hot water units, service lines, isolating valves, tempering and thermostatic mixing valves, general valve trains associated with hot water units and connections to fixtures and equipment.
- Provide and install all temporary services as required during the construction of the works to enable the construction works to continue uninterrupted.
- Provide and install all gas services, bulk tank, connections, service lines, valves, strainers, opso's and venting to all fixtures and equipment
- Provide and install insulated mechanical services drains to all air-conditioning and ancillary equipment
- Provide and install all trade waste including grease trap and vents

- Provide and install 90-minute fire rating material on all penetrations through firewalls. Ensure integrity of fire compartment is maintained.
- Drilling of holes through floors, walls and fire stop sealing thereafter.
- Signage and Painting

To ascertain the scope of work the specification will be read in conjunction with the drawings. The Architect shall be advised of all discrepancies prior to close of Tenders and all discrepancy adjustments are deemed to have been incorporated into the Tender.

## **47.2 WORKMANSHIP**

### **47.2.1 ACCESS**

Provide all necessary cleaning access to all pipework concealed in a cavity, in ducts, etc. to the requirements of the Water Corporation whether shown on the drawings or not.

Allow to inform Contractor of location of access panels in walls and access slabs in pre-cast concrete paths etc.

### **47.2.2 INSPECTION POINTS/CLEAN OUT POINTS**

Provide inspection points brought up to ground or floor level and terminating in cast iron box for pedestrian traffic areas, pre-cast concrete box for garden areas, solid screwed 316 stainless steel finish flush with floor level inside buildings, where indicated on the drawings.

### **47.2.3 CHROME PLATING (C.P.)**

Copper connections to fixtures shall be chrome plated with chrome plated wall plate against wall.

Traps and waste pipes shall be chrome plated only where indicated on the Hydraulic drawings and where specified under Section 1.4.2 - Waste Pipes.

All chrome plating shall be bright chrome unless otherwise specified.

Silver spray painting of pipework as a substitute will not be accepted.

### **47.2.4 DISSIMILAR METALS**

The Contractor shall be responsible for separating all dissimilar metals from direct contact. The Contractor shall supply and install all necessary dielectric couplings, anodes, gaskets, etc. All bolts or screws, etc., used for the support and/or jointing of any metal fixtures, pipe etc. shall be made of the same material as that material being supported.

Where pipe supports are dissimilar to the copper pipes, wrap copper pipe with at least four thicknesses of wide black polyethylene tape prior to fixing.

### **47.2.5 ORDERING OF MATERIALS**

The Contractor shall be responsible for obtaining written confirmation that all materials required for the project are available and have been ordered in ample time for their programmed installation in the project. Failure of the builder to confirm this, will render the Contractor responsible for all extra costs incurred in substitution or and/or extra freight costs of the materials fittings or fixtures.

### **47.2.6 FIXINGS**

All pipes are to be fixed clear of walls and each other with brass, copper, or mild steel with P.V.C. inserts, screwed or bolted to the wall. Clips shall be of the one brand and type throughout the job. Fixings shall be spaced at not more than 2000 for pipe on grade, 3000 for vertical pipes internally and 2000 for vertical pipes externally. Brazing of pipes to each other will not be accepted. Percussion type fixings shall not be used. All fixings shall be to the requirements of the Water Corporation and Acoustic Engineer. Allow to obtain Acoustic Engineers report prior to commencing works and ensure all acoustic recommendations and requirements for the hydraulic services are met.

Cisterns shall be fixed to the wall with neoprene "Rawlnuts" Type 6350 for M6 with a square neoprene washer 25 x 25 x 6mm made from Mackay M164 located between the cistern and the wall. All pipe

clamps to be provided with 13mm thick closed cell foam nitrile rubber eg Bradflex between clamp and pipe.

#### **47.2.7 SPACING OF PIPES**

Where practicable pipes shall be spaced at least 50 clear of each other. Lagged hot water pipes shall be 75 clear of plastic material and unlagged hot water pipes shall be 150 clear.

#### **47.2.8 CONCEALMENT OF PIPEWORK**

All pipes etc. are to be concealed in ceiling spaces, ducts, cavities, walls and trenches. Exposed pipework will not be accepted except where specifically noted on the drawings. Pipes shall be installed neatly and close to the building structure. Any pipes which are not in the opinion of the Superintendent installed as neatly as they should be shall be taken out and replaced without cost to the Owner.

Copper pipes concealed in cavity or framed walls shall be fixed clear of wall surface.

All copper service lines chased into masonry constructions shall be spirally wrapped with 6mm thick x 65mm wide foam insulation, with all joints tape sealed. The chase shall be fully grouted and packed firm.

Copper pipework laid in ground and wall cavities shall be wrapped in one layer of Denso 500 or similar approved, protective wrap. Wrap to be installed strictly in accordance with the manufacturers specifications.

#### **47.2.9 BRAZING**

All brazing shall be done with a suitable silver brazing alloy containing not less than 15% silver and 5% phosphorous, and comply with AS1167.

Materials to be brazed shall be thoroughly cleaned prior to application of heat.

Bronze welding shall not be permitted.

Flux used in brazing shall be non-corrosive and all residual flux on completion of joint shall be removed by quenching the joint in water and cleaning with a steel wire brush or file card. Care shall be taken during brazing to ensure that heat is applied only to the joint area and only of sufficient temperature to fuse the joint materials.

If any lower grade of silver brazing alloy is found on this project, it shall be construed by the Superintendent that such low grade alloy has been used for all jointing in pipework installed prior to the discovery of the use of low grade brazing alloy, and all such pipework shall be completely removed and replaced, at no expense to the client. The Superintendent will not accept silver analysis of the installed joints in lieu of replacement of all pipes.

#### **47.2.10 COPPER PIPES AND FITTINGS**

Pipe runs in copper shall be fabricated of the longest possible lengths and building up of sections with short off cuts will not be accepted. Where pipes terminate in wall e.g. at traps or taps, a suitable anchor is to be brazed to the pipe and securely cemented in.

Bends are to be preformed type, junctions are to be fabricated in the tube. Alternatively cast brass junctions and bends for use with copper tube may be used except in hot water services.

All Copper pipes concealed in cavity chased into brickwork or concrete and laid in ground shall be as previously specified. Copper unions shall be of the flared type. Conetite and Olive type fittings are not acceptable.

#### **47.2.11 EXCAVATION AND BACKFILL**

Provide all excavation and backfilling necessary for the installation of the work of this section.

Bottoms of trenches shall be excavated so that piping will be supported on a solid bed of undisturbed earth and/or made up compacted earth compacted to eight blows per 300 on a penetrometer with additional excavation under the joints to permit the joint to be properly made up.

All backfilling outside the buildings, except as noted, shall be done with selected excavated sands, containing no large stones to a depth of 300 above crown of pipe and with unselected sands for the balance of the depth. Backfilling shall be done in 300 layers, thoroughly watered and compacted to

six blows per 300 on a penetrometer. The first 600 of all backfill over drains shall be hand compacted.

Large boulder, rubbish etc. shall not be used for backfilling and shall be removed from the site and approved earth shall be brought in for use in this event.

Backfilling around manholes and catch basins shall be in all cases done with the same materials to the same depth as connecting piping.

#### **47.2.12 DEWATERING**

Effectively dewater all excavations required for the installation of this section of the work to the satisfaction of the relevant authority having jurisdiction and to the satisfaction of the Superintendent.

Discharge all water from the site to the satisfaction of the relevant authority having jurisdiction and the Superintendent.

Dewatering of excavations shall include water generated from any source entering the excavations required for this section of the work.

### **47.3 MATERIALS**

#### **47.3.1 GENERALLY**

Materials shall be the best of their respective kind, manufactured in accordance with the relevant Australian Standard Specification or in its absence, the relevant British Standard Specification.

All installed materials are to be tested and stamped by the Water Corporation and are to bare such stamps of approval. All materials and products shall be as specified or similar product equivalent in function quality etc to the approval of the Superintendents representative.

#### **47.3.2 COPPER PIPES**

All waste, vent, hot and cold water and fire service piping shall be solid drawn copper tube manufactured in accordance with A.S. 1432 Table '2' compilation of gauges.

#### **47.3.3 P.V.C. PIPES**

P.V.C. pipes are to be rigid P.V.C. manufactured in accordance with Australian Standard Specification A.S. 1415 for soil waste and vent application and A.S. 1260 for sewer application all with compatible fittings and/or of a class required by the Water Corporation.

#### **47.3.4 HIGH DENSITY POLYETHYLENE (TRADE WASTES AND SANITARY DRAINS)**

All High Density Polyethylene (HDPE) shall be Geberit / AcuTech or Rehau – Raupiano or equal approved in strict accordance with ISO 8770/8772, Water Mark W209 and W211.

Pipe and fittings shall have a written ten (10) year manufacturer's guarantee upon installation and shall provided in hard copy to the client in the plumbing manual at completion of the project.

HDPE pipe and fittings shall comply with the Manufactures recommendations and instructions for installation and clipping. Jointing shall be achieved by the following methods: Electro fusion sleeve coupling, butt welding, Ring seal socket, linear expansion socket, flange joints. Pipe sizes jointing of 200-315mm diameter sizes shall employ Thermo sleeve couplings. Only use the Manufacture's approved welding/jointing equipment to link piping. Jointing methods shall comply with the manufactures "Reference of technical data" with respect to tensional forces.

Exposure of HDPE pipes and fittings to UV light is prohibited. Wrap all HDPE drains exposed in trenches prior to backfill with white heat resistant shielding to minimize expansion of pipes. Trench backfill shall take place when HDPE materials are not subject to expansion and tensional forces and the material has returned to their original manufactured condition.

Polyethylene (HDPE) systems of mixed manufacturing origin and rating will NOT be accepted.

#### **47.3.5 POLYETHYLENE (WATER SUPPLY SERVICES)**

All Polyethylene (PE) Infra-Structure water supply services shall be ACU-TECH or equal approved SDR11 PE100 made to AS/NZ 4130. Polyethylene pipe and fittings shall be of one manufacturer and comply with Australian Standards, AS 2419-1994 and Draft standard DR 03223 for pressure

applications. All (PE) fittings shall be ACU-TECH with Electro fusion joints, tested to AS/NZ 4129 and carry a Standards mark License number SMKP 20303.

All Polyethylene (PE) pipes and fittings shall be Class PN16 pressure rated. Design working pressure is 1000 Kpa at 20°C ambient operating temperature. (PE) pipes and fittings shall be subjected to test pressures at least 1.5 times the design working pressure. Polyethylene Water service pipes and fittings shall be BLACK colour with RED stripes with legend indication labels.

Electro fusion welding shall be done in strict conformance with the manufacturer's guidelines. All welding shall be done by a licensed (PE) welder with ACU-TECH equipment capable of automatic fitting recognition, dynamic weld monitoring, automatic ambient temperature compensation and data retrieval facility.

Long term exposure to UV light is prohibited. Protect all PE pipes and fittings exposed in trenches and storage areas. Were exposed to UV light cover all PE pipes and fittings with heat resistant shielding to minimize expansion and damage. Trench backfill is to take place when HDPE materials are not subject to expansion and tensional forces and the material has returned to their original manufactured condition.

Polyethylene (PE) systems of mixed manufacturing origin and pressure rating will NOT be accepted.

#### **47.3.6 POLYETHYLENE SILVER (HOT AND COLD WATER BRANCH SERVICES)**

All Cross linked Polyethylene with Aluminium coating and Polyethylene Macro Composite (PE-AL-PEX) pipe & fittings shall be Rehau – Rautitan Stabil or equal approved. (PE-AL-PEX) pipe & fittings shall be PN20 pressure compliant. Design working pressure is 1000 Kpa at 20°C ambient operating temperature. (PE-AL-PEX) pipes and fittings shall be subjected to test pressures at least 1.5 times the design working pressure.

(PE-AL-PEX) Water service pipes and fittings shall be SILVER colour with HOT or COLD legend indication labels affixed at 1800mm centres.

(PE-AL-PEX) pipe, fittings and installation must;

Comply with Water Corporation By-laws,

Comply with AS/NZS 2492 requirements for Cross-linked polyethylene (PE-X) pipes for pressure applications

Comply with AS2537 for Mechanically jointed (PE-X) fittings,

Incorporate same manufacture (PE-X/AL/PE) pipe and fittings,

Be installed in accordance with manufacturers requirements,

Be Watermarked,

Be Rautitan system transition made from stainless steel manufactured to DIN EN 10088, part 3 (material designation 1.4404/1.4571) or DZR brass.

Cross linked Polyethylene (PE-AL-PEX) systems of mixed manufacturing origin and pressure rating will NOT be accepted.

(PE-AL-PEX) pipes and fittings shall be clipped at spaces that comply with the manufacturer's installation catalogue, and associated written instructions.

Provide (PE-AL-PEX) expansion loops in accordance with the manufacturer's installation catalogue, and associated written instructions.

All (PE-AL-PEX) hot water services shall be insulated with energy efficient 20mm thick Thermotec or equivalent expanded nitrile foam, low fire hazard thermal insulation.

Installers shall be trained by the manufacturer in the correct installation and welding techniques for this material and shall provide certifications of competency to the Managing Contractor.

(PE-AL-PEX) pipe shall not be chased or built into masonry walls or cast in concrete slabs.

#### **47.3.7 CEMENT**

Cement shall be 'Portland' cement of approved local manufacture conforming to AS 3972. The cement shall be supplied and delivered to the site in the manufacturer's branded and sealed bags and the Contractor shall arrange for adequate protective cover and storage to prevent deterioration.

Cement which does not comply with the required standards or has been adversely affected in storage shall be removed from the site.

**47.3.8 SAND**

Sand shall be clean, sharp pit sand, screened if necessary, free from all foreign or organic matter and confirming in cleanliness with all the requirements of A.S. No. 1465/1974.

**47.3.9 WATER**

Water shall be fresh, clean and free from all impurities and fit for human consumption.

**47.3.10 CONCRETE**

Concrete shall be minimum 20mpa strength.

**47.4 DETAILED SERVICES****47.4.1 PROPERTY SEWER**

All property sewers are to be U.P.V.C. to AS1260 as previously specified and/or to type of material where indicated on the drawings. Property sewer installed at depths greater than 4.0metres shall be constructed of S.E.H. UPVC.

Provide and install all necessary inspection openings, clean outs, manholes etc. all as indicated on the drawings and to Water Corporation regulations. Cut, seal and remove all redundant property sewer as indicated and as required from demolished existing building. Allow to pump out, demolish, backfill and compact redundant ATU and effluent disposal system.

Extend new property sewer in size and locations indicated and connect to new Aeration Treatment Unit.

Provide and install all necessary vents and overflow relief to comply with AS3500

**47.4.2 AERATION TREATMENT UNIT AND EFFLUENT DISPOSAL**

Provide, install and commission Western Waste Water O-2NR 18KI aeration treatment unit all as noted and in location as indicated on the drawings. Provide and install protective traffic bollards around ATU in locations as indicated on the drawings. Allow to provide, install and commission flat bed effluent disposal system complete with distribution valves and all interconnecting pipework in locations as indicated on the drawings.

**47.4.3 WASTE PIPES GREASE WASTE AND TUNDISHES**

Provide and install waste pipes of sizes and located in positions as indicated on the drawings. Connect waste pipes to fixture outlet traps and extend to combine with floor waste gullies, vented graded pipes or disconnector gullies. Tundishes to be chrome plated copper in all cases with matching wastes.

Cut, seal and remove redundant wastes as indicated and as required from demolished existing building..

Extend HDPE grease waste from kitchen and connect to grease trap. Provide and install grease trap in location and as detailed on the drawings. Connect outlet of grease trap to property sewer as indicated.

Waste pipes shall be constructed of the following:

Exposed internally	-	CHROME PLATED COPPER
Exposed externally	-	UPVC/HDPE
Concealed internally	-	UPVC/HDPE
Concealed externally	-	UPVC/HDPE

**47.4.4 VENT PIPES**

All vent pipes shall be of U.P.V.C., SWV class unless otherwise specified on drawings.

Provide and install all vents of sizes shown on drawings, complete with all bends, junctions and reducers.

Cut, seal and remove redundant vents as indicated and as required from demolished existing building.

Provide vent offsets where necessary. Vent pipes shall terminate 3 metres from extract fans or openings into the building and 5 metres from intake fans.

Provide expansion joints and appropriate anchors to all continuous vent risers, in accordance with requirements of the Water Corporation.

Where any vent pipes are installed in external cavity walls an 'Alcor' or similar approved flashing material shall be provided to prevent moisture bridging the cavity.

Vent pipes shall be extended to 150mm above metal deck roofs and be fitted with 'Dektite' formed rubber flashing secured and sealed to roof.

Terminate vent risers at Water Corporation approved proximity to windows/parapets/all intakes etc. and at correct height, fitted with mosquito proof cowl.

#### 47.4.5 TRAPS

All traps shall be double union type of size scheduled hereinafter:

Sink		50 'P' trap
Shower		50 'P' trap with ACO S/Steel strip drain
Basin	-	40 'P' trap
Floor Waste Gully	-	80 x 65 'P' trap
Cleaners Sink	-	50 'P' trap
Bar sink	-	50 'P' trap
Glasswasher	-	50 'P' trap
Commercial Dishwasher	-	50 'P' trap

Traps shall be constructed of the following:-

Exposed	-	CHROME PLATED COPPER
In-ground/cupboards	-	HDPE/PVC
Cast In-slab		N/A

#### 47.4.6 FLOOR GRATES

All floor waste, floor waste gully and industrial floor waste grates shall be Galvalume Engineering or equal approved 316 grade stainless steel with matching trim surrounds, screw down type to suit vinyl flooring where applicable.

Provide and install MEA stainless steel 316 grade heel guard 100 wide shower grate and channel with tile skirt upstand to showers..

#### 47.4.71.4.7 COLD WATER SERVICE

Provide and install copper water service of sizes and in positions shown on the drawings and connect to all fixtures requiring water.

All cold water service branches shall be a minimum diameter of 15 for one outlet and 20 for two outlets or more.

All cold water pipes concealed in cavities, chased into brickwork, cast into concrete or laid below ground shall be installed as previously specified under 'Concealment of Pipework'.

Water Service pipework shall be as follows :-

##### IN-GROUND

15 and 20 diameter inclusive -	Rehau – Rautitan Stabil
25 to 80 diameter inclusive -	PE SDR11 PN16
100 diameter and over -	PE SDR11 PN16
All sizes below slab -	Copper Type 'B' to AS 1432.

**EXPOSED AND ABOVE GROUND**

15 diameter and over - Copper Type 'B' to AS 1432 / Rehau – Rautitan Stabil

Isolating valves are to be fitted by screwing to a tube bush brazed to the pipe on the inlet and a flare type boiler union on the outlet side. Isolating valves are to be fitted to REHAU by MI brass straight connectors on inlet and outlet sides

Stop valves must not be brazed to a pipe except in the case of concealed assemblies. Where pipes terminate in walls, e.g. at taps or outlets, a suitable anchor is to be brazed to the pipe and securely cemented into the wall.

Isolating valves in the ground are to be fitted with a GALVIN ENGINEERING or equal approved cast iron valve box with hinged lid and set on brickwork built up from the pipe and with lid finishing flush with ground or paving level.

Allow to cut, seal and remove redundant cold water pipework as indicated and as required from existing demolished building and surrounds..

The entire cold water installation shall be subject to a hydrostatic pressure test of 2000 Kpa as set out by the Water Corporation.

Provide, install and commission AUSWATER domestic pressure pump, filtration system and UV unit as noted and as indicated on the drawings. Allow to provide and install reinforced concrete slab and weatherproof canopy over new pump and equipment as noted. Extend pipework from new pump, filter and UV and connect to new isolation valves. Extend pipework from new isolation valves in sizes and locations indicated and connect to all fixtures and outlets as indicated and as required.

Provide and install new domestic water tank of size and in location as indicated and as detailed on the drawings. Tank installation shall be strictly in accordance with manufacturers requirements. Connect new infill pipework to existing bore and connect to inlet of tank. Extend outlet of tank as indicated and connect to new pressure and water treatment system.

Provide and install backflow prevention valves in locations indicated. Extend non potable pipework from backflow valves and connect to fixtures and outlets as noted and as required. Provide and install signage "NON POTABLE WATER. DO NOT DRINK" to wall above fixtures and outlets connected downstream of backflow valves.

**47.4.8 HOT WATER SERVICE**

The whole of the hot water service shall be of copper pipe and be installed to the requirements set out in 'Cold Water Service'. All hot water pipework shall be Type B Copper or Rehau – Rautitan Stabil Preformed brass bends and tee pieces shall not be used. All bends shall be long radius type.

Allow to cut, seal and remove redundant hot water pipework and hot water units as indicated and as required. Existing hot water units and service to existing change rooms shall remain.

All hot water service pipework in cavities, exposed on wall or soffit, shall be insulated with 'Ensolex' or similar approved foam rubber insulation having a minimum wall thickness of 20mm and with all joints glued with L.A. 6 adhesive. Pipework insulation shall not be carried out until pressure testing of the system has been satisfactorily completed.

Relief pipes shall discharge in locations as indicated on the drawings. Provide and install hot water units of type and in locations as indicated on the drawings. Provide and install tempering valves and thermostatic mixing valves to outlets as indicated with outlet temperatures set in accordance with AS3500 and all other relevant codes and standards.

**47.4.9 GAS SERVICE**

The entire gas service installation shall comply with AS 5601, AS1596 and all other relevant Origin Energy Gas or other gas supplier regulations.

Gas pipework shall be as follows:-

**INGROUND**

- 15 and 20 diameter - Copper Type 'B' to AS 1432
- 25 diameter to 100 diameter inclusive - PVC as previously specified.
- over 100 diameter - NA
- Below slab all sizes - Copper Type 'B' to AS 1432

**EXPOSED AND ABOVE GROUND**

- 15 diameter and over - Copper Type 'B' to AS 1432

Provide and install new Origin Energy 2.75KL Bulk Gas tank to Origin Energy requirements and extend pipework in sizes and locations indicated to all appliances and outlets requiring gas.

Allow to provide and install bulk tank in compound consisting of concrete support slab, security fence, security gates and clearances as per Origin Energy Standard Details (Appendix 1 of this Specification) and in accordance with AS1596.

Provide and install gas isolating valves and second stage regulators in locations as indicated.

Provide and install All Controls gas emergency shut off valve in location as indicated on drawing. Allow to install electrical manual reset button in sequence adjacent to emergency stop button.

**47.4.10 STORMWATER DRAINAGE**

All stormwater drainage pipes shall be as follows:

100 diameter to 225 diameter inclusive - sewer class UPVC with solvent weld joints.

300 diameter and larger - Rocla 'x' class concrete with rubber ring joints.

Provide and install stormwater drainage as indicated on drawings and connect to all downpipes, sumps, manholes, sand traps, soakwells etc.

External downpipes shall discharge over a Galvins concrete downpipe sump complete with PVC grate. Downpipes located with 1 metre of 2<sup>nd</sup> stage gas regulators shall be direct connected to inground drains and shall not discharge over open grates.

Cut, seal and remove redundant stormwater drainage as indicated and as required from existing demolished building.

**47.4.11 BACKFLOW PREVENTION**

Provide and install all necessary backflow prevention as indicated on the drawings to the requirements of AS 3500 and as directed by the Water Corporation. Provide and install signage to non potable outlets as previously noted under Cold Water Service.

**47.4.12 MECHANICAL SERVICES**

Provide and install all drains and wastes to air conditioning equipment in sizes and locations as indicated on the drawings. All wastes and drains shall be constructed of DWV uPVC class pipe and wrapped in 20mm thick flexible insulation wrap to prevent condensation through pipe.

**47.4.13 BIN STORE DRAIN**

Provide and install bin store drains comprising 100mm diameter uPVC floor waste gully with 'Vinidex In-Floor DBA' 150x 150 x 100Ø nickel bronze grate with removable strainer basket and uPVC coupling.

Set top of grate at level as required to facilitate the total effective drainage of the Bin Store area.

**47.4.14 INDUSTRIAL WASTE SAMPLE POINT**

Provide and install an industrial waste sample point in accordance with the Water Corporations details and requirements, in the positions indicated on the drawings comprising precast concrete DT mound with cast iron grate set 50mm above finished ground level in landscaped areas and 20mm above finished surface level in paved areas. Charge industrial waste sample points with waste pipe connection or hose tap over, as required.

**47.4.15 STORMWATER SUMP**

Provide and install stormwater sumps constructed of a 1200 diameter Rocla Concrete Liner, set on a 150 thick concrete base reinforced with one layer F72 mesh, and complete with 225 thick concrete cover reinforced with two layers of F72 mesh with 8mm ligs at 150 centres around cover. 600 diameter cast iron EJ CO grate and frame raised above, cover to suit paving and 300 difference between base and outlet.

**47.4.16 STORMWATER MANHOLE**

Provide and install stormwater manhole constructed of a 1200 diameter Rocla Concrete Liner, set on a 150 thick concrete base reinforced with one layer F72 mesh, and complete with 225 thick concrete cover reinforced with two layers of F72 mesh with 8mm ligs at 150 centres around cover. 600 diameter cast iron EJ CO Class D cast iron cover and frame raised above, cover to suit paving and 300 difference between base and outlet.

**47.5 SANITARY FIXTURES****47.5.1 GENERALLY**

Provide and fix tested sanitary fixtures to the manufacturer's specifications in positions indicated and as follows including all necessary brackets, fixings and fittings, waste outlets, overflows and such like and connect to services as required in order to complete the work to the satisfaction of the Superintendent.

All vitreous china fixtures shall be white.

Fixture outlets, grates, threads and nuts shall be chrome plated brass. Basin outlets to be standard plug and washer without fixed plug.

Provide and install basin wall supports as required to securely anchor basin to walls and support a load of not less than 180kg, where installed against stud walls.

**47.5.2 FIXING OF FIXTURES AND FITTINGS IN CUPBOARDS, ETC.**

Where fixtures and fittings are to be installed in vanity unit's cupboards etc, allow for liaison and attendance on the "Joiner" to ensure: -

The correct location, size, etc of holes for taps and fixtures in bench tops.

Samples of taps and fixtures are made available as requested by the "Joiner."

Notwithstanding the above fixtures and fittings shall be fixed and sealed as recommended by the manufacturer and in accordance with the requirements of the Statutory Authority.

**47.5.3 FIXING OF FIXTURES TO WALLS**

Allow for liaison and attendance to ensure that additional trimmers or noggins are provided in stud walls where required to provide a satisfactory area for fixing of any fixtures fittings etc.

**47.5.4 FIXTURE SCHEDULE**

Provide and install all sanitary fixtures as scheduled hereinafter:

**MALE/FEMALE CHANGEROOMS**

Standard WC – Caroma Opal II 'S' trap wall face suite complete

Ambulant WC – Caroma Care 660 'S' trap Ambulant toilet suite complete

Basin – Caroma Cube Extension wall basin with single tap hole

**UMPIRES CHANGEROOMS**

Standard WC – Caroma Opal II 'S' trap wall face suite complete

Basin – Caroma Cube Extension wall basin with single tap hole

**CLEANERS ROOM**

Cleaners Sink – Clark stainless steel cleaners sink with hinged grate to top and gallows support brackets

**FIRST AID ROOM**

Sink – Clark stainless steel 45 litre inset stainless steel trough with one tap hole

**DISABLED TOILET UAT**

Disabled WC – Caroma Care 800 'S' trap Disabled wall face toilet suite with backrest and Blue seat

Bain – Caroma Carboni II Disabled wall basin with single tap hole

**MALE TOILETS**

Standard WC – Caroma Opal II 'S' trap wall face suite complete

Ambulant WC – Caroma Care 660 'S' trap Ambulant toilet suite complete

Basin – Caroma Cube Extension wall basin with single tap hole

Urinal – Caroma Cube wall hung urinal with Galvin Engineering FLOWPLUS mains pressure urinal flush valve with in ceiling sensor and flushpipe

**FEMALE TOILETS**

Standard WC – Caroma Opal II 'S' trap wall face suite complete

Ambulant WC – Caroma Care 660 'S' trap Ambulant toilet suite complete

Basin – Caroma Cube Extension wall basin with single tap hole

**MALE/FEMALE HALL TOILETS**

Standard WC – Caroma Opal II 'S' trap wall face suite complete

Basin – Caroma Carboni II wall basin with single tap hole

**KITCHEN**

Basin – Caroma Concorde wall basin with one tap hole

Connect only to the following items supplied by others:

- 1No x commercial dishwasher
- 2No x commercial sink bowls
- 3No x gas cooking appliances

**MAIN HALL**

Sink – Clark stainless steel 960 inset sink with single end bowl and one tap hole

**BAR**

Connect only to the following items supplied by others:

- 1No x Bar sink
- 2No x Glasswashers
- 1No x Ice Machine
- 2No x Ice Wells

**47.6 TAPS, VALVES AND OUTLETS****47.6.1 GENERALLY**

The Plumbing Contractor shall supply and install all tapware, valves and outlets as nominated in the Architects schedules and as indicated on the Architectural and Hydraulic drawings.

Set taps and outlets true, level and on tile joints where such occur. Ensure assembly and spuds are securely fastened to prevent any movement within walls.

Provide protective covering to all taps and outlets after installation to any damage during construction. Damaged tapware will not be accepted under any circumstances.

Refer to Architectural Detail and Room Elevation drawings to ascertain exact positions of taps and outlets.

Wherever necessary all valves for services coming under the jurisdiction of the Water Corporation shall be tested and stamped with the approval of that Authority.

Wherever necessary all valves for services coming under the jurisdiction of ATCO Gas shall be tested and stamped to the approval of that Authority.

Prior to positioning of any pipework in ceiling spaces or wall chases, allow for coordination on site with all other trades and Superintendent to determine exact pipe route to avoid clashes with other services.

**47.6.2 ISOLATING VALVES**

Cold water service isolating valves up to and including 50Ø shall be approved full bore stainless steel ball valves with stainless steel handles and disconnecting unions comprising tube bush on inlet and flared type boiler union on outlet.

Hot water service isolating valves up to and including 50Ø shall be approved full bore stainless steel ball valves with stainless steel handles and disconnecting unions comprising tube bush on inlet and flared type boiler union on outlet.

Gas service isolating valves shall be diameter shall be approved full bore stainless steel ball valves with stainless steel handles and disconnecting unions comprising tube bush on inlet and flared type boiler union on outlet.

**47.6.3 TAPWARE SCHEDULE**

Provide and install all tapware valves as specified herewith

(NOTE- CS refers to ENWARE chrome plated Anti Vandal CS model tapware)

**MALE/FEMALE CHANGEROOMS**

Pan-15 brass cistern ball valve

Basin-Enware Oras 15 CP single lever basin mixer

Shower-CS wall shower set with Enware anti vandal shower rose

Urinal – 20 brass ball valve and Galvin Engineering Flowplus mains pressure flush valve

**UMPIRES CHANGEROOMS**

Pan-15 brass cistern ball valve

Basin-Enware Oras 15 CP single lever basin mixer

Shower-CS wall shower set with Enware anti vandal shower rose

**CLEANERS ROOM**

Cleaners Sink- CS 15CP wall mounted sink set with aerator swivel outlet

**FIRST AID ROOM**

Sink- Enware Oras 15 CP single lever sink mixer

**DISABLED TOILET**

Pan-15 brass cistern ball valve

Basin-Enware Oras 15 CP single lever basin mixer with disabled lever

Shower-Enware Oras single lever shower mixer with disabled lever and Galvin Engineering Clevakit shower unit with reinforced 1800 long hose and hand held shower rose

**MALE TOILETS**

Pan-15 brass cistern ball valve

Basin-Enware Oras 15 CP single lever basin mixer

Urinal – 20 brass ball valve and Galvin Engineering Flowplus mains pressure flush valve

**FEMALE TOILETS**

Pan-15 brass cistern ball valve

Basin-Enware Oras 15 CP single lever basin mixer

**MALE/FEMALE HALL TOILETS**

Pan-15 brass cistern ball valve

Basin-Enware Oras 15 CP single lever basin mixer

**KITCHEN**

Sinks-GE 15CP single lever sink mixer

Pre rinse sink-Stoddart CMPL.0841 Spray Rinse Arm

Basin-Enware knee operated basin mixer

Gas Cooking Appliances-25 brass gas cock.

Dishwasher-20 brass duo-valves

**MAIN HALL**

Sink- Enware Oras 15 CP single lever sink mixer

**BAR**

Sink-GE 15CP single lever sink mixer

Glasswasher-15 brass duo-valves

Ice Machine-20 brass duo-valve

**47.6.4 REDUCED PRESSURE ZONE DEVICES (RPZD)**

Provide and install to locations shown on the drawings Flomatic reduced zone pressure devices complete with ball valve and strainer on inlet and ball valve on outlet, in accordance with AS3500. Install tundishes and drains under each RPZD.

**47.6.5 HOSE TAPS**

15Ø brass hose tap with removable handle and vacuum breaker on outlet. Securely fix hose taps to walls. Supply removable tap handles to the Centre Manager upon Practical Completion. Obtain receipt of tap handle delivery.

**47.7 COMPLETION**

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**47.7.1 CLEANING UP**

On completion of the work clean all pipe work of mortar and other foreign material, check all pipelines, inspect and tighten all cleaning openings and trap connections, flush and clean out all debris from wastes, property sewers, stormwater drains, road gullies, grated channels etc, and leave the whole of this section of the work in perfect new condition.

Check all pipe clips and fasteners and tighten where necessary. All pipelines shall be checked; taps and valves shall be tested and rectified if required. Cisterns shall be checked and adjusted if required. Sanitary fixtures and chrome pipe work shall be uncovered and thoroughly cleaned and the whole of this section of the work shall be left in perfect new condition.

**47.7.2 CAST IRON COVERS AND GRATES**

At completion remove all cast iron covers, wire brush clean frame and inset and reseal in approved grease seal, removing all excess grease from surrounding surfaces. Replace all missing key hole plugs.

Allow for waiting on and making good to this section of the work after all other trades to the satisfaction of the Superintendent.

**47.7.3 RESTORATION & COMPLETION**

All existing concrete bitumen and paved areas shall be restored to the levels and surfaces finish existing prior to commencement of the Hydraulic Services and to a condition deemed satisfactory by the Superintendent.

All lawns, gardens and undeveloped surfaces shall be restored with excavated materials made good to the satisfaction of the Superintendent.

At all times keep the Superintendent informed of any damage to existing services and the action taken to repair or make good such damage.

Prior to the date of practical completion, all access pits are to be cleared of any debris which may have accumulated. All soil, waste pipes and drains are to be checked by flushing and cleared of blockages and video all drainage lines and junctions that fall under the works contract to prove all lines are in good working order. Footage to be submitted to Hydraulic Consultant for assessment prior to Practical Completion.

The complete plumbing services installation is to be checked and the whole left in perfect condition to the entire satisfaction of all relevant Authorities.

**47.8 TENDER FOR HYDRAULIC SERVICES MUCHEA RECREATION CENTRE**

**47.8.1 TENDER SUM BREAKDOWN**

I/We hereby certify that the following submitted Tender Price is fully inclusive of all labour, costs, materials and equipment as specified and scheduled within the Construction Hydraulic Design Specification and accompanying drawings No HS1 TO HS4 Revision 0 inclusive.

<b>Fixed Lump Sum Tender Price</b>	<b>\$</b>	<b>(excluding GST)</b>
		<b>GST    \$</b>
Tenderer:.....		
Address:.....		
Signed:.....		Date:.....

The following tender breakdown attached is to be completed in full and returned as part of the tender submission.

**TENDER BREAKDOWN**

The following breakdown is to be completed and will be used for the purpose of assessing tenders and progress claims.

Fixtures and Tapware	\$.....
Property Sewer	\$.....
ATU and Flatbed Leach Drains	\$.....
Sanitary Plumbing	\$.....
Fixtures and Tapware fit off	\$.....
Cold Water Service	\$.....
Hot Water/Warm water service and Units	\$.....
LP Gas Service	\$.....
Stromwater drainage	\$.....
Mechanical Drainage	\$.....
Demolition of existing services	\$.....
Authority Application Fees	\$.....
Sub Total	\$.....
GST 10%	\$.....
<b>TENDER SUBMISSION TOTAL</b>	<b>\$.....</b>

**APPENDIX A**  
**ORIGIN ENERGY STANDARD LPG BULK TANK**  
**INSTALLATION DETAILS**

## 48 MECHANICAL SERVICES

### 1.1 PROJECT DESCRIPTION

The Mechanical Services described in this specification are associated with the [Title], located at 48 Archibald St Muchea.

The project consists of a new Recreation Centre with changerooms, Social Hall, Kitchen and Amenities.

### 1.2 SCOPE OF WORKS

The scope of works includes the following:

→ Air cooled, Variable Refrigerant Flow (VRF), Heat Pump type air conditioning system connected to the following indoor units:

- Ducted type air conditioning serving the Hall – 3 off
- Cassette type air conditioning serving the Shire Office

The VRF condensing unit of “Mitsubishi” manufacture, model “PUHY-P750YSNW-A1” has been pre-purchased by the Shire. The Contractor is to allow for the collection of the condensing unit from the Shires storage facility, installation on site and commissioning of the system.

The new indoor units, pipework, controls and the like, purchased as part of this Contract are to be compatible with the pre-purchased air conditioning condensing unit.

- Toilet / changeroom exhaust system serving the Amenities, Change Rooms 1 to 4, Umpires Rooms and Cleaners Room
- Kitchen exhaust system serving the cooking equipment (kitchen exhaust hood specified by others)
- Make-up air system to provide make-up air to the kitchen exhaust system
- Mechanical ventilation system to serve the First Aid Room
- Air distribution associated with the above systems
- Pipework associated with the above systems
- Electrical works associated with the above systems
- Controls associated with the above systems
- Noise and vibration control for the above systems
- Identification labelling of the above systems
- Testing and commissioning of the above systems
- Operating and maintenance manuals associated with the above systems
- Defects liability period of 1 year from the date of practical completion
- Maintenance and servicing of the above systems for a period of 1 year from practical completion

#### 48.1.1 DESIGN CRITERIA

The design criteria for the Mechanical Services design or any future design modifications, are as follows.

##### System Sizing

Parameter	Design Criteria
<b>System Sizing</b>	
Cooling	<ul style="list-style-type: none"> <li>→ Maximum coincident room load</li> <li>→ 5% safety factor</li> </ul>

Heating	<ul style="list-style-type: none"> <li>→ Maximum coincident room load</li> <li>→ 5% safety factor</li> </ul>
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**Design Temperatures**

Parameter	Design Criteria	
<b>Extreme External Conditions</b> (at which equipment shall still operate)		
Summer	<ul style="list-style-type: none"> <li>→ 40.0°C dry bulb maximum</li> <li>→ 23.0°C wet bulb maximum</li> </ul>	Exceeded 0.25% of operating hours
Winter	→ 6.5°C dry bulb minimum	
<b>External Conditions</b> (at which equipment shall meet specified performance)		
Summer	<ul style="list-style-type: none"> <li>→ 36.6°C dry bulb maximum</li> <li>→ 20.1°C wet bulb maximum</li> </ul>	Exceeded 10 days per year
Winter	→ 7.4°C dry bulb minimum	
<b>Internal Conditions</b> (to be met at specified external conditions)		
Occupied spaces generally	<ul style="list-style-type: none"> <li>→ 22.5°C ± 1.5°C dry bulb at point of control</li> </ul> Relative humidity generally in the range of 40-60% through the cooling process but noting that humidity is not actively controlled	
Amenities	Indirectly conditioned if adjoining air conditioned space but not actively controlled	
<b>Supply Air</b>	14°C dry bulb minimum	
<b>Operating Hours</b>	Extended business hours	

**Internal Heat Gains**

Parameter	Design Criteria
<b>Occupancy Numbers</b>	
Hall	1 person / 1m <sup>2</sup> (approx. 296 people)
Shire Office	2 people
First Aid Room	3 people
<b>Occupancy Loads (Degree of Activity)</b>	
Occupied spaces generally	Considered to be equivalent to "seated, standing, walking slowly" <ul style="list-style-type: none"> <li>→ 70W / person (sensible)</li> <li>→ 60W / person (latent)</li> </ul>
<b>Equipment Loads</b>	
Hall	3 x 300 W – AV Equipment
Shire Office	150 W
Communications rack	300 W – TBC by Shire

Parameter	Design Criteria
<b>Lighting Loads</b>	
Hall	8 W/m <sup>2</sup>
Office	4.5 W/m <sup>2</sup>

### Air Distribution Systems

Parameter	Design Criteria	
<b>Supply Air</b>		
Occupied spaces generally	6 L/s/m <sup>2</sup> minimum	
<b>Outside Air</b>		
Occupied spaces generally	7.5 L/s/person	
Kitchen Exhaust Hood Make-up Air System	1000 L/s	
<b>Exhaust Air</b>		
Amenities & Umpires Room	10 L/s/m <sup>2</sup> or 25 L/s/fixture, whichever is greater	
Amenities airlock	5 L/s/m <sup>2</sup>	
Cleaners room	5 L/s/m <sup>2</sup>	
Kitchen Exhaust Hood	1100 L/s	
<b>Air Diffusion Equipment</b>		
Air conditioned spaces	0.25 m/s maximum terminal velocity in occupied zone	
<b>Air Change Effectiveness</b>	>0.95 when measured in accordance with ASHRAE F25-1997	
<b>Ductwork Maximum Velocities and Pressure Drops</b>		
Primary ductwork	7.5 m/s	0.8 Pa/m
Flexible ductwork	2.5 m/s	0.8 Pa/m

### Acoustics

Parameter	Design Criteria
<b>Maximum Noise Levels Under All Conditions of Equipment Operation L<sub>AEQ</sub></b>	
Halls	45 dB(A)
Private offices	40 dB(A)
Amenities	50 dB(A)
Storerooms	55 dB(A)
Kitchen	55 dB(A)
Property Boundary	Not to exceed the requirements of the Local Authority
All other areas	to the requirement of AS 2107 – Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors

### Building Details

Construction details of the major building elements affecting equipment performance are listed below. Any modifications to these building elements may impact its overall thermal performance which may impact the ability

of the equipment to meet the above design criteria. Any proposed changes to these building elements must be approved by the Consultant Engineer.

Construction		Compliant Materials
External Walls	Framed Walls Rt1.48*	Steel framed walls insulated with <b>R2.5 Insulation batt + R0.2 Thermal break</b> between steel frame and external lining + Plasterboard lining internally. External finishes as per elevations
Floors	Concrete Slab	In-Situ Concrete slab construction Floor coverings as per plans
Ceiling/Roof	Metal Deck roof with dropped ceiling	Shale Grey metal deck roof (SA: 0.43) <b>60mm Anticon (R1.3) with R2.5 ceiling insulation</b> or <b>Anticon 130</b> with 110mm Ashgrid spacer system

Please note all values above include air films.

\*Total R-Values have accounted for thermal bridging as per AS/NZS 4859.2. Refer to compliant materials for min R-Value required for specified insulation to achieve Rt.

Window Specification		U-Value	SHGC
Glass Type	Low-E Clear glazing in aluminium frames (eg. 6.38mm ComfortPlus Clear)	4.80	0.58

## 48.2 GENERAL REQUIREMENTS

### 48.2.1 GENERAL

The following clauses outline the general requirements for the Works. These requirements are not intended to cover all aspects of the installation and must be read in conjunction with the Conditions of Contract, Special Conditions of Contract, documents by other Consultants and the Mechanical Services drawings.

### 48.2.2 CODES, STANDARDS & GUIDELINES

Comply with all requirements of the National Construction Code, applicable Australian Standards, Local Council Laws, Development Approval requirements and guidelines by recognised industry groups.

### 48.2.3 COMMUNICATION

An open and collaborative approach to the project is expected of the Contractor and hence the Consultant welcomes calls, emails and meetings to discuss the intent of the Tender documentation, clarifications or queries. However, all official communication such as submissions and requests for information / clarification must be submitted via email on an official RFI form, using a process established and tracked by the Contractor.

The Contractor is expected to think about RFI's prior to submitting and propose a solution within the RFI which can be accepted or otherwise by the Consultant.

### 48.2.4 DISCREPANCIES IN DOCUMENTS

In the event of any ambiguity, discrepancies or inconsistencies in the Contract documents, raise a RFI with the Consultant to seek clarification. In all instances the requirements of the applicable Codes and Standards shall take precedence.

### 48.2.5 CONTRACTOR DESIGN RESPONSIBILITIES

The Contractor is responsible for the detailed design activities listed below:

- Calculate system resistances to fluid flow (air) based upon the proposed plant layout and selected equipment. Submit calculation to Consultant for review. Final equipment selections are to be based on the Contractors calculated resistances, not the specified figures.  
Allow for and design amendments to power supplies for Contractor selected equipment if equipment differs from those specified.
- Allow for and design secondary structural supports for equipment, ductwork and pipework as required
- Amend pipework and ductwork routes to suite onsite conditions
- Amend pipework and ductwork connections to suite Contractor selected equipment
- Calculate electrical cable sizes, rating and voltage drops based upon installed cable lengths, selected make of cables and on-site conditions
- Size and locate penetrations in walls, floors, roof and ceilings
- Physical co-ordination of installation with other trades
- Provision of electrical loads to other trades
- Equipment mounting details and fasteners
- Cable installation details and derating factors
- Settings for protection equipment, time delays, time switches etc
- Capacity, location, design and sizing of cable support, trunking and conduit systems
- Acoustic design or modification of Tendered equipment that may require change, to meet with the noise levels specified. Such change to approval of the Engineer. Specified levels to be achieved with all plant operating
- Damper and access locations
- Selection of all anti-vibration mountings to suit the particular application of the mounts
- Final locations of control sensors, detectors and thermostats

#### **48.2.6 ALTERNATIVE DESIGNS**

Alternative designs that enable the Works to be delivered more economically or provide programme efficiencies compared to those specified may be suggested at any time.

Allow for all costs incurred by the Consultant to review any Alternative Designs.

#### **48.2.7 BIM / REVIT REQUIREMENTS**

The project has been documented in Revit in 3D which forms the basis of the Consultant 2D drawings which will be considered the contract documentation together with this Specification for Tendering purposes.

Coordination of model elements in the Consultant's Model has been undertaken to a degree considered adequate to convey the design intent of the Mechanical Services. Finalisation of positions, selections, supports and fixings shall be undertaken by the Contractor as part of the Shop Drawing process.

The Consultants Model shall under no circumstances be used for construction purposes.

Where, with agreement, the Consultant's Model is provided to the Contractor, it will be done so for information purposes only, in order to assist in gaining a better understanding of the Works. Accordingly, it should be used as a guide, together with the Consultants Drawings and Specification for the production of Shop Drawings.

#### **48.2.8 SITE PROVISIONS AND ASSOCIATED WORKS**

##### **General**

This clause is intended to identify site provisions and works associated with the Mechanical Services Works. It is not an exhaustive list and the Contractor is responsible for the demarcation of tasks and responsibilities between trades.

##### **Site Provisions**

To be agreed with Head Contractor, however, consideration should be given to:

- Power
- Water

- Hoisting
- Scaffolding
- Site facilities including storage sheds / containers

#### **Associated Works**

Associated works typically provided by the Head Contractor are listed below under indicative trade categories. Liaise with the Head Contractor and agree demarcation of tasks and responsibilities between Mechanical Services and other Trades before commencing Works. Provide any additional Associated Works necessary for the completion of the Works.

#### Louvres

- Fully louvred enclosures

#### Doors

- Door cut-outs for relief air grilles
- Undercuts for ventilation purposes
- Fully louvred external doors

#### Concrete, Superstructure, Brickwork and Blockwork

- Wall and floor penetrations
- Chasing, coring, cutting and making good

#### Ceilings

- Penetrations
- Ceiling access panels to all equipment, ductwork access panels and dampers above solid ceilings requiring access for testing, commissioning or maintenance

#### Dry Wall / Plenums

- Penetrations

#### Roof

- Penetrations and upstand

#### Plumbing

- Tundishes for equipment condensation

#### **Termination Points**

Termination points for building services are listed below under typical Trade categories. Liaise with the Head Contractor and agree demarcation of tasks and responsibilities between Mechanical Services and other Trades before commencing Works.

#### Works by Electrical Services

- Provision of switched isolators adjacent Mechanical Services equipment

#### Works by Hydraulic Services

- Provision of condensate drain tundishe(s)

#### Kitchen Equipment

- Commercial kitchen exhaust canopy – 3900L x 1050W

#### **48.2.9COORDINATION**

Coordinate the installation of the works with all other Trades to ensure a logical, sequenced approach. Pay all costs associated with delays, re-work, making good or additional works resulting from delays, or deficiencies in coordination of the works or provision of information.

Prior to the installation of wall mounted equipment, such as thermostats and control panels, co-ordinate with the Architectural, furniture and electrical services layouts.

Prior to the installation of ceiling mounted equipment such as air diffusion equipment, co-ordinate with the Architectural, Electrical and Fire Protection Services layouts and provide coordinated on ceiling drawings.

## 48.2.10 SUBMISSIONS

### System Resistance Calculations

**DO NOT** prepare Equipment Schedule or order equipment based on specified system resistances as these have been provided for tendering purposes only.

Perform pressure drop calculations for each system based on site measurements, the distribution system sizes and routes, half loaded filters, onsite conditions and proposed ancillary equipment.

### Equipment Schedules

**DO NOT** submit Equipment Schedules without undertaking System Resistance Calculations.

Equipment selections and hence Equipment Schedules are to be based on the Contractor's System Resistance Calculations, not specified values.

Complete and submit to the Consultant for review an electronic (pdf) version of the Equipment Schedules stating design and tendered information, accompanied by the System Resistance Calculations, prior to the preparation of Shop Drawings and placing of orders.

Allow within the Works Programme a minimum of 5 business days for the review of the submission by the Consultant and an additional 5 business days for the resubmission and second review of any equipment which is deemed "Not Satisfactory".

Should the above timeframes not be achievable within the Works Programme, provide the Consultant with advanced notice of a pending reduced mutually agreeable review period.

### Shop Drawings

**DO NOT** submit Shop Drawings until Equipment Schedules have been reviewed by the Consultant and marked as "Satisfactory" or "Satisfactory - subject to comments".

The Consultant drawings accompanying this Specification are diagrammatic layouts and are intended to convey the design intent of the Works only. As a result, Shop Drawings must be prepared and submitted to the Consultant for review, providing details of the fabrication, layout and installation of all equipment proposed to be installed, including relationship to the building structure, architecture and other services.

Allow within the Works Programme a minimum of 5 business days for the review of Shop Drawings by the Consultant and an additional 5 business days for the resubmission and second review of any drawings which are deemed "Not Satisfactory".

Should the above timeframes not be achievable within the Works Programme, provide the Consultant with advanced notice of a pending reduced review period.

Prepare and submit for review an electronic version (pdf) of Shop Drawings which include the following information as a minimum:

- Equipment, as approved by the Consultant, including manufacturer recommended access, operational and installation requirements
- Ductwork and pipework arrangements including details of construction, supports, anchoring, expansion and fixing
- Reflected ceiling plans detailing and coordinating air diffusion equipment locations, sizes, air quantities, ceiling details, Electrical Services and Fire Protection Services layouts
- Wall mounted equipment such as sensors and control panels, co-ordinated with the furniture and Electrical Services layouts – including dimensioned set-outs
- Locations of all valves, dampers and actuators
- Switchboard / control panel layouts and schematics
- Secondary structural support details
- Associated Works including penetrations with dimensioned set-outs, plinths, access panels, drain positions and termination points between other services

Check on site the setting out of all equipment, penetrations, ductwork and pipework prior to the fabrication or placing orders.

**DO NOT** place any orders, commence fabrication or works on site until Shop Drawings have been reviewed by the Consultant and marked as "Satisfactory" or "Satisfactory – subject to comments".

**48.2.11 SAMPLES**

The following samples are requested for review prior to placing any orders to ensure they are technically or aesthetically acceptable.

Deliver 1 of each sample requested to the site office at least 5 business days prior to ordering is required, clearly marked with a specification / drawing reference. Samples are to be retained on site until Practical Completion is granted.

Submit the following samples for review and approval prior to placing orders:

- Weatherproof louvres - brochure acceptable
- Door grilles - brochure acceptable
- Wall mounted linear bar grilles - brochure acceptable

**48.2.12 TREATMENT OF BUILDING PENETRATIONS**

The Contractor is responsible for treatment of all building penetrations including but not limited to fire, smoke, acoustic, watertight and airtight barriers.

Ductwork and pipework penetrations exposed to view are to be flashed with sheet metal escutcheon plates. Include silicon sealant where exposed to the weather.

Install weatherproof over flashings and any trimmer beams required to support the material passing through the penetration. Utilise "Dektite" or equal approved silicon sealant for minor penetrations.

**48.2.13 TRANSPORT, STORAGE AND PROTECTION**

Provide protection from moisture and dust ingress to the internals of all materials and equipment during transportation, storage on site and while installation is in progress.

Protect from the weather all material and equipment upon delivery to site.

**48.2.14 EQUIPMENT, MATERIALS AND WORKMANSHIP**

Supply and install new, good quality, fit for purpose equipment and materials which are of current manufacture. Maintain uniformity of manufacturer and type across the project.

Comply with the manufacturer's recommendations in relation to installation techniques, operational clearances, maintenance & servicing access, and Safety in Operation requirements.

Employ suitably qualified and licensed tradespersons to carry out the Works.

**48.2.15 ELECTROMAGNETIC INTERFERENCE**

Comply with Australian Communications Authority requirements for electrical and electronics products to limit electromagnetic interference (EMI).

**48.2.16 SITE CLEANLINESS AND RUBBISH REMOVAL**

Remove from site all rubbish, debris, material cuttings and other redundant which result from the Works, progressively and whenever directed. Comply with the site requirements in relation to the recycling of materials.

**48.2.17 QUALITY ASSURANCE**

Implement a quality system in accordance with ISO 9001 for quality assurance during design, fabrication, installation, maintaining and servicing.

**48.2.18 SAFETY IN DESIGN & CONSTRUCTION**

Safety in Design and Construction is to be the primary consideration of the Contractor. As a minimum conform to the requirements of the applicable Workplace Health and Safety regulations.

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## 48.3 EQUIPMENT

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### 48.3.1 GENERAL

Supply and install all equipment in accordance with this specification, the National Construction Code, applicable Australian Standards, Development Approval requirements and the applicable Council Local Laws as a minimum. Include all ancillary equipment and components to ensure a complete, safe and operational system.

Ensure that the tendered equipment can be accommodated within the available space while meeting the manufacturers recommendations.

The following schedules have been prepared for tendering purposes and should be read in conjunction with their preceding equipment construction criteria, other clauses of this Specification and the Consultant Drawings.

Specified cooling and heating capacities are net capacities. The Contractor shall take into consideration fan motor gains and refrigerant pipe equivalent lengths when selecting equipment to ensure the specified capacities are delivered by the indoor units. Outdoor units are to be selected to deliver the specified, diversified capacity with no additional diversity applied.

Specified system resistances have been provided for tendering purposed only. Perform and submit for review pressure drop calculations for each system based on site measurements, the distribution system sizes and routes, half loaded filter resistances, onsite conditions and proposed ancillary equipment.

The primary selection criteria for air conditioning units are the cooling and heating requirements. As a result, supply air quantities may vary in response to the particular manufacturers equipment and the calculated system resistances. However, air distribution Design Criteria in Clause 0 must still be adhered to. If the acoustic requirements are not met by the installed equipment, additional sound absorption and / or attenuation may be required to meet the acoustic requirement at no additional cost to the project.

### 48.3.2 AIR CONDITIONING UNIT – AIR COOLED, REVERSE CYCLE, VRF TYPE

Supply and install air cooled, reverse cycle, VRF (Variable Refrigerant Flow) type air conditioning units complying with the following construction and performance criteria.

#### INDOOR UNITS

##### Cassette Type

- Closed cell, foil faced foam insulation to casing incorporating dry media air filter
- Centrifugal type indoor supply air fan with multi-speed DC motor
- Evaporative coil to be epoxy protective coated, maximum face velocity of 2.5 m/s, aluminium plate fins and mechanically expanded rifled copper tube

##### Ducted Type

- High grade galvanised steel casing incorporating closed cell, foil faced foam insulation
- Forward curved supply air fan with multi-speed EC motor
- Evaporative coil to be epoxy protective coated, maximum face velocity of 2.5 m/s, aluminium plate fins and mechanically expanded rifled copper tube
- Where fan coil units are installed in ceiling spaces, incorporate a galvanised steel, 1 piece safety tray to the underside of the unit, complete with drain connection

Indoor Unit Designation	ACU-1	ACU-2	ACU-2
Area Served	Hall LHS	Hall Centre	Hall RHS
Configuration	Ducted	Ducted	Ducted
Associated Condensing Unit	CU-1	CU-1	CU-1
Total Cooling Capacity (kW)	24.5	19.9	25.9
Sensible Cooling Capacity (kW)	21.0	17.1	22.2
Heating Capacity (kW)	16.5	13.5	17.5
Evaporator Coil Air On - Cooling db/wb (°C)	30.3/18.6	30/18.5	30.2/18.5
Evaporator Coil Air On - Heating db (°C)	14.2	14.5	14.3
Supply Air Quantity (L/s)	1100	900	1200
Outside Air Quantity - Minimum (L/s)	40	40	40
Outside Air Quantity - Design (L/s)	550	430	590
Outside Air Quantity - Maximum (L/s)	1100	900	1200
External Static Pressure (Pa)	200	200	200

Indoor Unit Designation	ACU-4
Area Served	Shire Office
Configuration	Cassette
Associated Condensing Unit	CU-2
Total Cooling Capacity (kW)	2.0
Sensible Cooling Capacity (kW)	1.9
Heating Capacity (kW)	1.6
Evaporator Coil Air On - Cooling db/wb (°C)	24/17
Evaporator Coil Air On - Heating db (°C)	21.0
Outside Air Quantity - Design (L/s)	0

## OUTDOOR UNITS

- A VRF condensing unit of “Mitsubishi” manufacture, model “PUHY-P750YSNW-A1” has been pre-purchased by the Shire

### 48.3.3 FAN – MIXED-FLOW - SMALL

Supply and install mixed-flow fans complying with the following construction and performance criteria:

Fan, Motor and Drive

- Mixed-flow impellers of injection moulded plastic
- Squirrel cage, capacitor run
- Bearings sealed for life, ball

Casing

- Reinforced, injection moulded polypropylene plastic

Designation	TEF-1	TEF-2	TEF-3
Area Served	Change Rm 1	Change Rm 2	Change Rm 3
Fan Type	Ducted	Ducted	Ducted
Impeller Type	Mixed Flow	Mixed Flow	Mixed Flow
Air Quantity (L/s)	280	280	280
External Static Pressure (Pa)	90	90	90
Full Load Current / Phase (A)	0.2 / 1	0.2 / 1	0.2 / 1
Sound Power Level - Inlet (dB)			
63 Hz	57	57	57
125 Hz	57	57	57
250 Hz	66	66	66
500 Hz	67	67	67
1000 Hz	65	65	65
2000 Hz	62	62	62
4000 Hz	58	58	58
8000 Hz	59	59	59
dB(A) @ 3m	49	49	49
Sound Power Level - Outlet (dB)			
63 Hz	60	60	60
125 Hz	58	58	58
250 Hz	66	66	66
500 Hz	65	65	65
1000 Hz	64	64	64
2000 Hz	63	63	63
4000 Hz	55	55	55
8000 Hz	54	54	54
dB(A) @ 3m	48	48	48

Designation	TEF-4	TEF-5	TEF-6
Area Served	Change Rm 4	Umpire 1	Umpire 2
Fan Type	Ducted	Ducted	Ducted
Impeller Type	Mixed Flow	Mixed Flow	Mixed Flow
Air Quantity (L/s)	280	80	80
External Static Pressure (Pa)	90	60	60
Full Load Current / Phase (A)	0.2 / 1	0.2 / 1	0.2 / 1
Sound Power Level - Inlet (dB)			
63 Hz	57	56	56
125 Hz	57	50	50
250 Hz	66	54	54
500 Hz	67	55	55
1000 Hz	65	52	52
2000 Hz	62	50	50
4000 Hz	58	49	49
8000 Hz	59	39	39
dB(A) @ 3m	49	37	37
Sound Power Level - Outlet (dB)			
63 Hz	60	55	55
125 Hz	58	54	54
250 Hz	66	56	56
500 Hz	65	56	56
1000 Hz	64	52	52
2000 Hz	63	50	50
4000 Hz	55	49	49
8000 Hz	54	39	39
dB(A) @ 3m	48	38	38

Designation	GEF-1	VF-1	TEF-7
Area Served	Cleaners	First Aid	UAT, F & M
Fan Type	Ducted	Ducted	Ducted
Impeller Type	Mixed Flow	Mixed Flow	Mixed Flow
Air Quantity (L/s)	30	30	240
External Static Pressure (Pa)	50	50	90
Full Load Current / Phase (A)	0.1 / 1	0.1 / 1	0.5 / 1
Sound Power Level - Inlet (dB)			
63 Hz	49	49	50
125 Hz	41	41	56
250 Hz	44	44	58
500 Hz	44	44	60
1000 Hz	40	40	62
2000 Hz	39	39	64
4000 Hz	38	38	58
8000 Hz	26	26	51
dB(A) @ 3m	26	26	47
Sound Power Level - Outlet (dB)			
63 Hz	45	45	67
125 Hz	44	44	58
250 Hz	44	44	60
500 Hz	44	44	63
1000 Hz	39	39	66
2000 Hz	37	37	64
4000 Hz	38	38	59
8000 Hz	25	25	53
dB(A) @ 3m	25	25	49

Designation	TEF-8
Area Served	F & M Amb
Fan Type	Ducted
Impeller Type	Mixed Flow
Air Quantity (L/s)	80
External Static Pressure (Pa)	60
Full Load Current / Phase (A)	0.2 / 1
Sound Power Level - Inlet (dB)	
63 Hz	56
125 Hz	50
250 Hz	54
500 Hz	55
1000 Hz	52
2000 Hz	50
4000 Hz	49
8000 Hz	39
dB(A) @ 3m	37
Sound Power Level - Outlet (dB)	
63 Hz	55
125 Hz	54
250 Hz	56
500 Hz	56
1000 Hz	52
2000 Hz	50
4000 Hz	49
8000 Hz	39
dB(A) @ 3m	38

**48.3.4 FAN – MIXED-FLOW – LARGE**

Supply and install mixed-flow fans complying with the following construction and performance criteria:

Fan, Motor and Drive

→ Mixed-flow impellers

→ EC motor

Casing

→ Galvanised steel construction

Designation	KEF-1
Area Served	Kitch Ex Hood
Fan Type	Ducted
Impeller Type	Mixed Flow
Air Quantity (L/s)	1100
External Static Pressure (Pa)	250
Speed Control	2 Speed
Full Load Current / Phase (A)	4.2 / 1
Sound Power Level - Inlet (dB)	
63 Hz	74
125 Hz	75
250 Hz	70
500 Hz	68
1000 Hz	63
2000 Hz	65
4000 Hz	65
8000 Hz	59
dB(A) @ 3m	51
Sound Power Level - Outlet (dB)	
63 Hz	75
125 Hz	74
250 Hz	70
500 Hz	70
1000 Hz	71
2000 Hz	69
4000 Hz	67
8000 Hz	61
dB(A) @ 3m	55

**48.3.5 FAN – INLINE AXIAL**

Supply and install inline axial fans complying with the following construction and performance criteria:

Fan, Motor and Drive

- Axial impellers of high strength powder coated steel
- EC motor
- Bearings sealed for life, ball

Casing

- Aluminium fan housing with plastic spigots

Designation	MAF-1
Area Served	Kitch Ex Hood
Fan Type	Ducted
Impeller Type	EC Axial
Air Quantity (L/s)	1000
External Static Pressure (Pa)	150-200
Speed Control	2 Speed
Full Load Current / Phase (A)	4.2 / 1
Sound Power Level - Inlet (dB)	
63 Hz	78
125 Hz	73
250 Hz	71
500 Hz	73
1000 Hz	69
2000 Hz	69
4000 Hz	65
8000 Hz	59
dB(A) @ 3m	55
Sound Power Level - Outlet (dB)	
63 Hz	81
125 Hz	75
250 Hz	72
500 Hz	71
1000 Hz	67
2000 Hz	68
4000 Hz	65
8000 Hz	61
dB(A) @ 3m	54

#### 48.3.6 AIR FILTER – PANEL TYPE

Supply and install air filters of panel type complying with the following construction and performance criteria.

Frame

- Rigid, water resistant cardboard frame
  - Selected for consistency across the project and sizing which is readily available off-the-shelf
- Media
- Pleated and made from cotton and / or synthetic, continuous fibres to prevent fibre shredding
  - Fully supported media bonded onto a wire support grid
  - Bonded into frame to eliminate air bypass
  - Maximum face velocity of 2.5 m/s
  - Performance rating of F5
  - Of Type 1
  - Of Class A
  - Panel depth of 50mm
  - Maximum clean filter pressure drop of 55Pa

#### 48.4 AIR DISTRIBUTION SYSTEMS

##### 48.4.1 GENERAL

Supply and install all air distribution systems in accordance with this specification, the National Construction Code, applicable Australian Standards, Development Approval requirements and the applicable Council Local Laws and SMACNA guidelines, as a minimum. Include all ancillary equipment, components and balancing dampers to ensure a complete, safe and operational system.

The Consultant drawings accompanying this specification are a schematic representation of the air distribution system and hence do not show all offsets and transitions required for the coordination with other trades, the building structure and site conditions or to connect to the Contractor selected equipment.

Ductwork dimensions indicated on drawings are in millimetres and are the internal dimensions of the air passage i.e. excluding insulation or acoustic lining where fitted. The first dimension stated for rectangular ductwork is the ductwork dimension visible on the drawing in that particular view.

Insulation material R-Value to be as indicated on drawings.

Support all air distribution systems from the building structure.

##### 48.4.2 SHEET METAL DUCTWORK

Utilise "Pittsburg Lock" seam at all longitudinal corner seams.

Reinforce transverse joints utilising drive cleat or proprietary flanging system.

Seal water-tight all joints containing moisture including toilet exhaust and kitchen exhaust ductwork with silicon sealant compound applied to the metal prior to constructing the joint. Grade ductwork containing moisture and provide drain points at all low points of ductwork containing moisture.

Provide turning vanes within all ductwork elbows of 90° or more acute than 90° in the index run except where the inclusion of turning vanes presents a fouling risk or a long radius bend in accordance with AS 4254.2 is used.

Insulation to be glasswool with a density of 32 kg/m<sup>3</sup> of "Bradford Supertel" manufacture or equal approved. Provide factory applied, perforated aluminium foil laminate to internal face of insulation of "Bradford Thermofoil HD Perf" manufacture or equal approved, and having a free area of approximately 10%.

Faced insulation shall have minimum sound absorption coefficients as follows:

Insulation	Sound Absorption Coefficients					
	125	250	500	1000	2000	4000
R2.0 w/ perforated foil laminate	0.33	1.05	1.25	1.06	0.98	0.91

Provide flexible connections at all air conditioning units and fans to ensure vibration and/or noise is not transmitted to the ductwork or building elements.

Provide access panels within ductwork where maintenance access is required and where cleaning access is required within kitchen exhaust ductwork. Kitchen exhaust ductwork access panels to be located in the side of ductwork.

#### 48.4.3 FILTER PLENUMS

Construct filter plenums from galvanised steel and ensure it is rigid, airtight and free from excessive deflection, rattling or flexibility. Provide galvanised steel mounting rails/channels for filter supports incorporating neoprene sealing strips. Incorporate 1.0mm thick galvanised sheet metal slides, with 100mm upstands at each filter module, within the filter plenums to aid filter removal. Incorporate hinged access panel within each plenum to access filters.

#### 48.4.4 CIRCULAR FLEXIBLE DUCTWORK

Flexible ductwork shall be in accordance with AS1668 Part 1 and shall have early fire hazard properties not exceeding the following indices when tested in accordance with AS1530 Part 3 and AS4254:

→ Spread of Flame

0

→ Smoke Developed

3

Must not account for more than 6 metres in length in any duct run, with a minimum material R-Value of 1.0.

Form bends with a centre line radius of not less than 1.5 times the diameter of the ductwork.

Support flexible ductwork from structure above with rot and fire proof webbing or straps at all changes in direction and at not more than 2000mm intervals.

Connected to circular sheet metal spigots of equivalent size to flexible ductwork, incorporating butterfly dampers at sheet metal ductwork take-offs. Seal connections to spigots by taping and then mechanically fixing inner sheath to spigot, then taping outer sheath to spigot.

#### 48.4.5 VOLUME CONTROL DAMPERS

Supply and install volume control dampers as necessary to commission the system and achieve the specified air distribution, without audible noise within the occupied space.

#### 48.4.6 CUSHION HEAD BOXES

Cushion head boxes to be insulated with insulation having a R-Value equal to that of the connecting ductwork.

Paint matt black all internal surfaces of cushion head boxes, balancing dampers and ductwork exposed to view through the face of the air diffusion equipment.

Support all cushion head boxes from the building structure unless approval is obtained from the Ceiling Contractor to support from the ceilings/ceiling suspension system. Submit Ceiling Contractor approval to Consultant for their records.

#### 48.4.7 AIR DIFFUSION EQUIPMENT

Provide concealed fastenings to all air diffusion equipment.

Colour of all air diffusion equipment to be as per Architects selection.

Linear Bar Grille

- Aluminium construction with powder coat finish
- Slimline horizontal bar grille type supported and braced by means of concealed stiffeners and bars
- Horizontal bars to incorporate 15° downward deflection of tips
- Flangeless to enable flush mounting with plasterboard
- Minimum free area of 70%
- Maximum pressure drop of 40 Pa
- Of "Holyoake" manufacture, or equal approved

**Eggcrate Grille**

- Powder-coated, aluminium construction
- 13mm x 13mm x 13mm aluminium, removable, framed core
- No balancing damper within diffuser neck unless stated otherwise within Air Diffusion Schedule
- Minimum free area of 90%
- Maximum pressure drop of 30 Pa

**Weatherproof Louvre**

- Aluminium construction, colour anodised finish
- Fixed core, fixed horizontal blades supported and braced by concealed stiffeners and bars
- Fix blades at 45° to the direction of airflow
- Outward draining
- Flash and seal to building opening
- Incorporating removable vermin mesh to inside face of grille
- Minimum free area of 50%
- Maximum pressure drop of 30 Pa

**Roof Mounted Cowl**

- Lightweight, corrosion-proof construction of either UV-stabilised plastic or fibreglass
- Steel components with corrosion-resistant finish
- Complete with bird mesh guards
- Maximum pressure drop of 30 Pa

**Door Grille – Full Chevron**

- Aluminium construction, colour anodised finish
- Construction of inverted chevron shaped blades, tightly held by spacers, in guide slots in the surround
- Completely sight proof
- Vandal proof and weatherproof if installed in the building external facade
- Minimum free area of 50%
- Maximum pressure drop of 12 Pa

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**48.5 PIPEWORK SYSTEMS**

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**48.5.1 GENERAL**

Supply and install all pipework systems in accordance with this specification, the National Construction Code, applicable Australian Standards, Development Approval requirements, Water Corporation and the applicable Council Local Laws, as a minimum. Include all ancillary equipment, valves, fittings, vents, drains, supports, anchors and components to ensure a complete, safe and operational system.

The Consultant drawings accompanying this specification are a schematic representation of the pipework systems and hence do not show all offsets and bends required for the coordination with other trades, the building structure and site conditions.

Pipework diameters indicated on drawings are in millimetres and are the nominal internal diameter.

Pipework to be clean, moisture free with sealed ends when delivered to site and at all times during construction.

Support all pipework system from the building structure above and walls within risers utilising a proprietary pipework support system such as “Unistrut”, or equal approved. Neatly install true and square and with the minimum number of bends with all necessary brackets and supports to provide firm fixings and avoid sagging.

### 48.5.2 REFRIGERANT PIPEWORK SYSTEMS

Copper Type A as applicable for system pressure and temperature ranges.

Provide spring hangers to pipework within 3m of spring hung / mounted equipment.

#### Insulation

Provide insulation to both refrigerant pipes with flexible, closed cell insulation made from nitrile rubber of "Armacell Armaflex FRV" manufacture or equal approved. Apply during pipework construction without longitudinal slitting. Glue resulting butt joints with waterproof, low VOC adhesive. In high humidity and high temperature locations, to avoid tension within the material and to prevent the trapped solvent from opening the seam, seams are to be taped immediately after gluing.

Minimum insulation R-Value:

Fluid Temperature Range	Nominal Pipework Diameter			
	≤ 40mm	> 40mm and ≤ 80mm	> 80mm and ≤ 150mm	> 150mm
> 2°C but ≤ 20°C	1.0	1.5	2.0	2.0
> 30°C but ≤ 85°C	1.7	1.7	1.7	1.7

Provide sleeves at pipework support points to avoid compression of the insulation. Where pipework insulation is exposed to the weather, provide sheet metal cladding within 3 days of installation or temporarily cover until permanent cladding can be installed.

#### Testing

Pressure test to 1.25 times the design pressure as defined in the SAA Refrigeration Code, maintaining pressure for a period of 10 hours, using a dry inert gas.

### 48.5.3 DRAIN PIPEWORK SYSTEM

Provide drain pipework from all items of equipment such as coiler headers, drip trays, overflows, dirt legs and safety trays, and run to the nearest sump or tundish.

Condensate Drain Pipework to be UPVC (generally) and Copper Type B (where exposed to view in the occupied space and trafficable areas of plantrooms, plant enclosures and on roof decks), in a minimum of 20mm diameter pipework, 'U' trapped outside the unit, graded at 1:100, incorporating screwed unions, or clear plastic hose sections fixed with hose clamps to enable rodding out.

Test drains and vents by capping off lowest point, filling with liquid and visually checking all joints for leaks.

## 48.6 ELECTRICAL SYSTEMS

### 48.6.1 GENERAL

Supply and install all electrical systems in accordance with this specification, the National Construction Code, applicable Australian Standards, Development Approval requirements, Western Power and the applicable Council Local Laws, as a minimum. Include all ancillary wiring, equipment and components to ensure a complete, safe and operational system.

### 48.6.2 ELECTRICAL SCOPE OF WORKS

- Final connection of power to the Mechanical Services equipment from the adjacent isolating switch (switch specified by Electrical Services Consultant)
- All final power sub-circuits from the outdoor condensing unit(s) to the indoor evaporator unit for all split system air conditioning units
- Motor starters and switchgear

### 48.6.3 MOTOR ISOLATING SWITCHES

Provide power isolating switches of "Clipsal" manufacture, or equal approved, in an accessible location adjacent all items of equipment containing motors.

**48.6.4 CABLE SUPPORT**

Support all cabling with catenary wires, conduits or cables trays from the structure above. All cabling is to be supported independent of ductwork, pipework or equipment.

**48.6.5 VARIABLE SPEED DRIVES**

Supply and install variable speed drives of "Danfoss VLT HVAC Drive" manufacture, or equal approved.

Select VSD's for normal operation at an ambient temperature of 50°C and capable of reduced operation at ambient temperature of -10°C to +55°C.

Provide IP54 enclosures with self-contained, forced draft ventilation.

**48.7 CONTROL SYSTEMS****48.7.1 GENERAL**

Supply and install all control systems in accordance with this specification, the National Construction Code, applicable Australian Standards, Development Approval requirements and the applicable Council Local Laws, as a minimum. Include all ancillary wiring, equipment, motors, relays, interlocks and components to ensure a complete, safe and operational system.

Control systems shall be generally of the Direct Digital Control.

**48.7.2 FUNCTIONAL DESCRIPTION**

The following functional description provides a description of how the systems shall operate. The Contractor shall utilise this description as a basis for their controls programming and provide inputs and outputs as required to achieve the intent of the function description.

Submit to the Consultant for review, the Controls Points List prior to commencing the testing and commissioning process.

Setpoints, time schedules, differentials, limit values and time delays nominated shall be adjustable parameters. All outputs shall be capable of being overridden.

**Air Conditioning Unit - Air Cooled, Reverse Cycle, Split, Variable Refrigerant Flow Type****2 Cassette Type Indoor Units**

- Provide a control dead band of not less than 2°C
- Proprietary, hard wired, wall mounted control panel for each indoor unit, located in the occupied space to control cooling and heating demand to maintain the space temperature set-point as specified within the Design Criteria section of the Specification. Control panel to incorporate the following features:
  - LCD display panel
  - On / off button
  - 7-day time schedule, incorporating start and stop times for each day
  - Set-point adjustment
  - 'Run' indicator
  - 'Fault' indicator
  - Integral temperature sensor
  - Fan speed control

**3 Ducted Type Indoor Units**

- Wall mounted temperature sensor for each indoor unit, located in the occupied space to control cooling and heating demand to maintain the space temperature set-point as specified within the Design Criteria section of the Specification
- Provide a control dead band of not less than 2°C

- Control panels of high impact resistant polycarbonate type, located where shown on the drawings, incorporating the following features:
  - Run activation push button
    - press for 120 minutes run time (adjustable)
    - 3 second hold to switch off
  - Green run indicator light
  - Amber fault light
  - Labels, instructions and air conditioning unit designation
- Proprietary control panel for each unit, located within ceiling adjacent each indoor unit for commissioning purposes only, incorporating the following features:
  - 7-day time schedule, incorporating start and stop times for each day
  - Set-point adjustment
  - Fan speed control
  - Fault diagnosis
- Provide individual economy cycle systems for each unit:
  - Subject to a call for cooling and the ambient air enthalpy being lower than the return air, initiate the economy cycle
  - Modulate outside air, return air and relief air dampers, and the economy cycle fan to introduce sufficient outside air to eliminate the need for mechanical cooling, or 100% outside air if mechanical cooling cannot be eliminated
  - Incorporate delay timers to prevent over / under pressurisation of the building and fan operation against closed dampers
- Provide carbon dioxide monitoring system for each unit. Commence modulating the outside air, return air and relief air dampers at 700ppm, to maintain a maximum CO<sub>2</sub> level of 1000ppm.
- Motorised return air and outside air dampers are to close when the unit is deactivated

#### **Fan – Toilet Exhaust (TEF Designation)**

- Demand operation of the toilet exhaust fans via lighting circuit such that fans run when lighting circuit is activated within any room served by fan (specified by the Electrical Services Consultant)
- Indicator Panels of high impact resistant polycarbonate type, located where shown on the drawings, incorporating the following features:
  - Green run indicator light
  - Amber fault indicator light
  - Light labels and fan designation

#### **Fan – Kitchen Exhaust**

- Control panel of high impact resistant polycarbonate type, located where shown on the drawings, incorporating the following features:
  - Exhaust off / low / high switch
  - Canopy light on / off switch
  - Green run indicator light
  - Amber fault light
  - Label and unit designation
  - Warning label as follows:

WARNING: THIS VENTILATION SYSTEM SHALL NOT BE TURNED OFF DURING A FIRE

#### Fan – Kitchen Exhaust Make-up Air

→ Interlock with kitchen exhaust fan, including 2 speed operation

#### Fan – Cleaners Room (GEF)

→ Demand operation of the cleaners room exhaust fan via time schedule

#### Fan – First Aid Room Ventilation Fan

→ Control panels of high impact resistant polycarbonate type, located where shown on the drawings, incorporating the following features:

- Run activation push button
  - press for 30 minutes run time (adjustable)
  - 3 second hold to switch off
- Green run indicator light
- Amber fault light
- Labels, instructions and air conditioning unit designation

#### 48.7.3 FIRE MODE OPERATION

In Fire Mode Operation, **shutdown** the following system;

→ Commercial kitchen make-up air systems only

### 48.8 NOISE AND VIBRATION CONTROL

#### 48.8.1 GENERAL

Supply and install all equipment, air distribution systems and pipework systems to ensure quiet and vibration free operation in accordance with this Specification, the National Construction Code, applicable Australian Standards, Development Approval requirements and the applicable Council Local Laws, as a minimum.

Vibration isolation shall be as manufactured by Mason Industries, Embelton, or equal approved. All isolation materials shall be supplied by the same manufacturer.

Vibration isolators shall be installed in strict accordance with the manufacturers written instructions and all certified submittal data.

#### 48.8.2 SCHEDULE OF NOISE AND VIBRATION CONTROL SYSTEMS

Select, supply and install noise and vibration control systems in accordance with the application, loads of the operational system and of the type scheduled below.

Noise and Vibration Source	Noise and Vibration Control System
→ Air Conditioning Unit – Split, Ducted Type (indoor unit) → Pipework within 3m of spring hung / mounted equipment → Fan	Spring hangers achieving 95% isolation efficiency
→ Air Conditioning Unit – Split Type (outdoor unit)	Double deflection neoprene mounts achieving 95% isolation efficiency

## 48.9 IDENTIFICATION LABELLING

### 48.9.1 GENERAL

Supply and install all identification labelling in accordance with this Specification, the National Construction Code, applicable Australian Standards, Development Approval requirements and the applicable Council Local Laws, as a minimum.

Provide black and yellow diagonal stripe danger notation to all motor drives and edges of ductwork, pipework and equipment installed at low level or likely to be hazardous.

Provide all warning signs as required by the Statutory Authorities.

### 48.9.2 SCHEDULE OF IDENTIFICATION LABELLING

Supply and install identification labels as follows.

Equipment / Pipework	Label / Marker
Equipment	<div style="border: 1px solid black; padding: 2px; display: inline-block;">1A2AB/V01</div> with text as per the scheduled designation
Refrigerant Pipework	
Condensate Drain Pipework	

### 48.9.3 EQUIPMENT LABELS

Labels shall be:

- Laminated "Traffolyte" with black lettering on white background
- Weatherproof and permanent
- Screwed to sheet metal work and glued to control panels
- Lettering size to be a minimum of 32mm
- Located for easy identification
- Aligned with the equipment designations used in the Consultant Drawings and this Specification

### 48.9.4 PIPEWORK MARKERS

Pipework markers shall be:

- Of "Safetyman" manufacture, or equal approved
- Indicating type of service and direction of flow
- Spaced every 3m in plantrooms / enclosures, every 8m elsewhere and at each level vertically at branch take-offs
- Utilise manufacturers recommended marker size for the corresponding pipework outside diameter (inclusive of insulation if applied)

### 48.9.5 TESTING AND COMMISSIONING

#### General

Test and commission the Mechanical Services systems in accordance with this Specification, the National Construction Code, applicable Australian Standards, Development Approval requirements and the CIBSE Commissioning Codes, as a minimum.

### 48.9.6 EQUIPMENT

- Test and commission in accordance with the manufacturers recommendations and the requirements identified within the Drawings and this Specification

**48.9.7 AIR DISTRIBUTION SYSTEMS**

- Check and adjust air diffusion equipment for direction and throw to ensure free from noise, vibration or draughts
- Balance air quantities to within -0% to +10% of the levels agreed as part of the review process, ensuring the minimum possible fan speed is used
- Adjust fan speeds or blade pitches to achieve the desired outcome
- Where air filters are installed, simulate the system resistance of an operating condition with 50% loaded filters by installing temporary media or blanking plates

**48.9.8 CONTROLS**

- Calibrate, adjust and set all control instruments, systems and safety measures
- Activate and visually confirm the correct operation of each control strategy within the Functional Description.

**48.9.9 DRAIN SYSTEMS**

- Test drains by capping at the lowest point, filling with water and visually checking all joints for leaks

**48.9.10 SUBMISSIONS AND WITNESSING BY CONSULTANT**

Submit to the Consultant for review an electronic (pdf) version of the Testing and Commissioning results which shall include both the agreed 'design' values (as per Equipment Schedule review process) and the commissioned values.

Allow within the Works Programme a minimum of 5 business days for the review of the submission by the Consultant and an additional 5 business days for the rebalancing, resubmission and second review of any results which are deemed "Not Satisfactory".

Upon the receipt of commissioning results considered "Satisfactory", the Commissioning Engineer is to demonstrate the testing and commissioning results to the Consultant prior to Practical Completion.

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## 48.10 OPERATING AND MAINTENANCE MANUAL

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### 48.10.1 GENERAL

Prepare and submit for review to the Consultant an electronic (pdf) version of the Operating & Maintenance Manual, including the folder cover, spine and section dividers.

Allow within the Works Programme a minimum of 5 business days for the review of the submission by the Consultant and an additional 5 business days for the resubmission and second review if deemed "Not Satisfactory".

Practical Completion will not be recommended by the Consultant until draft Manuals have been submitted for review. Final Manuals to be distributed prior to Client Representation Training and within 1 week of occupation.

### 48.10.2 HARD COPY FORMAT AND CONTENTS

#### Format

- A4 Binder
- Lever Arch or D-Ring
- Insert cover and spine
- Ring size to suit contents
- Section divider pages with tabs
- Split across multiple binders, if required

#### Contents

##### Spine

- Project Name
- "Mechanical Services Operating and Maintenance Manual"

##### Cover

- Project Name
- "Mechanical Services Operating and Maintenance Manual"
- Consultant Company Name and Logo
- Contractor Company Name and Logo

##### Inside Cover

- Labelled USB Flash Drive, attached with Velcro, which includes an Electronic version of the manual as outlined within the next Section
- a note advising of its contents and warning not to remove permanently

##### Index

- Referencing section names and numbers

##### Section 1 - Contact Details

- Consultant Name, Contact person, phone number and email address
- Contractors Name, Contact person, phone number and email address
- Service call-out contact details
- Emergency contact details

##### Section 2 – System Description

- General description of the installation

**Section 3 – Design Criteria**

- As outlined within this Specification

**Section 4 – Equipment Schedules**

- Equipment Schedules for all equipment, with capacities and conditions specific to the project, not nominal conditions

**Section 5 – As-Built Drawings**

- Shop Drawings are to be updated electronically and progressively to record changes resulting from Consultant Advice notices and on-site modifications to produce As-Built Drawings. The Consultant will not issue updated drawings for the preparation of As-Built Drawings.
- As-Built Drawings are to be updated electronically to reflect Testing and Commissioning results deemed “Satisfactory” by the Consultant, not the Specified values.
- Include a drawing list
- Original paper size, folded to A4 and inserted into clear plastic sleeves

**Section 6 – Testing and Commissioning Results**

- Typed
- Testing and Commissioning results
- System balance results
- Electrical Certificate of Compliance

**Section 7 – System Operating Instructions**

- Complete description and correct sequence of all actions required for the starting-up, operation and shutting down of the systems
- Ensure compliance with the manufacturers operating instructions for each item of equipment
- Manufacturers literature will not be accepted

**Section 8 – System Maintenance Instructions**

- Complete description of the tasks required to maintain the systems, including frequency
- Arranged in a tabular format with space for logging / recording of maintenance visits post Practical Completion, and for signing-off of visit by a Client Representative
- Include spare maintenance log sheets within clear plastic sleeve which is labelled accordingly
- Ensure compliance with the manufacturers maintenance requirements
- Manufacturers literature will not be accepted

**Section 9 – Manufacturers Literature**

- Manufacturers literature for all equipment, air distribution, pipework, electrical and control systems

**48.10.3 ELECTRONIC FORMAT AND CONTENTS****Format**

- A single, searchable (scans will not be accepted), pdf version of the manual
- Drawings in rvt or dwg format

**Contents**

Cover Page

- Project Name
- "Mechanical Services Operating and Maintenance Manual"
- Consultant Company Name and Logo
- Contractor Company Name and Logo

#### Index

- Hyperlinked section names and numbers

#### Section 1 - Contact Details

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- Electrical Certificate of Compliance

#### Section 7 – System Operating Instructions

- Complete description and correct sequence of all actions required for the starting-up, operation and shutting down of the systems
- Ensure compliance with the manufacturers operating instructions for each item of equipment
- Manufacturers literature will not be accepted

#### Section 8 – System Maintenance Instructions

- Complete description of the tasks required to maintain the systems, including frequency

- Arranged in a tabular format with space for logging / recording of maintenance visits post Practical Completion, and for signing-off of visit by a Client Representative
- Ensure compliance with the manufacturers maintenance requirements
- Manufacturers literature will not be accepted

#### Section 9 – Manufacturers Literature

- Manufacturers literature for all equipment, air distribution, pipework, electrical and control systems

#### Distribution of Manuals

Recipient	Format	No.
Building Owner: Shire of Chittering Attention: Address:	Hard Copy	2
Consultant: TABE Engineers Attention: Tabe Voigt Address: tabe.voigt@tabe.com.au	Electronic via file transfer	1

### 48.11 PRACTICAL COMPLETION

#### 48.11.1 GENERAL

Practical Completion will be recommended at the Consultant's discretion.

#### 48.11.2 MINIMUM REQUIREMENTS

The following are the minimum requirements for achieving Practical Completion;

- Compliance with the National Construction Code
- All physical works completed which may impact the performance of the system or disrupt the occupants if completed after occupation
- Rectification of all defects identified within the Site Inspection Report which may impact the performance of the system or disrupt the occupants if completed after occupation
- Testing and Commissioning Results submitted for review, considered "Satisfactory" and demonstrated to the Consultant
- Draft Operating and Maintenance Manuals submitted for review

### 48.12 CLIENT REPRESENTATIVE TRAINING

#### 48.12.1 GENERAL

Arrange and provide training to the Client Representative(s) by an appropriate member of the Contractor Team. Provide Consultant with opportunity to assist with Training.

#### 48.12.2 TRAINING TOPICS

Training is to include the following topics:

- An overview of the installation
- Highlight Design Criteria or System Limitations that the Client Representative should be made aware of i.e. maximum occupant numbers, equipment loads etc
- System start-up, normal operation, after hours operation and shutdown procedures
- Interfaces with other systems

- Sustainability / energy efficiency features of the system
- Operational health and safety areas to be aware of
- Alarms
- Contractor obligations during the Defects Liability Period
- Defect notification and service call-out process
- An overview of the Operating & Maintenance Manual

#### 48.12.3 TIMING

Training shall take place after Practical Completion has been recommended by the Consultant, once Operating & Maintenance Manuals have been distributed and within 1 week of being occupied.

### 48.13 PREVENTATIVE MAINTENANCE

#### 48.13.1 GENERAL

Warrant and maintain the Works for a period of 1 year from the date of being awarded Practical Completion.

Maintain the Works in accordance with the Manufacturers recommendations, National Construction Code, applicable Australian Standards, Development Approval requirements, Council Local Law and manufacturer's recommendations, as a minimum.

Provide all consumables necessary for the maintenance of the Works, at no additional cost to the Client.

Keep a log / record of Preventative Maintenance visits by completing the Maintenance Log Sheets within the Operating and Maintenance Manual.

Retention monies (or bank guarantees) will not be released until the correct number of dated and completed Maintenance Log Sheets have been received by the Consultant. Should the correct number of maintenance visits not be completed within the Defects Liability Period, then that period, including all equipment warranties will be extended until the Preventative Maintenance requirements have been met.

#### 48.13.2 MAINTENANCE LEVELS AND FREQUENCY

Three levels of maintenance are provided in the following schedules:

- Level A - Best Practice – this includes all of the maintenance tasks and frequencies to comply with the compliance and good practice levels outlined below and would typically include for some tasks to be scheduled more frequently to ensure greater knowledge and understanding about plant condition, or suggest where additional proactive information may be continuously gathered to increase vigilance or analyse trends, such as vibration analysis, thermograph, energy consumption, pressure drop, etc.
- Level B - Good Practice – this includes all of the maintenance tasks and frequencies to comply with the compliance level outlined below and the additional work required to achieve a good scheduled maintenance program. This level is particularly important for equipment that does not have compliance requirements such as pumps, and therefore if left to Level C alone would not have a structured maintenance program. This level is a good industry-practice level, but it is somewhat discretionary as there is no Act or Regulation requiring this work to be performed.
- Level C - Compliance – this is the minimum maintenance standard required to meet statutory compliance, incorporating the requirements from the regulations, plus obligations to environment, health and safety and general duty of care. Compliance maintenance requirements are based on maintenance compliance standards AS 1851, AS/ ANS 3666.2/.3 and AS/NZS 5149.4. Statutory requirements in individual jurisdictions vary and should be checked to determine local requirements.

The Preventative Maintenance for this project must incorporate the tasks and frequencies nominated for **Level B - Good Practice**.

Note, the Actions outlined in the schedules below are only to be performed within this Contract if the frequency of the corresponding level falls at or within the specified Preventative Maintenance period.

### 48.13.3 AIR DISTRIBUTION SYSTEMS

Maintenance of air distribution systems is required to comply with AS/NZS 3666.2.

#### Air Distribution

Maintenance of air distribution is required to comply with AS/NZS 3666.2.

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Inspect components, and record and report if cleaning is necessary.	3	12	12	As required by AS/NZS 3666.2 – 2.3.5 (ducts and components).
2. Carry out airflow performance checks as per original commissioning data on major air handling equipment and record results.	12	60		If the total airflow to each system has changed from the previous adjustment by more than the allowable tolerance, the reason should be determined, and adjustments made to rectify and to ensure efficient operation of the system. This action should be included on any building experiencing operational issues or undergoing regular minor renovations.
3. Check system minimum outdoor air quantities and record results.	12	30	60	<p>WHS/AS 1668.2 – Owners and PCBUs have a duty to ensure that the minimum outdoor ventilation air required by regulation (e.g., NCC/AS 1668.2) is continued to be delivered by any mechanical ventilation system while spaces are occupied.</p> <p>Ensure that the minimum outdoor air quantities are in accordance with the design requirements. This action should be included on any building experiencing operational issues or undergoing regular minor renovations.</p> <p>Measure the minimum outdoor airflow for all units once every five years. If the measured minimum airflow rates are less than the design minimum rate (<math>\pm 10</math> per cent balancing tolerance) documented in the O&amp;M manual, they should be adjusted or modified to bring them to the minimum design rate or evaluated to determine if the measured rates are in compliance with AS 1668.2.</p>

#### Ductwork (Supply, Return, Exhaust)

Maintenance of ductwork in the vicinity of moisture-producing equipment is required to comply with AS/NZS 3666.2.

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Inspect ductwork and report.	3	3	12	AS/NZS 3666.2 – 2.3.5. Inspect ductwork in the vicinity of moisture-producing equipment and clean when necessary.  Bacterial slime and sludge should be removed by cleaning. These deposits are usually very persistent and chemical disinfection should follow physical cleaning of components. All traces of disinfectant should be removed before plant is placed back in service.
2. Inspect and test flashing at external penetrations.	12	12		
3. Inspect duct hangers for support and security.	12	12		
4. Check for air leaks (audible or observed).	12	12		Inspect to ensure that any water seals in the system are adequate and are charged with water.
5. Inspect all flexible connections for tears, delamination or loose connections.	12	12		Report replacement or repair for ducts found to be damaged, as this can cause blockage of the ducts or serious leakage of conditioned air from/or introduction of unclean air into the system.
6. Inspect components for UV damage.	12	12		
7. Inspect for any electrolysis or corrosion.	12	12		If corrosion is observed, it should be determined if it has been caused by moisture or electrolysis. Whatever the cause, it should be corrected before the corrosion is removed and protection applied. Report on replacement or repair.
8. Inspect for physical damage.	12	12		
9. Inspect insulation and examine for loss of vapour seal and deterioration.	12	12		
10. Inspect outdoor ducts for rain ponding.	12	12		If ponding is observed, then the duct should be protected to prevent water being retained on the surface, or the duct should be reshaped to ensure that all water runs off the surfaces.
11. Observe for drumming on fan start-up (particularly high-pressure/high-velocity systems).	12	12		Drumming of ductwork may cause dust to become dislodged from the inside of ducts and air handling unit walls. While every effort should be taken to ensure that dust does not penetrate into the clean air side of the

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
				distribution system, it is inevitable that some will penetrate, and this should not be disturbed except when carrying out cleaning procedures.
12. Observe for undue noise, whistling or rattles.	12	12		Determine the cause and make good.

**Air Grilles**

Maintenance of outlet, inlet and relief air grilles is required to comply with AS/NZS 3666.2 and the manufacturer's instructions.

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Inspect supply air outlets for cleanliness and report.	12	12	12	AS/NZS 3666.2 – 2.3.5 (g). Inspect and report when cleaning is required.
2. Inspect return and relief air grilles for cleanliness and report.	12	12	12	AS/NZS 3666.2 – 2.3.5 (h). Inspect and report when cleaning is required.
3. Check all components are secure.	6	12		

**48.13.4 AUTOMATIC AND SAFETY CONTROLS****General System Controls**

## 3.1.1

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Check equipment set-points.	3	3		Using a list of set-points and approved values, go through the controls and confirm that set-points have not been changed unless approved. Document in the table any warranted changes.
2. Check occupancy and operating schedules.	3	3		Check all time-of-day schedules of zones and confirm that the time schedule has not been changed and is optimised for the occupancy.
3. Check any alarms.	3	3		Check re-occurring BMS alarms and reported faults.
4. Check all thermal comfort sensors.	3	3		Walk-through every zone and check location of wall-mounted sensors and air sampling ports (temperature and humidity) and ensure correct location relative to controlled area. This is particularly important where it is known that partitions have been moved. Any spaces modified by new or relocated partitions should be checked to ensure that the associated sensors are having control over the correct areas. Check that any supplementary air conditioning unit control is not "fighting" with base building control. Randomly check zones with portable instrument for temperature and humidity on floors, in rooms or in any areas requiring special conditions.
5. Check system software.	3	3		Install and verify software updates, patches, equipment firmware and renew licences.
6. Check all indoor air quality monitors.	6			Walk-through every zone and check location of wall-mounted monitors and air sampling ports.

**Air Terminal Unit Controls – General Spaces**

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Calibrate CO2 sensors.	6	12		When used with demand control ventilation. Report the sensors failing to meet accuracy requirements – for recalibration or replacement.
2. Test temperature loop controls.	12	12		Via BMCS diagnostic check for reheat coil leakage/bypass, control valve and damper/valve function, and supply air temperature sensor accuracy test.
3. Calibrate space temperature sensors.	36	36		Thermistor-type sensors. Report the sensors failing to meet accuracy requirements – for recalibration or replacement.
4. Calibrate flow sensors.	60	60		This repeats the original (or recommissioned) air balance.

**48.13.5 DAMPERS****Manual Dampers**

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Inspect and clean dampers.	12	12		

**Air Control Dampers**

Air control dampers for supply, return, exhaust, recycle, relief, smoke spill and outdoor air must be inspected in accordance with AS 1851. For definitions of supply air, return air, exhaust air, recycle air, relief air and outdoor air damper – see AS 1668.1.

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Inspect damper and confirm operation is correct.	6	6	6	AS 1851 – 13.4.1.4. Check that the damper is capable of operating from fully open to fully closed, and is clear of obstructions. Where the damper is not required to fully open or close, check that it is capable of operating between maximum and minimum positions.  NOTE: Increase frequency to three-monthly if dampers are dedicated to fire mode duty only and are exposed to the corrosive effects of exterior air.
2. Check damper fire mode position for recycle air, relief air, smoke spill and outdoor air dampers.	12	12	12	AS 1851 – 13.4.1.4. Ensure damper moves to its fire mode position on removal of power source.
3. Check damper failure mode position for supply, return and exhaust air dampers.	12	12	12	AS 1851 – 13.4.1.4. Ensure damper moves to its required failure mode position on removal of power source.
4. Check damper for air leakage.	12	12	12	AS 1851 – 13.4.1.4. Check that there is no excessive leakage past dampers when in the closed position (only where dampers are required to close fully).
5. Check damper bearings.	12	12	12	AS 1851 – 13.4.1.4. Check linkage and damper bearings.
6. Check damper for corrosion.	12	12	12	AS 1851 – 13.4.1.4. Check dampers and associated mountings and frames for corrosion. Clean down and re-apply protection as necessary.
7. Inspect for air leaks.	12	12	12	If motors are pneumatic, check for air leaks in the air lines and connections.

**48.13.6 FANS**

Note that AS1851 compliance requirements apply to all fans that form part of a building's fire and life safety systems (e.g., smoke control systems).

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Inspect fan and report if repair required or if any obstructions may impede performance.	1	3	3	AS/NZS 3666.2 – 2.3.5 (e). Inspect for corrosion, wear on flexible connections, deterioration or cleaning and report repairs required. AS1851 – 13.
2. Check fan operates.	1	3		
3. Check for vibration, bearing noise or overheating.	1	3	3	AS 1851 – 13.4.1.2. Vibration can be due to fan rotor being out of balance or failure of one of the bearings. Heat or noise from the bearing will confirm that this is the source of the problem and appropriate steps can be taken to replace the offending bearing. It is frequently necessary to replace both bearings, as vibration from one can cause damage to the second.
4. Check mounts and holding down bolts for security.	1	3		
5. Lightly lubricate bearings to manufacturer's recommendation where possible.	6	12		
6. Check access panels for air leakage and seal.	12	12		
7. Check that impeller is tight on shaft.	12	12	12	AS 1851 – 13.4.1.2. This is carried out by physical examination of keys, keyways and locking bolts. Any movement in these components can lead to wear on the shafts, with resultant expensive replacement of the component becoming necessary.
8. If accessible, check cleanliness of fan blades and scroll or casing and record/report if cleaning is required.	12	12		Where possible, inspect the internal surfaces of the fan casing and the runner for any build-up of dirt grime grease, etc. Steam-cleaning or high-pressure water jets can be used to restore the surfaces to an as-new condition. The surfaces should then be examined for corrosion and, if necessary and possible, they should be repainted.
9. Inspect for evidence of corrosion, wear on flexible connections and other deterioration, report where repairs are necessary.	12	12		

**48.13.7 FILTERS****Panel Filters**

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Inspect system filters and determine if maintenance is required.	1	1	1	AS/NZS 3666.2 – 2.3.2 (except terminal units). AS 1324.1. After servicing, the media shall not be used if it shows any of the following characteristics: (a) Reduction in thickness by 25 per cent of the new condition. (b) Media material shedding. (c) Uneven thickness occurs in the media when compared with new media.  Level A – Best practice includes monitoring the pressure drop across the filter to determine the operating resistance and help optimise filter life/energy.
2. Record and report on replacement of extended surface panel filters, sock or deep bed filters when resistance exceeds the design amount.	1	1		Dirty media should be placed in plastic bags for disposal to an approved site.
3. Order new filters or filter media if required for next service.	1	1		Ensure that there is always a spare set left onsite.
4. Check for air leakage around media, ensure that media edge is in the channel provided.	3	3		It is convenient to use a lead light for this purpose, with the service personnel working from both sides of the filter.
5. Ensure that media is not disintegrating or delaminating.	3	3		

**48.13.8 INSULATION****Duct Insulation**

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Check for condensation on ducts; ensure continuity of insulation over cold ducts. Where ducts are internally insulated, ensure that insulation is not	1	3		This is particularly important on cold ducts, where it is essential to maintain a vapour barrier to avoid the deterioration of the insulation.  On occasion it is found that the lining has collapsed to the degree where the insulation is resting against the cooling coils and subsequent condensation can cause “wicking” of the porous material. If left unchecked, this can cause

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
saturated.				stagnant water to lie in the ducts or equipment, leading to serious health-related problems.
2. Visually inspect ducts for areas where external insulation has fallen away or is obviously damaged.	1	3		This inspection is particularly important after any work has been performed on the insulation or ductwork.
3. Ensure that all cover strips and peripheral bands are in place and that duct tape is not peeling off.	12	12		

**Pipework Insulation**

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Inspect and minor make-good to metal sheathing on all pipes and pressure vessels. Record and report on any major make-good requirements.	1	3		
2. Visually inspect all insulation for areas where insulation is obviously damaged.	1	3		
3. Inspect all insulation for condensation. Record and report on all wet insulation and damaged vapour seals.	6	6		
4. Check isolation at pipe hangers, record and report on any necessary repairs.	12	12		

## 48.13.9 KITCHEN EXHAUST SYSTEM

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Check grease level in filters.	1	1	1	AS 1851 – 13.4.1.16. Check grease-arresting filters for excessive grease accumulation.
2. Check hood and exhaust plenum.	1	1	1	AS 1851 – 13.4.1.16. Check hood and its exhaust plenum for excessive grease accumulation.
3. Check grease gutters.	1	1	1	AS 1851 – 13.4.1.16. Check grease gutters for excessive grease accumulation.
4. Check grease filters.	1	1	1	AS 1851 – 13.4.1.16. Check that grease-arresting filters are secured in the correct position and are undamaged. Any exhaust air bypassing the filter will cause grease accumulation within the exhaust duct.
5. Clean grease filters.	1*	1*	1*	AS 1851 – 13.4.1.16. Clean grease-arresting filters as required. *Frequency may be subject to inspection or regulation. Some types of filters are disposable, and manufacturers' instructions should be followed.
6. Clean hood and plenum.	12	12	12	AS 1851 – 13.4.1.16. Clean hood and its exhaust plenum of any grease accumulation or other contamination.
7. Inspect filter for damage and report.	12	12	12	AS 1851 – 13.4.1.16. Check grease-arresting filters for excessive leaks or damage and replace as necessary. NOTE: Non-metallic grease filters and other special types must be replaced at specific time intervals whether damaged or not. In these cases, follow manufacturer's instructions. Any exhaust air bypassing the filter will cause grease accumulation within the exhaust duct.
8. Inspect and clean kitchen exhaust duct.	12	12	12	AS 1851 – 13.4.1.16. Check duct for accumulated grease and clean as required. Any significant build-up of grease and dirt within the kitchen exhaust duct poses a serious fire risk and potential health hazard. A – Best practice is to nominate/agree and validate the level of clean (or the level of grease contamination to be allowed before and after cleaning).

**48.13.10 PACKAGED AIR CONDITIONING EQUIPMENT****Ducted Split Systems**

Packaged and ducted split air conditioning systems are required to be maintained in accordance with AS/NZS 3666.2 and AS/NZS 5149.4.

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Check all components are secure.	1	1		
2. If fitted with an outdoor air intake, ensure that the intake is clear and report.	1	1	1	AS/NZS 3666.2 – 2.3.1.
3. Check insulation is secure.	1	3		
4. Check operation through heating and cooling sequence.	1	3		
5. Inspect plant for physical damage and record/report condition.	1	3		
6. Lubricate in accordance with manufacturer's recommendation.	3	3		
7. Record on/off coil temperatures.	3	6		
8. Check refrigerant charge if required. Record and report readings.	3	6		
9. Inspect casing for corrosion and record/report condition.	12	12		
10. Check for broken frame supports and missing or loose bolts.	12	12		
11. Check for icing on coil and investigate if necessary.	12	12		
12. Check operation of defrost systems and devices.	12	12		
13. Fit set of gauges to refrigerant circuit, record readings.	12	12		Fit gauges, where suitable points exist, and record readings. If appropriate tapings are not provided, then the system should be left sealed. In the event that there is no provision for checking the gas charge in this manner, it is usual that the manufacturer has made other means available and the manual accompanying the unit should be referred to for this component of the service.

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
14. Simulate loading of compressor. Check operation of control stages.	12	12		

**Cassette A/C**

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Check casing, wiring and insulation for corrosion, clean, dry and ensure that all components are secure. Record/report on any make-good required.	1	3		
2. Check drains and drip tray are clear.	1	3		
3. Check unit operation through heating and cooling sequence.	1	3		
4. Check for unusual noise or vibration in the indoor unit.	1	3		
5. Check for unusual noise or vibration in the outdoor unit.	1	3		
6. Check compressor for oil leaks.	1	3		
7. Check that condenser fan operates correctly.	1	3		
8. Clean air filter.	6	6		
9. Check indoor coil for cleanliness.	6	6		
10. Check outdoor coil for cleanliness.	6	6		
11. Check operation of reversing valve.	6	6		
12. Check that all controls operate correctly.	6	6		
13. Check and record outdoor	6	6		

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
air temperature and air on/off temperature for both heating and cooling.				

### 48.13.11 PIPEWORK

Ensure compliance with relevant standards (AS 1345, AS 1697, AS 2885.3, etc). Check that all pipework is correctly colour-coded and that direction-of-flow arrows have been applied.

#### Refrigeration Pipework

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Check for refrigerant leaks on pipes, fittings and connections.	3	6	1–12*	*AS/NZS 5149.4. Leak inspection regime, using direct and indirect leak detection methods – <ul style="list-style-type: none"> <li>Monthly for systems containing 300kg or more refrigerant,</li> <li>Every 6 months for systems containing 30–300kg of refrigerant</li> <li>Every 12 months for systems containing 3–30 kg of refrigerant.</li> </ul> This should include all pipework, valves and valve stems.
2. Visually inspect pipework in accessible areas for physical damage or loose supports.	1	3		
3. Check for frosting, adjust gas charge or TX control valve setting if necessary.	1	3		It may be found that there is insufficient insulation on the piping or that the vapour barrier has broken down and should be made good. Dependent on the type of insulation that has been used, it may be necessary to remove some of the insulation and replace it due to deterioration caused by moisture in the insulation.
4. Check operation of solenoid valves and TX valves.	1	3		
5. Check temperature and pressure drop across refrigerant drier.	1	3		
6. Check that pipes and gauges are securely fixed.	6	6		
7. Check operation of all manual valves. Ensure that all valve caps have copper seal rings fitted.	12	12		

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
8. Check operation of solenoid valves.	12	12		
9. Clean all strainers when isolation devices are fitted.	12	12		
10. Test and reset TX valve superheat settings.	12	12		

**48.13.12 VIBRATION ISOLATION**

Action	Frequency (m)			Explanation
	Maintenance Level			
	A	B	C	
1. Check for damaged isolators and incorrect settings on jacking bolts.	3	6		
2. Check pipe flexible connections for damage.	3	6		
3. Check that flexible connections are installed correctly.	3	6		
4. Check that machine isolators are not short-circuited by electrical conduits, guards, debris, etc.	3	6		
5. Check that pipe flexible connections are not short-circuited by other pipes, electrical trays, debris, etc.	3	6		
6. Ensure mounts are clear of oil or water.	3	6		
7. Inspect vibration isolators.	3	6		
8. Check the pressure in air springs.	12	12		Check the pressure, following the manufacturer's instructions. Recharge as necessary.

**48.14 DEFECTS LIABILITY PERIOD**

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**48.14.1 GENERAL**

It's important to remember that the Client's impression of the performance of the design and construction team collectively is almost always determined by their satisfaction with the quality and operation of the finished product once they occupy.

For this reason, the following requirements are outlined to ensure the Client's expectations for the project are met.

**48.14.2 DEFECTS**

Provide a Defects Liability Period of 1 year from being awarded Practical Completion.

Defects may be identified at any stage during the Defects Liability Period and must be rectified within 1 week of being notified.

**48.14.3 SERVICE CALL-OUTS**

Attend to service call-outs within 24 hours of notification, at no charge to the Client unless caused by user fault.

Provide all consumables necessary for the serving of the Works, at no additional cost to the Client.

**48.14.4 FINE TUNING**

Undertake Fine Tuning of the Mechanical Services Systems after the first quarter (1 off in total).

Include the following as a minimum:

- Arrange a meeting with the Clients Representative to discuss the operation of the system
- Review fault history
- Review historical data logs for correct operation of the system
- Produce a report for the Clients Representative and Consultant which outlines the findings and any recommended modifications to the system
- Adjust set-points, time schedules and control strategies as required by the Clients Representative, to improve the performance of the system and as per agreed recommendations within Fine Tuning Report

**48.15 TENDER FORM**

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[Title]

**48.15.1 MECHANICAL SERVICES**

**TENDERERS DETAILS**

Company Name:.....

Address: .....

Telephone:

Email:

**TENDER OFFER**

We hereby submit a fully compliant Tender in accordance with the following documents:

- Mechanical Services Specification Rev .....
- Drawings No's and Rev .....
- Addendum No's .....

To carry out the complete Works for the Fixed Lump Sum Tender of:

Fixed Lump Sum Tender (ex GST)	\$ .....
Goods and Services Tax	\$ .....
	\$ .....
<b>Total Fixed Lump Sum Tender (incl GST)</b>	<b>\$ .....</b>

Signature of Tenderer: .....

Name of Signatory: .....

Date: .....

**48.15.2 TENDER BREAKDOWN**

General Requirements	\$ .....
Equipment	
Air Conditioning Unit – Air Cooled, Reverse Cycle, VRF Type	\$ .....
Fan – Mixed-flow - Small	\$ .....
Fan – Mixed-flow – Large	\$ .....

Fan – Inline Axial	\$ .....
Air Filter – Panel Type	\$ .....
Air Distribution System	\$ .....
Pipework Systems	\$ .....
Electrical Systems	\$ .....
Control Systems	\$ .....
Noise and Vibration Control	\$ .....
Identification Labelling	\$ .....
Testing and Commissioning	\$ .....
Operating and Maintenance Manual	\$ .....
Practical Completion	\$ .....
Client Representative Training	\$ .....
Preventative Maintenance	\$ .....
Defects Liability Period	\$ .....

**Total Fixed Lump Sum Tender \$**

**48.15.3 ALTERNATIVE OFFER OR VALUE ENGINEERING SUGGESTIONS**

We hereby offer the following adjustments to our fully compliant Fixed Lump Sum Tender.

- ..... \$
- ..... \$
- ..... \$

**48.15.4 UNIT RATES**

Unit rates applicable to the Contract including all labour, materials, overhead recovery, travel, freight and profit, but exclusive of GST.

Unit rates may be used as a guide to assess variation claims.

**48.15.5 EQUIPMENT AND MATERIAL**

Mark-up applied to the cost of equipment and materials ..... %

**Labour**

Hourly labour rates applicable to the Contract.

Electrician	\$ .....
Labourer	\$ .....
Engineer	\$ .....
Draftsperson	\$ .....

Controls Technician	\$ .....
Commissioning Technician	\$ .....
Maintenance Technician	\$ .....

**AIR DISTRIBUTION SYSTEMS**

**Sheet Metal Ductwork**

For supply, installation and internal insulation of straight lengths of ductwork, per metre run.

Size (mm)	Uninsulated	R1.2 w/ perforated foil laminate	R2.0 w/ perforated foil laminate
200 x 200	\$	\$	\$
300 x 300	\$	\$	\$
400 x 400	\$	\$	\$
500 x 500	\$	\$	\$

**PIPEWORK SYSTEMS**

For supply, installation and insulation of straight lengths of pipework, per metre run.

Nominal Diameter (mm)	Refrigerant – Copper Type A	Condensate Drain - UPVC
6	\$	N/A
9	\$	N/A
12	\$	N/A
15	\$	N/A
20	\$	\$
22	\$	N/A

**49 CIVIL WORKS****49.1 SITE PREPARATION AND EARTHWORKS****49.1.1 GENERAL**

The Contractor shall allow for clearing, excavation, backfilling, compaction and dewatering in any material that may be reasonably expected by an experienced Contractor to be encountered on site. The Contractor shall deposit all materials that cannot be used in the works at an approved refuse disposal site. The Contractor shall allow for all costs and charges in connection with the removal and disposal of such materials.

**49.1.2 TOLERANCES**

Item	Tolerance
Clearing and Grubbing (Width of Design Earthworks plus 2.0m)	± 0.5m
Earthworks	
- overall level	+ 50mm -0mm
- top and toe of cut and fill batters	± 100mm
- drainage basins	+ 0mm -100mm
Verge Level	+ 25mm -0mm
Top Soiling	
- thickness minimum	+ 50mm - 20mm

**49.1.3 CLEARING**

The clearing shall consist of removal for the entire width of the formation area and those cut and fill areas designated in the drawings of all trees, stumps and other vegetation, boulders and rubbish. All such material shall be removed to a depth of 600mm from the finished surface.

Any holes left shall be filled and compacted to the same density as that of the surrounding undisturbed soil.

Before any excavation or filling to any part of the Works is commenced, the Contractor shall remove from that part of the Site all vegetation with a girth of more than 100mm and length of more than 300mm and shall dispose of all such vegetation from the site.

Minor vegetation matter may be re-distributed with the topsoil with the prior approval of the Superintendent.

Vegetation shall not be disturbed elsewhere in the Site unless identified on the drawing. Where stormwater drains or other works are to be constructed, clearing shall be limited to the area of work.

No burning shall occur on site.

Any rubbish, paving or redundant street furniture not required for the construction shall be removed and disposed of off site unless otherwise noted on drawings.

**49.1.4 TOPSOIL**

Topsoil shall consist of the upper layer of material which includes minor vegetation, roots and grass for the purposes of this Contract.

Topsoil shall be removed from all areas on which excavation or fill operations are to be conducted.

Topsoil so removed shall be stockpiled in areas selected to avoid interference with other construction or cause likely contamination of trench backfill. Clean topsoil free of debris shall be re-distributed to a depth of 100mm to all verge and public open space. Topsoil re-distribution shall not commence until the grades have been inspected and approved by the Superintendent.

The maximum thickness of any topsoil respread shall be 100mm.

Unless specifically noted on the drawings, the Contractor shall dispose of any excess topsoil off site and shall allow for all costs and charges for such disposal.

The Contractor shall allow in the Programme of Works for having at any one time no more than one (1) hectare of land (not including road reserves and trenches) stripped of topsoil, unless otherwise approved by the Superintendent.

The blending and reuse of screened topsoil may be permitted pending geotechnical advice and acceptance by the Superintendent. The Contractor shall allow for all costs associated with these works including screening, disposal of waste and geotechnical certification.

#### **49.1.5 EARTHWORKS**

Earthworks shall include all cut and fill required within the Site to achieve the required levels and shapes as shown on the drawings and specified herein.

Prior to placement of any fill, the site shall be compacted, proof rolled and inspected by the contractor's Geotechnical Engineer. Any areas of unsuitable material exposed shall be excavated, removed and replaced with suitable material. Prior to placement of the fill the contractor's Geotechnical Engineer shall provide written certification that the site has been prepared in accordance with the Geotechnical Report.

Fill within the Site shall be placed in layers not exceeding 300mm thickness and compacted to achieve a minimum dry density ratio of 95% when tested in accordance with AS 1289 E2.1 unless otherwise specified.

All imported fill shall be clean well graded non plastic sand class SW. All fill from general or roadwork excavation shall be free of large stones, vegetation, rubbish or other deleterious material.

The Contractor shall allow for any means necessary for adjusting the moisture content of the fill to achieve the required compaction.

Any surplus cut material shall be removed from site.

Earthworks shall be trimmed to a neat finish within the tolerance specified. The surface shall be even and conform to the intent of the drawings.

The Contractor shall allow for a level survey of all such cut and fill areas on a 20 metre grid. Finished levels shall comply with the tolerances specified.

#### **49.1.6 WATER IN EXCAVATIONS**

The Contractor shall at all times maintain excavations free from water regardless of source or method of entry to the excavation. The Contractor shall allow for cut-off drains, well points, bores, drain diversions, pumps and any other means necessary to keep excavations dry and in a safe condition and shall repair or reinstate any damage caused by failure to keep the excavation free from water.

#### **49.1.7 EXCAVATION IN ROCK**

The different kinds of material encountered in excavation shall be classified under the headings "Other than Rock" or "Rock", and shall have the following meanings:

**"Other than Rock"** shall mean all kinds of materials which in the opinion of the Superintendent can be ripped by a track dozer up to 140kw power and 20t mass with one tyne or broken by a track excavator up to 100kw power and 20t mass with a rock bucket.

**"Rock"** shall mean hard material which in the opinion of the Superintendent requires ripping or breaking by a larger machine or hydraulic rock breaker and is in fact so ripped or broken.

Where excavation in rock occurs, the Contractor shall be responsible for any overcut beyond that specified and all necessary backfill to allow correct line and level to be maintained. Such excavation shall be undertaken at hourly rates submitted by the Contractor in the Schedule of Prices.

#### **49.1.8 EXCAVATION IN EXISTING ROAD RESERVES, PUBLIC OPEN SPACES, ACCESS WAYS, PRIVATE PROPERTY**

Excavation shall be kept to a minimum in existing roadways, footpaths, other paved areas and developed verges. Lawn is to be cut in sods or racks, removed and stacked prior to excavation for reuse where practicable otherwise remove and dispose of it off-site. Returned lawn or new lawn is to be installed and level immediately after backfill of the trenches, excavation and formation works to tie into surrounding levels.

Any irrigation lines which are damaged during the works shall be reinstated immediately upon backlift of the excavations. Pipes shall be cut and capped to allow use of the system during works.

The Contractor shall ensure minimal damage to all vegetation and any damage shall be reinstated to the satisfaction of the Local Authority or asset owner. Such costs shall be at the expense of the Contractor.

**49.1.9 SITE PRESENTATION**

All lots and verges shall be backbladed and graded so as to present a smooth even surface. This shall be completed prior to stabilisation.

**49.1.10 AS CONSTRUCTED' INFORMATION**

The contractor shall prepare an 'as constructed' survey to the Local Authority's standard and present to the Superintendent.

The 'as constructed' survey shall detail all ground levels around retaining walls, top and toe of embankments, verge levels, top and bottom of kerbs, edge of pavement, footpaths and crossovers, fences, all visible service indicators at ground level (valves and pits), poles, signs and street furniture.

An as-constructed drawing in PDF and Autocad dwg format is also to be provided reflective of the required as constructed information noted above.

Practical Completion will not be issued until satisfactory drainage 'as constructed' drawings are provided.

**49.2 DRAINAGE****49.2.1 GENERAL**

Stormwater drains and subsoil drains shall be constructed in accordance with the drainage layout.

Pile and keel or bearers will be required in soft ground and where drains cross existing services.

Drain construction shall take place in dry conditions and where necessary the Contractor shall provide dewatering equipment to ensure such suitable conditions exist.

**49.2.2 TOLERANCES**

COMPONENT	TOLERANCE		
	ALIGNMENT	GRADE	LEVEL
<b>PIPES</b>	± 25mm	+ 10mm - 20mm	± 10mm
<b>STRUCTURES</b>	± 20mm	-	± 10mm
<b>CHANNELS</b>	± 10mm	± 5mm	± 5mm

**49.2.3 MATERIALS****Cement**

Cement shall be ordinary Portland Cement (Type A) in accordance with AS 1316.

**Water**

Water shall be fresh and clean, free from impurities and fit for human consumption.

**Fine Aggregate**

Fine aggregate shall be clean, sharp and free from extraneous matter such as loam, clay, vegetable matter, salt or injurious dust. Fine aggregate shall comply with AS 1141 and AS 2758.

**Coarse Aggregate**

Coarse aggregate shall be clean, hard and free from impurities such as excessive dust and organic matter. If necessary, to comply with this requirement, heaps of coarse aggregate shall be hosed before use to remove such matter. Coarse aggregate shall comply with AS 1141 and AS 2758.

**Reinforcing Steel**

Reinforcing steel shall comply with the requirements of AS 4671.

**Concrete**

All concrete work shall be carried out in accordance with AS 3600. No concrete shall be placed before the Superintendent has checked the base, formwork and reinforcement. All materials shall be weighed batched and the proportions for each mix shall be approved by the Superintendent before concrete is made.

**Concrete Proportions**

Concrete for manholes shall contain not less than 270 kg of cement per cubic metre and the water/cement ratio shall not exceed 0.60.

Concrete for other works shall not contain less than 213 kg of cement per cubic metre and the water/cement ratio shall not exceed 0.60.

**Timber**

All timber shall be of the best quality cut from well matured trees, seasoned, sound, straight, free from decay, large and loose knots, gum veins, shakes, wanings, pipes, holes and other defects, and shall hold fully the sizes shown on the drawings.

Unless otherwise shown, all timber to be used shall be jarrah.

**Steel**

All steel shall comply with the requirements of AS3679.

All steel shall be new and each member free of any welding or other form of splice.

**Galvanising**

Miscellaneous steel fittings and fixings shall be hot dip galvanising to requirements of AS 4680.

**Bricks**

All bricks to be used for construction shall be solid burnt clay bricks and shall comply with AS 4455 and be of quality appropriate to the class of brickwork.

**Cement Mortar**

Cement mortar shall consist of cement and sand gauged by volume in the following proportions: one part by volume of Portland Cement to 3 parts of sand.

The ingredients shall be mixed in an approved mechanical mixer or shall be mixed together dry on a clean wooden stage until the mix is homogeneous in colour. Water shall then be added in sufficient quantity to give more than stiff workability. The whole shall then be turned until perfectly mixed.

Mortar shall be used within 2 hours of mixing and shall not be remixed or worked up again after it has stiffened. Any mortar that has commenced to set shall be removed from the works.

**49.2.4 PIPES AND CULVERTS**

Stormwater pipes shall be reinforced concrete, rubber ring jointed, Class 2 drainage pipes manufactured to AS4058 unless otherwise specified on the drawings.

Culverts and bases shall be precast reinforced concrete culverts manufactured to AS1597 unless otherwise specified on the drawings.

**49.2.5 EXCAVATION**

The Contractor shall excavate trenches on the alignments and shown on the Drawings and shall keep to the minimum width reasonably necessary to construct the Works.

No more than 300m of trench shall be open at any particular time and at no time shall excavation lead pipe laying be more than 100m.

The Contractor shall provide all intermediate benches, side-lacings, shorings, frames, timbers and other materials to ensure that the trench sides are maintained at all times in a safe condition.

Care shall be exercised when excavating near existing services, structures or other items likely to be damaged by the Contractor's activities, in particular, machinery causing vibration shall be operated only at a safe distance in such areas and the Contractor shall allow for use of alternative methods of construction where machines of this nature cannot be used.

Where over excavation has occurred, the Contractor shall make good such over excavation with clean well graded sand class SW compacted to a minimum dry density ratio of 95% when tested in accordance with AS 1289 E2.1 or other approved remedial actions.

The Contractor shall at all times maintain excavation free from ponding water regardless of source or method of entry to the excavation. The Contractor shall provide cut-off drains, well points, bores, drain diversions, pumps and any other means necessary to keep excavations dry and in a safe condition and shall repair or reinstate any damage caused by failure to keep the excavation free from water.

**49.2.6 PIPE AND CULVERT INSTALLATION**

Pipes and culverts shall be laid in accordance with the manufacturer recommendation on the prepared bedding to the line level and grade shown on the approved drawings. No pipes or culverts shall be

laid on filled ground until such ground has been compacted to a minimum dry density ratio of 95% when tested in accordance with AS1289 E2.1.

Hip holes shall be dug to ensure the pipe bears uniformly along its barrel and does not bridge between supports at the sockets.

Rubber ring joints shall be installed in accordance with the manufacturers recommendations. Bitumastic sealant tape 300mm wide shall be applied to the external face of all culvert joints.

Pipes shall be in straight alignment before the joint is closed and after the joint is home any necessary angular adjustment may be made.

Pipes and culverts laid in wet conditions shall be laid on coarse aggregate bedding for the full width of the bottom of the trench.

Culverts shall be laid on a reinforced concrete base.

#### **49.2.7 BACKFILLING**

Initial backfill to the top of the pipeline shall be carried out by hand placing approved fill material, free from rock, soil lumps or other unsuitable material.

The fill shall be placed uniformly on both sides of the pipe and compacted as firmly as can be managed by hand tamping.

Care should be taken to avoid damaging the pipe by direct impact.

Final backfill above the pipe shall be placed in uniform layers along the total length of pipeline to prevent overload or displacement and compacted at optimum moisture content by mechanical methods to achieve a compacted density not less than that of the same material in an undisturbed state.

Surplus material from excavations shall be graded out over the Site and any unsuitable materials removed from the site.

No excavation shall be backfilled until the pipeline or structure has been inspected and approved by the Contractor's supervisor.

Should any section of pipe be disturbed or damaged during backfill it shall be removed and re-laid by the Contractor.

#### **49.2.8 MANHOLES AND GULLY PITS**

Manholes and gully pits shall be constructed of reinforced concrete segments, at the locations and to the detail shown on the drawings.

Top of manholes and gully pits shall finish flush with the final level of the surrounding ground, footpath, road or kerb.

All covers shall be aligned to be parallel to the adjacent kerb, road or path.

Step irons shall be installed to the Local Authority requirements.

#### **49.2.9 FILL AGAINST STRUCTURES**

Filling shall not be placed against structures until the structure has been inspected and approved for filling.

ill materials shall be placed in horizontal uniform layers not exceeding 150mm thickness and shall be compacted to a minimum dry density ratio of 98% when tested in accordance with AS1289 E2.1 or E3.3.

Backfilling over and around structures shall avoid unbalanced loading or create movement.

The Contractor shall be responsible for repairs to any damage to existing structures as a result of filling and compacting operations. These repairs shall be at the Contractor's expense.

#### **49.2.10 PROPRIETARY PRODUCTS**

The contractor shall supply, handle and install all proprietary products in accordance with the requirements of the manufacturer.

#### **49.2.11 OPEN DRAINS, BASINS AND BERMS**

Open drains, basins and berms shall be constructed at the locations and to the details shown on the drawings at the earthwork stage.

All batters shall be trimmed and stabilized.

Inlet and outlet scour protection shall be constructed at the locations shown on the drawings using mortared stone pitching.

Stones shall be hard, durable limestone spalls weighing generally in excess of 5kg each with the greatest dimensions not exceeding 1.5 times the least dimension.

Stones shall be set on a prepared soil bed in a close fitting pattern and rammed into position.

Joints shall be raked for their full depth and grouted with cement mortar.

#### 49.2.12 SUBSOIL DRAINS

Subsoil drains shall be installed in the locations shown on the drawings.

Subsoil drains shall consist of slotted pipes fitted with geofabric filter material and screened by graded aggregate.

The aggregate shall be clean and uniformly graded from 7mm to 14mm.

The aggregate shall have a minimum thickness of 150mm all round pipe.

Subsoil pipes shall be PVC with 300mm long by 5mm slots cut through the pipe on alternate sides, separated by one third the circumference with a combined length of approximately half that of the pipe.

Subsoil pipes shall be laid with the slots on either side of the centre line of the pipe and with the slots in the lower half.

The Contractor shall undertake a particle size distribution analysis of the soil prior to selection of the filter fabric and shall forward the results to the Superintendent.

The geofabric filter material shall be non woven and have the following filtration requirements in relation to the soil being drained;

	D50S < 75µm
	EOS < D85S
	EOS < 2.5 x D50S
	EOS > D15S
generally	EOS < 200 µm
	G > 900

(EOS equivalent open size of fabric)

#### 49.2.13 EXCAVATION IN ROCK

The different kinds of material encountered in excavation shall be classified under the headings "Other than Rock" or "Rock", and shall have the following meanings:

"Other than Rock" shall mean all kinds of materials which in the opinion of the Superintendent can be ripped by a track dozer up to 140kw power and 20t mass with one tyne or broken by a track excavator up to 100kw power and 20t mass with a rock bucket.

"Rock" shall mean hard material which in the opinion of the Superintendent requires ripping or breaking by a larger machine or hydraulic rock breaker and is in fact so ripped or broken.

Where excavation in rock occurs, the Contractor shall be responsible for any overcut beyond that specified and all necessary backfill to allow correct line and level to be maintained. Such excavation shall be undertaken at hourly rates submitted by the Contractor in the Schedule of Prices.

#### 49.2.14 'AS CONSTRUCTED' INFORMATION

The Contractor shall ensure that no part of the work is backfilled or otherwise covered until 'as constructed' information has been obtained.

The drainage 'as constructed' information shall be to the Local Authority D spec requirements and must include, but need not be limited to the following:-

- type of pit and cover level;
- pipe invert levels at all pits;
- grade of pipes;
- distance between pits;
- trench grates;
- pipe size;
- cover level of all pits, including lot connection pits;

- invert levels of all pipes in existing pits to which connection may have to be made, including subsoil drainage;
- invert levels of open drains and dimensions of basins;
- cross-section of open drains;
- change of locations e.g. line alignments and manholes tied to properties/lot boundaries.

Such information shall be certified by the Contractor's Surveyor and forwarded to the Superintendent.

A red line/ink mark up drainage as-constructed in PDF and Autocad dwg format is also to be provided reflective of the required drainage as constructed information listed above.

Practical Completion will not be issued until satisfactory drainage 'as constructed' drawings are provided.

### 49.3 ROADWORKS

#### 49.3.1 TOLERANCES

Pavement construction shall comply with the following tolerances and the surface shape shall be such that water cannot pond at any point.

COMPONENT	TOLERANCE			
	THICKNESS	LEVEL	SHAPE (DEPARTURE FROM 3M STRAIGHT EDGE)	WIDTH
<b>Sub Grade</b>	-	+ 10mm - 30mm	-	+ 200mm - 0mm
<b>Sub Base</b>	+ 15mm - 0mm	+ 10mm - 20mm	-	+ 200mm - 0mm
<b>Base</b>	+ 10mm - 0mm	+ 10mm - 10mm	10mm	+ 100mm - 0mm
<b>Seal Surface</b>		+10mm -10mm	5mm	+ 100mm - 0mm
<b>Asphalt Surface</b>	+ 5mm - 0mm	+ 5mm - 5mm	5mm	+ 100mm - 0mm

#### 49.3.2 PAVEMENT MATERIALS

##### Gravel

Gravel shall be quarried from an approved source and consist of durable stone and soil binder, free from oversized stones, clay lumps, excess organic matter and deleterious material.

##### Grading:

The grading of the portion passing a 37.5mm AS sieve shall vary from coarse to fine in a uniform and consistent manner. The material shall not be gap graded as represented by the grading crossing from the maximum limit for one sieve size to the minimum limit for another sieve size, and shall conform as closely as possible to the specified target grading as specified below:-

NOMINAL SIZE 37.5 (mm)	PERCENTAGE PASSING 100 (by mass)	PERCENTAGE PASSING 100 (Target Grading)
19.0mm	72 - 100	80
9.5mm	50 - 78	57
4.75mm	36 - 58	43
2.36mm	25 - 44	31
1.18mm	18 - 35	23

425 µm	11 - 25	18
75µm	4 - 13	7

**Soil Constants:**

The portion of the sample which passes the 425 µm sieve (Soil Mortar) shall conform to the following requirements:

- The liquid limit shall not exceed 25%
- The Plasticity Index shall not exceed 5%
- The Linear Shrinkage shall not exceed 2%
- The Dry Compressive Strength shall not be less than 2.3 Mpa

Notwithstanding this Specification, any sample, which in the opinion of the Principal's Geotechnical Engineer, is composed of unsuitable material, or is composed of material which would break down with ageing or weathering to such an extent that it would then fall outside the limits of this Specification, shall be rejected.

**Road Base**

Road base shall be hard crushed aggregate of various gradings, including "fines", derived from naturally occurring igneous rock and free from sand, vegetable matter and any other deleterious material.

Recycled products shall not be used without prior written approval of the Principal.

**Grading:**

The portion of the total sample retained on the 19mm AS sieve shall not exceed 5% of the total sample. The grading of the portion passing a 19mm AS sieve shall conform with the following:-

NOMINAL SIZE (mm)	PERCENTAGE PASSING (by mass)
19.0mm	100
9.5mm	70 - 80
4.75mm	40 - 65
2.36mm	30 - 50
425µm	12 - 30
75µm	3 - 12

The ratio of the portion passing the 75µm sieve to the portion passing the 425µm sieve shall fall within the range 40 - 60%.

**Soil Constants:**

The portion of the sample which passes the 425µm sieve (Soil Mortar) shall conform to the following requirements:-

- The plastic limit shall not exceed 20
- The liquid limit shall not exceed 25
- The Plasticity Index shall not exceed 5
- The Linear Shrinkage shall not exceed 1%

The Dry Compressive Strength shall not be less than 1.75 Mpa

Dust ratio shall not exceed 0.67

Notwithstanding this specification, any sample which in the opinion of the Superintendent, is composed of unsuitable material, or is composed of material which would break down with aging or weathering to such an extent that it would then fall outside the limits of this Specification, shall be rejected.

**Road Sealing Aggregate**

Aggregates shall consist of clean hard, durable pieces of crushed stone, crushed gravel or screened gravel, free from deleterious material or excessive amounts of flat or elongated pieces.

Aggregates shall be even graded from coarse to fine and comply with the following limits.

AGGREGATE GRADING SPECIFICATION			
NOMINAL SIZE (mm)	PERCENTAGE (BY MASS) PASSING FOR THE FOLLOWING NOMINAL SIZE AS SIEVE		
	14mm	10mm	7mm
19.0	100		
13.2	80 - 100	100	
9.5	0 - 20	80-100	100
6.7	0 - 2	0-25	80 - 100
4.75	-	0-2	0 - 30
2.36	-	-	-
1.18	0 - 0.5	0-0.5	0 - 0.5
Maximum Flakiness Index	≧30	≧30	≧30
Average least dimension	9-13mm	6-8mm	4-6mm

When tested in accordance with Los Angeles abrasion test, aggregate shall have a percentage of wear not greater than 40% and when tested in accordance with the Aggregate Crushing Strength Test, shall have a loss not greater than 30%.

Notwithstanding this Specification any sample, which in the opinion of the Superintendent, is composed of unsuitable material, or is composed of material which would break down with ageing or weathering to such an extent that it would then fall outside the limits of this specification, shall be rejected.

### 49.3.3 BITUMEN PRODUCTS

#### General

The materials shall comply with the following relevant standards:

AS1160 Bitumen Emulsions for Construction and Maintenance of Pavements

AS2008 Bitumen for Pavements

AS2150 Hot Mix Asphalt

AS2157 Cut Back Bitumen

#### Hot bitumen

Hot bitumen shall be straight run class 170 residual bitumen suitable for road sealing purposes.

Additives for various conditions may be specified by the Superintendent.

For spray work the temperature of the bitumen shall be not greater than 180°C and not less than 160°C.

#### Bitumen emulsions

The emulsions shall be prepared from class 50 residual bitumen and an approved emulsifier.

The type and grade of emulsion may be specified by the Superintendent. The bitumen content shall be a minimum of 60%.

#### Cut-back bitumen

The cut-back bitumen shall consist of straight run class 170 residual bitumen mixed with medium curing cutter and slow curing cutter.

The grade and proportions of each cutter may be specified by the Superintendent.

For spray work the temperature of the cut-back shall be in accordance with the relevant range recommended in Austroads "Sprayed Seal Design Method".

#### Spraying Equipment

The spraying unit shall have a current test certificate issued by Main Roads Western Australia and shall comply with the requirements specified in Austroads "Performance Requirements for Bitumen Sprayers".

Unless otherwise permitted, the sprayer shall have a minimum tank capacity of 2000 litres.

#### Adhesion Agents

Adhesion Agents shall be compatible with the Sealing Aggregate being used.

#### Precoating

Precoating for aggregates shall be slow curing cutter. The application rate shall be 2 l/loose m<sup>3</sup>.

Asphalt - (Hot Mixed)

Standard Mix	AC 14	AC 10	AC 10 Intersections	AC 7	AC 10 Laterite
Aggregate Type	Granite	Granite	Granite	Granite	Laterite with up to 30% granite by mass
Nominal Mix Size	14mm	10mm	10mm	7mm	10mm
Marshall Blows	50	50	75	50	75
Minimum Marshall Stability of Compacted Mix	6.5 kN	6.5 kN	8 kN	5.5kN	8kN
Marshall Flow Value	2 - 4mm	2 - 4mm	2 - 4mm	2 - 4mm	2 - 4mm
Range of Voids Content Compacted Mix	4 - 6%	4 - 6%	4 - 6%	3 - 5%	3 - 5%
Bitumen Binder	Class 170	Class 170	Class 320	Class 170	Class 320
Marshall Quotient	1.7 kN/mm	1.7 kN/mm	2.0 kN/mm	1.7 kN/mm	2.0 kN/mm
Binder Content	4.5 - 6.5%	5.0 - 7.0%	5.0 - 7.0%	5.0 - 7.0%	5.7% ± 0.3%
Adhesion Agent (Hydrated Lime)					1.5% ± 0.5%
Pigment (Minox F201 or Approved Equivalent)					1%

**Aggregate Grading Limits**

Sieve Size	Range Percentage of Mineral Aggregate Passing Sieve (by mass)		
	Size 14	Size 10	Size 7
19.0mm	100		
13.2mm	85 - 100	100	
9.50mm	70 - 85	90 - 100	100
6.70mm	62 - 75	70 - 90	80 - 100
4.75mm	53 - 70	58 - 76	70 - 90
2.36mm	35 - 72	40 - 58	45 - 60
1.18mm	24 - 40	27 - 44	35 - 50
0.600mm	15 - 30	17 - 35	22 - 35
0.300mm	10 - 24	11 - 24	14 - 25
0.150mm	7 - 16	7 - 16	8 - 16
0.075mm	4 - 7	4 - 7	5 - 8

**49.3.4 PAVEMENT****Sub-Grade**

The formation shall be excavated to the required pavement width and to the longitudinal and cross sectional gradings shown on the drawings.

The sub-grade shall be compacted to a minimum dry density ratio of not less than 95% when tested in accordance with AS1289 E2.

The final sub-grade shall have the specified dimensions and be true to level.

The completed sub-grade shall be quality checked by the Contractor's Supervisor and the results forwarded to the Superintendent.

**Sub-Base**

The sub-base shall be constructed to the width shown on the drawings.

The sub-base shall be placed within the formed box and spread, without unduly disturbing the sub-grade, to the required profiles working from the centre towards the edges. Any outside spalls shall be crushed or removed from the work.

After spreading, the sub-base shall be water bound and compacted to a minimum dry density ratio of 95% when tested in accordance with AS1289 E2.1.

The completed sub-base shall be quality checked by the Contractor's Supervisor and the results forwarded to the Superintendent.

**Base**

The base course shall be constructed to the width shown on the drawings.

The base material shall be spread from an approved tipping truck in an even and continuous layer.

The base material shall be watered to the optimum moisture content, graded to the required profile with a minimum of cut and uniformly compacted to a minimum dry density ratio of 98% when tested in accordance with AS1289 E2.1.

Any part of the base course which is below the required level after consolidation shall be scarified to a depth of 75mm, made up with fresh base material and re-compacted.

The final base course shall be to specified dimensions with the surface true to level and free from bony areas and thin layers of finer material.

Compaction equipment employed shall include a smooth steel wheel roller and a rubber tyred multi wheel roller, each not less than 8 tonne gross weight.

No seal coat shall be applied until the base course has dried back such that the dryback characteristic moisture content is 85% of optimum moisture content.

The completed base course should be quality checked by the Contractor's Supervisor and the results forwarded to the Superintendent.

The completed base course shall be accepted by the Superintendent prior to the application of any seal coat.

### **49.3.5 SURFACE COURSE**

#### **General**

The bituminous surfacing of roads shall be a primer seal of bitumen emulsion and 7mm aggregate and a wearing course of a dense graded 10mm size Asphalt (Hot Mixed) laid to a minimum thickness of 30mm unless otherwise specified on the drawings.

Intersections shall have a wearing course of dense graded 10mm size asphalt (Hot mixed) intersection mix unless otherwise specified on the drawings.

The Contractor shall notify the Superintendent at least 48 hours in advance of the intended sealing or surfacing works and shall submit the proposed seal design for acceptance.

#### **Spray Seals**

##### **Primer Seal**

The grade and application rate of the binder shall in accordance with the appropriate seal design and confirmed by the Contractor after the inspection of the completed base course. Generally the binder will be bitumen emulsion but may be cut back hot bitumen.

Generally the application rate will be 1.4 l/m<sup>2</sup>.

The cover aggregate shall be spread at a rate accepted by the Superintendent. Generally for 7mm nominal aggregate the application rate will be 110m<sup>2</sup>/m<sup>3</sup>.

After the completed base course has been accepted and any deficiencies corrected it shall be broomed clean of all loose materials and dust without damaging the surface.

Immediately before the application of a bitumen emulsion binder, the base course shall be slightly dampened to ensure proper penetration and coverage.

##### **Final Seal**

The grade and application rate of the binder shall be in accordance with the appropriate seal design and confirmed by the Contractor after inspection of the completed primer seal.

Generally the binder will be hot bitumen fluxed with 2% diesel fuel and contain 0.1% adhesion agent.

Generally the application rate will be 1.50 l/m<sup>2</sup>.

The cover aggregate shall be spread at a rate accepted by the Superintendent. Generally for 14mm nominal aggregate the application rate will be 80m<sup>2</sup>/m<sup>3</sup>.

Prior to sealing, the primer seal shall be broomed clean of all loose materials and any defects or irregularities corrected to the satisfaction of the Superintendent.

##### **Two Coat Bitumen Emulsion Seal**

The grade and application rate of the binder shall be in accordance with the appropriate seal design and confirmed by the Contractor after the inspection of the completed base course. Generally the binder will be Cationic RS.1

Generally the application rate for the first coat will be 1.1 l/m<sup>2</sup> and for the second coat will be 1.9 l/m<sup>2</sup>.

The cover aggregate shall be spread immediately following application of the binder. Generally the first coat will be 14mm aggregate at an application rate of 80m<sup>2</sup>/m<sup>3</sup> and the second coat will be 7mm aggregate at an application rate of 110m<sup>2</sup>/m<sup>3</sup>.

After the completed base course has been accepted and any deficiencies corrected it shall be broomed clean of all loose materials and dust without damaging the surface.

Immediately before the application of the binder the base course shall be slightly dampened to ensure proper penetration and coverage.

The first coat shall be rolled and lightly drag broomed and the emulsion allowed to 'break' before the second coat is applied. Both coats shall be completed in the same establishment.

##### **Spraying**

The binder shall be sprayed directly from a spraying unit having a current test certificate issued by Main Roads Western Australia.

Before and after each spray run the contents of the spraying unit shall be dipped on level ground and the application rate checked. This shall be within ± 5% of the specified rate.

The aggregate spreading trucks, rolling and brooming equipment shall be ready to follow the spraying unit prior to the commencement of each spray run.

The width and length of each spray run shall not be greater than that which can be adequately covered by the material and equipment on hand immediately prior to the commencement of the spray run.

he laps of each run shall be free of loose aggregate prior to the commencement of an adjoining run. Stop/start trays or cut-off sheets shall be available for use if required by the Superintendent.

Spraying of hot bituminous binders shall not be carried out when the pavement temperature is below 20°C and spraying in general shall be not carried out in inclement weather or if the Superintendent has advised that conditions are unsuitable.

#### **Aggregate Spreading**

Trucks used for aggregate spreading shall be in good mechanical condition and fitted with bodies and aggregate spreaders from which the material cannot spill.

The aggregate spreader shall be operated only by persons competent and experienced in similar types of work.

At the completion of each spreading run the quantities used shall be recorded and the application rate checked.

The aggregate shall be spread immediately following the commencement of each spray run and continue as close as practicable behind the spraying unit.

#### **Rolling and Brooming**

Prior to rolling, any areas under covered shall be corrected and any spillage heaps shall be removed or uniformly distributed over the work.

If the aggregate is wet the rolling operation shall be delayed until it is almost dry.

Initial rolling shall be effected by a 6/8t smooth steel wheeled roller completing two passes over the total sealed area.

After the initial rolling the seal shall be broomed with a drag broom to ensure uniform distribution of the aggregate and final rolled with a 6/8t smooth steel wheeled roller or 8/10t pneumatic rubber tyred multi-wheeled roller.

The rolling shall continue in conjunction with the brooming to achieve 1 hour of rolling per 500m<sup>2</sup> of seal. The wheels of the roller shall be kept clean.

If there is any evidence of aggregate crushing, the steel roller shall be removed from the work and the rolling continued with a rubber tyred roller.

#### **Finish**

The completed seal shall produce a well bonded uniform surface free from over-sprayed, under-sprayed or under-covered areas and an excessive quantity of loose aggregate.

The completed seal may be inspected by the Superintendent and no sealing plant shall be removed from the site until the work has been approved.

### **49.3.6 ASPHALT (HOT MIX) SURFACE**

#### **Delivery**

All delivery vehicles shall be in good mechanical condition. Vehicle bodies shall be such that the asphalt cannot leak or spill and shall be fitted with covers of such size, thickness and material as to protect the load from the weather.

When directed by the Superintendent, or where the lead exceeds 110km, or where the ambient temperature is below 10°C and the lead exceeds 50km, the vehicle body and the cover shall be suitably insulated.

The interior of each vehicle body shall be cleaned of all foreign materials and lightly lubricated as necessary with a slightly detergent solution or other approved material. All foreign material and excess lubrication shall be removed prior to loading the vehicle.

Delivery dockets showing the following written information shall be available to the Superintendent.

- Quantity of material.
- The date and time of loading.
- The name of the supplier.
- The identification number of the vehicle.
- The size of the asphalt and the location reference of the plant at which the asphalt was manufactured.

#### **Construction Plant**

##### **Sprayers:**

Sprayers shall be capable of spraying the tack coat uniformly through jets in a spray bar at the desired rate of application up to a width of 2.5m. The spray bar shall be fitted with end shields.

Pressure type sprayers issued for spraying bitumen emulsion shall be capable of operating at a continuous pressure of 175kPa.

**Pavers:**

Pavers shall be self-propelled and shall be equipped with hoppers and distributing screws of the counter rotation type to place the asphalt evenly in front of the screed. Means shall be provided to heat the screed uniformly over its full width.

Pavers shall be equipped with a quick and efficient steering device and shall be capable of forward and reverse travelling speeds of 30m/min. They shall be capable of spreading the asphalt without segregation in a paver compacted thickness between 15mm and 150mm and to widths between 1.8m and 4.3m except in the case of wide or twin pavers which shall be capable of spreading widths up to 8.0m.

**Compaction Plant:**

The Contractor shall provide at least one steel wheeled tandem roller fitted with a suitable cutting wheel and one pneumatic tyred multi-wheeled roller.

The rollers shall be in good mechanical conditions and capable of reversing without back lash.

All rollers shall be fitted with approved devices to enable the whole of the surface of the wheels to be kept damp with a minimum amount of water. The taps controlling the rate of flow shall be readily accessible to the driver. In no circumstances shall the water be allowed to run directly from taps onto the asphalt being compacted.

For the compaction of asphalt, the Contractor shall provide self-propelled reversible rollers complying with the following requirements:

- Steel wheeled rollers shall have a mass not less than 9 tonne (non vibratory) and 6 tonne vibratory and shall have a static load intensity not less than 4.5 tonne per metre width of drive roll.
- Self-propelled, pneumatic tyred, multi-wheeled rollers shall be equipped with tyres of equal size and diameter, having smooth treads. Tyres on the rear wheel shall be offset relative to the front tyres to give overlapping wheelpaths and complete coverage for the effective width of the roller. The tyres shall be capable of being inflated to 700kPa. The total operating mass and tyre pressures may be varied as directed by the Superintendent.
- Rollers used for layers of compacted thickness less than 100mm thickness shall be so constructed that the total mass of the roller can be varied to produce an operating load per tyre up to 1 tonne.
- Rollers used for layers of compacted thickness of 100mm or more shall be so constructed that the total mass of the rollers can be varied to produce an operating load per tyre of between 1.3 tonne and 2.3 tonne.
- Self propelled, pneumatic tyred, multi-wheeled rollers for use in initial rolling on layers of compacted thickness of 100mm or more shall have tyres not less than 220mm wide, on rims not less than 500mm diameter.
- All rollers shall have approved brushes or similar devices so that each roll of tyre is kept clean of foreign material and can be kept uniformly damp.
- For compacting confined areas, the Contractor shall provide a small roller and/or a mechanical impact type or vibrating type hand operated compactor.

**Preliminary Work**

Before commencing each days work, the Contractor shall clean the area.

Cleaning shall consist of the removal of all deleterious material and sweeping the area clean.

Surface preparation, which shall include sweeping and hand chipping shall be done before applying the tack coat. When any area contains an excess of binder in such a quantity that there is any possibility of the excess binder coming to the surface of the new work, no asphalt shall be placed upon such area until all such excess binder has been removed to the satisfaction of the Superintendent.

The Contractor shall take all necessary action and precautions to prevent and divert traffic from damaging the works. The Contractor shall at all times supply, use and place all necessary traffic control devices to control the traffic movement along the street when work is in progress. All such devices shall be selected and placed in accordance with the approved Traffic Management Plan.

**Tack Coat**

Tack coat shall consist of Class 50 rapid setting bitumen emulsion which may be diluted by the addition of up to 50% of clean water with the consent of the Superintendent. It shall be applied only to a clean, dry surface.

Tack coat shall be applied by a sprayer through jets in the spray bar at a rate of 0.5 l/m<sup>2</sup>.

Tack coat sprayers shall at all times be in a clean condition internally and externally. The interior of all pipework, spray bars and spraying jets shall be clean and free from any tack coat materials before spraying commences.

Tack coating and spreading of asphalt shall cease if the sprayer does not spray uniformly at the desired rate of application.

The Contractor shall arrange the work so that the minimum length of tack coat is sprayed in any one operation. A sufficient period of time shall be provided in order to allow the tack coat to set up and become tacky before the asphalt is placed.

The use of hand lance or squeegee will be strictly limited to those areas inaccessible to the use of a sprayer or where a variable application rate is required.

When spraying the tack coat shields shall be used and all necessary precautions taken to protect kerbs and adjoining structures from damage.

The Superintendent may require the Contractor to dispense with the tack coat when spreading asphalt over clean freshly laid asphalt, or over a clean dry and cured primed surface, or where the depth of the layer equals or exceeds 50mm.

### **Spreading**

Asphalt shall be laid after the kerbing has achieved adequate strength.

The asphalt shall be laid on a foundation which is essentially dry and free from puddles.

No asphalt shall be placed in layers less than 25mm compacted thickness when the ambient temperature is less than 10°C unless rolling is done immediately after spreading.

No asphalt shall be placed in layers less than 100mm compacted thickness when the ambient temperature is less than 10°C or when cold winds chill the asphalt to an extent that spreading and compacting are adversely affected. In an emergency, approval may be given by the Superintendent to spread the asphalt when the ambient temperature is below 10°C but only under such conditions as maybe directed.

Under no circumstances shall asphalt be spread when the ambient temperature is less than 5°C.

The asphalt shall be spread in accordance with lines and levels shown on the contract drawings for each pavement course.

The speed of the paver shall be as uniform as possible and the lowest consistent with the rate of delivery of asphalt. The occasions on which the paver needs to be stopped shall be kept to a minimum.

Asphalt paving operations shall not commence until sufficient asphalt is on site to permit continuous spreading operations.

The asphalt shall be spread without tearing, gouging, or displacement to produce an even surface. Where necessary, the surface shall be corrected by methods accepted by the Superintendent.

The spreading of asphalt by hand behind the paver is not permitted except that, where it is impractical to spread and finish asphalt by machine methods, hand methods may be used with the acceptance of the Superintendent.

Asphalt shall be spread in such a manner as to minimise the number of joints in the carriageway. The layout of joints shall conform to the following requirements.

In any individual layer transverse joints in adjoining paver runs shall be displaced longitudinally by not less than 2m.

All longitudinal joints shall be offset from layer to layer by not less than 150mm. Where proposed lane line positions are provided longitudinal joints in the wearing course shall be made to coincide with these by the use of spreading widths corresponding with the lane widths.

The screed of the paver shall overlap the previously spread lane by 25mm to 50mm. At cold joints the overlapped asphalt shall be removed to waste or crowded back at the joint. No asphalt shall be thrown on to the mat being spread.

Unless otherwise directed by the Superintendent, the day's work shall be organised so that each layer spread covers the full width of the carriageway.

Immediately after any layer is spread and before compaction is started, the surface shall be checked, any unevenness adjusted, and all sandy, segregated, hungry, or dusty areas removed and replaced with fresh hot asphalt. Irregularities in alignment and grade along the outside edge shall be corrected by the addition or removal of asphalt before the edge is rolled.

Competent workmen capable of correcting all pavement irregularities shall be employed. The correction of irregularities shall be checked for shape and level with a straight edge immediately following the initial rolling.

When laying of asphalt by hand is approved it shall be distributed into place without segregation in a loose layer of uniform density and to the correct level. It shall be spread without tearing, gouging or displacement to produce a smooth even surface true to line, level and camber. Raking shall be done in a careful and skilful manner. Asphalt shall not be deposited any faster than can be properly handled.

Workmen shall not stand or walk on the hot spread asphalt except for the purposes referred to in above.

### **Joints and Junctions**

All longitudinal and transverse joints shall be well bonded and sealed. Hot longitudinal joints are preferred.

Junctions between old and new pavements and joints between successive days' work shall be carefully made in such a manner as to ensure a thorough and continuous bond between the old and new surfaces and to provide a smooth riding connection across the junction or joint.

The exposed edges of each paver run shall be formed while hot with a dense face which may be between vertical and 45° to the vertical for the full depth of the layer. Rollers shall not be permitted to damage this face. Any segregated or open textured asphalt in such face shall be removed by cutting back the edge in a straight line to expose fresh, dense asphalt. The cut edge shall be between vertical and 45° to the vertical.

All longitudinal joints shall be parallel to the centre line of the carriageway. Special care shall be taken in the forming of longitudinal joints at ramp terminals and at all intersections to avoid joint layouts and an appearance that would tend to misdirect traffic from the designed travel paths. The plan of jointing in critical traffic path areas shall be accepted by the Superintendent prior to placing of the wearing course.

Transverse joints shall be at right angles to the direction of spreading and cut to a straight vertical face for the full depth of the layer.

When necessary, after asphalt has been placed by the paver along any abutting edge such as kerb, manhole or an adjoining pavement, just enough hot asphalt shall be carried back to fill any space left unfilled. This joint shall be properly 'set up' at the proper height and level to receive the specified compaction under rolling.

Any longitudinal edge which is damaged by traffic or rolling shall be treated as set out before additional asphalt is laid alongside it.

Where asphalt is required to match an existing surface, or other fixture, the Contractor shall place the asphalt in such a manner as to provide a smooth riding surface across the junction. Where required the Contractor shall remove sufficient of the existing pavement to enable a smooth riding surface to be constructed across the junction.

Where it is necessary to re-sheet an existing asphalt surface in order to provide a smooth riding surface across the junction the section of tapering thickness asphalt shall end at a chase cut into the existing asphalt. This chase shall be approximately 25mm deep and 150mm wide, unless otherwise directed by the Superintendent. When necessary, removal of coarse particles from tapering thickness asphalt will be allowed using hand raking.

Where the depth of asphalt being placed in tapers is less than twice the size of the asphalt the area upon which such reduced thickness is to be placed shall be uniformly covered with tack coat at an application rate of 0.50 l/m<sup>2</sup> as directed by the Engineer.

### **Compaction Procedures**

After spreading, the asphalt shall be thoroughly and uniformly compacted as soon as it will support the roller without undue displacement, other delays in rolling freshly spread asphalt will not be permitted.

Where asphalt is being placed in layers of less than 100mm and greater than 25mm compacted thickness the following procedure shall be adopted for compaction unless otherwise directed or accepted by the Superintendent.

- Initial rolling shall be performed with a steel wheeled tandem roller with the driving roll nearer the paver except on steep grades or on sharp curves where the steering roll shall be nearer the paver. Any transverse and/or longitudinal joints shall be rolled first. Rolling shall then continue and be in longitudinal straight runs, commencing on the lower side and proceeding to the higher side of the spread asphalt. The roller shall overhang the unsupported edges of the paver run approximately 0.1m.
- Each longitudinal run shall overlap the previous run by approximately 0.1m and adjacent passes of the roller shall be of differing lengths.

- Secondary rolling shall be performed as soon as possible after initial rolling, and shall be performed with a self-propelled pneumatic tyred roller or vibratory of gross mass not exceeding 12 tonne, with the driving wheels nearer the paver. Rolling shall be in longitudinal straight runs commencing on the lower side and proceeding to the higher side of the spread asphalt, each run substantially overlapping the previous.
- Final rolling shall be performed with a steel wheeled tandem roller whilst the asphalt is sufficiently warm to permit all roller marks to be eliminated. Rolling shall be limited to a maximum of two coverages in a similar manner and pattern as for initial roller except that the prior rolling of joints shall not be necessary.

The speed of rollers shall not exceed 5km/h for steel wheeled roller or 25km/h for self-propelled pneumatic tyred or vibratory rollers, or shall be as directed by the Superintendent, and at all times shall be slow enough to avoid displacement of the asphalt. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected immediately. Rollers shall be operated by competent and experienced drivers and shall be kept in continuous operation so that all parts of the pavement shall receive substantially equal compaction.

Rollers shall not remain stationary on recently compacted work. All roller wheels shall be kept clean of any build up including tack coat material.

Around manholes and similar structures and at all places not accessible to the roller, thorough compaction shall be obtained by means of approved tampers. The joints between these structures and the asphalt shall be effectively sealed.

Each layer shall have a characteristic Marshall density of 93%.

#### **Clean Up**

During the progress of the work the Contractor shall keep all channels and pits free of debris at all times. The Contractor shall remove all sweepings, spoil and excess or rejected material from the site and shall leave the area clean to the satisfaction of the Superintendent. The disposal of such material shall be in accordance with any requirements of the Local Authority.

#### **Testing**

All tests shall be conducted in accordance with Marshall design parameters by a NATA registered testing laboratory to current Australian Standard or Main Road WA standard and should detail thickness, compaction and percentage Matt Voids.

The acceptance of the asphalt surface will be determined in accordance with the requirements of the Institute of Public Works Engineering Australia (WA Division) and Australian Asphalt Pavement Association (WA Branch) Technical Specification for Supply and Laying of Hot Asphalt Road Surfacing.

### **49.3.7 KERBING**

#### **General**

Cast in-situ kerbing shall be constructed using extruded concrete and finished as required in AS2876 concrete kerb and channel (gutters). Where steel reinforcement is shown on the drawings it shall comply with AS4671.

Cross section of kerbing shall be in accordance with detail drawings show on the drawings.

#### **Placement**

Construction shall be carried out in approved method and shall be extruded and vibrated to give maximum density. Concrete strength shall develop a minimum twenty eight (28) day strength of 32 MPa.

The extruded kerb shall be laid on the freshly swept surface of the primer sealed bitumen pavement, the surface is to be cleaned of all foreign or loose and broken pavement material.

Finish to top and road face of kerb shall be uniformly smooth and free from voids and air pockets.

The line of the kerbing shall be parallel to the centre line of the road and the kerbing on both sides of the road shall be exactly parallel to each other, unless shown otherwise on the drawings.

All kerbing shall be laid to correct grades corresponding to the design grade of the road and radius sweeps and intersections.

All kerbing shall be protected by the Contractor from marking by children, animals or other causes. The Contractor shall also protect kerbs from bitumen overspray.

#### **Curing**

Kerbs shall be sprayed with Calcure "D" or equivalent curing membrane within two hours of surface finishing of the concrete.

**Joints**

Kerbs shall be cut completely through to give 10mm expansion joint every 4.5 metres of kerb length. Immediately after extrusion, contraction joints shall be formed by a grooving tool at every 1.5 metres, alternating with expansion joints. Kerb joints shall match with path joints if the kerb and path abut.

A 10mm expansion joint shall be left either side of all road drainage gullies and tangent points of all curves.

Expansion joints shall be cut by a suitable cutting wheel and filled with an approved Butylmastic compound filler and foam or polyurethane backing.

All failed and surplus material shall be removed from the Site. On no account are these materials to be disposed of within the Contract area.

**Backfilling**

Backfill material shall be of a suitable earth free from stones greater than 100mm as approved by the Superintendent. Backfill shall be compacted to a minimum dry density ratio of 92% when tested in accordance with AS1289 E2.1. The road verge shall be graded from top of kerb to the profile shown on drawings.

**49.3.8 CONCRETE FOOTPATHS****General**

Cast in situ concrete footpaths shall be laid on the alignments and at the locations shown on the drawings. Where steel reinforcement is shown on the drawings, it shall comply with AS4671.

The road verge shall be constructed to the approved cross section from the top of the kerb.

**Placement**

The foundation material shall be compacted to a minimum dry density ratio of 95% when tested in accordance with AS1289 E2.1 to a depth of at least 450mm. Special attention shall be given to Service Authority trenches. The Superintendent shall be given 24 hours prior notice of the concrete pour.

The path shall be constructed from concrete with at least a 28 day cylinder compressive strength of 32MPa. The ground shall be thoroughly wetted immediately prior to laying the concrete. The concrete shall be compacted by a vibrating screed board of sufficient capacity to effectively vibrate and compact the full thickness of the path.

The paths generally shall be constructed with a crossfall of 2% towards the kerb, unless otherwise noted. The surface finish shall be brushed with a smooth edge to all outside edges and joints. All work shall be of high quality, uniform appearance and executed in a tradesman-like manner.

All paths shall be protected by the Contractor from marking by people, animals or other causes.

**Joints****Expansion Joints**

Transverse expansion joints shall be installed in accordance with the local government's standard drawing. The joints shall be 10 millimetres wide and extend the full depth and width of the pavement, and be filled with approved expansion joint filler. The joint filler shall not exude bituminous material when compressed in hot weather. Where possible the colour of the joint material should match the path colour. The following materials are approved:

Nonporite	-	Bitumen impregnated canite by the cold solvent process.
Expandite	-	Flexcell.
Melijoint	-	Melcann
Lock Joint	-	All-in-One Lock Joint

Expansion joints shall be installed where the pathway abuts kerbing, utility service structures, drainage pits and/or existing crossovers.

Expansion joints are to coincide with kerb joints and vice versa where possible.

Expansion joints to be at changes in direction or width or where adjacent to a solid object, otherwise at maximum spacing of 40m.

**Contraction Joints/ Control Joints**

Transverse contraction joints shall be installed in accordance with the Local Government's standard drawing, equally spaced between expansion joints, aligned at 90° to the pavement alignment and finish flush with the path. Contraction joints are to coincide with kerb joints and vice versa where possible.

Where the Local Government's standard drawings have not specified spacings for the contraction joint, the joint shall be installed at the following spacings:

Clayey soils - 1.5 times the width of the path.

Sandy soils - 2 times the width of the path.

For all other soil types, consult the engineer or Lock Joint Australia for further advice.

The following materials are approved:

Lock Joint - Lock Joint

Lock Joint - Pinnable Lock Joint

### **Contraction Joints – Grooved Tool Joints**

(only to be used under direction of the Local Government or where specified)

Transverse contraction joints shall be installed in accordance with the Local Government's standard drawing and equally spaced between expansion joints. The contraction joint shall be aligned at 90° to the pavement alignment and be a minimum of five millimetres deep, and provide a vertical plane of weakness through the pavement. The joint shall be made in plastic concrete by depressing an approved grooving tool into the surface of the pavement.

Contraction joints are to coincide with kerb joints and vice versa where possible.

### **CLEAN UP**

At the completion of all paving works, the Contractor shall clean away all debris.

Kerbs shall be left clean and true to line and verges graded off to ensure full drainage of the pavement.

Verges shall be compacted to a density not less than that of the surrounding undisturbed soil and be free from unsightly winrows and wheel marks.

### **49.3.9 SIGNS AND LINEMARKING**

#### **General**

All regulatory and warning signs and pavement linemarking shall be provided to the requirements of Main Roads Western Australia.

#### **Temporary Signing and Linemarking**

The Contractor shall ensure that the site is maintained in a safe condition for all traffic during the construction works and until permanent signing and marking is installed. Temporary signing and pavement markings shall be provided to Main Roads Western Australia requirements, pending installation of permanent markings.

#### **Permanent Roadway Signing and Linemarking**

Permanent road signs and linemarking shall be installed by Main Roads Western Australia.

The Contractor shall insert 150mm PVC diameter sleeves at the location of all new signs.

The Contractor shall spot the approved pavement marking in accordance with Main Roads Western Australia's **Specification for spotting in preparation for longitudinal line marking on roads**. The Contractor shall remove any unnecessary pavement marking with 5-7mm aggregate seal or by grinding off, depending on the condition of the existing surface. The Contractor shall then notify Main Roads WA through the completion of the "Advice of Completion of Conditions Required Prior to the Provision of Services by Main Roads Western Australia" form. The Contractor shall maintain temporary signs and linemarking until permanent linemarking is installed.

#### **Permanent Parking Area Signing and Linemarking**

The pavements shall be marked by one of the following materials to AS 4049:

- Paint - with or without glass beads;
- Thermoplastic or other applied insitu plastic materials - with or without reflective properties.

Paint shall be resistant to bleeding when applied to a bitumen surface.

Colour of line markings shall be white excepting that yellow may be used for parking lines to indicate where parking is restricted and blue may be used to indicate areas for disabled persons parking.

White	off white Y35 in AS 2700
Yellow	golden yellow Y14 in AS 2700
Black	charcoal B65 in AS 2700
Blue	to ACROD requirements

The width of longitudinal or broken lane lines shall be 80mm minimum with 100mm preferred.

The width of parking bay lines shall be 80mm minimum with 100mm preferred.

Parking bays shall be marked with an unbroken line between spaces except those indicated by kerbing or other contrasting paving and a 1200mm T at the line of the carriageway.

The surface shall be dry and swept clean before paint is applied.

Paint application shall produce a wet film thickness of  $375 \pm 25\mu\text{m}$  and have a no pick up time of not more than 4 minutes.

Signs shall be consistent with those used in the street network in accordance with AS 1742.

Direction signs for vehicles and pedestrians shall comply with AS 2890.1.

The Contractor shall install 150mm diameter PVC sleeves at the location of all new signs.

In pedestrian areas the clearance to the underside of the sign shall be 2500mm. Signs shall not obstruct driver or pedestrian visibility.

#### 49.3.10 TESTING

Testing of materials, compaction, thickness and shape is required at each stage of the roadworks.

All tests shall be arranged and paid for by the Contractor with a NATA registered testing authority. All test results shall be forwarded to the Superintendent at each stage of the roadworks.

The testing schedule shall be as follows for each pavement course:

1. Material quality testing - one test for each product batch.
2. Compaction and Thickness Testing - one test for each 350m<sup>2</sup> of pavement with a minimum of two tests for each road.
3. Profile Testing - 1 test for each 200m<sup>2</sup> of pavement with a minimum of two tests for each road.

### 49.4 ACRYLIC ATHLETIC SURFACING AND LINEMARKING (COMPLEX)

#### 49.4.1 ACRYLIC SURFACING SYSTEM

The Contractor shall supply and install the a UV stabilised, slip resistant (as indicated), Plexipave acrylic surfacing system, or equivalent approved product, in accordance with the manufacturer's specifications and requirements to both the playing area and surrounds of the entire asphalt surface inclusive of linemarkings and numbering of all courts as indicated in the plans provided.

The Plexipave system is to incorporate:

##### **One base coat**

Additional wear coat where documented

##### **Two finish or wear coats**

Linemarking, lettering and numbering to the courts.

Colour finish as specified.

##### **Preparation of the asphalt surface**

The asphalt surface is to be thoroughly cleaned with a high-pressure wash prior to commencing to the application of the acrylic surface in accordance with the product manufacturer's specifications and requirements.

In the event any surface irregularities have been identified, these are to be corrected by the acrylic contractor using a suitable manufacture's acrylic compatible filler.

##### **Base Coat**

To avoid issues of the base coat 'shadowing' through to the surface as the top coat wears, the base coat shall be the same colour as the two top coats.

The application of the acrylic surface system shall include an initial colour pigmented filler / base coat to match the colour of the finished top or wear coats. This initial coat is to fill / reduce any voids in the surface in order to provide an acceptable evenly textured finish to the acrylic system.

#### 49.4.2 PROTECTION OF THE ACRYLIC SURFACING

The Contractor is to adequately protect the acrylic sport surfacing both during and following the application procedure.

Welding or metal cutting works should be at least 5m clear from any acrylic surface. Where welding or metal cutting works are unavoidable above or within the vicinity of the acrylic surface areas, then the surface is to be protected with appropriate sheeting/matting to prevent metal shards / filings coming in contact with the acrylic as this may cause future staining. If in the event the above does occur the area to be thoroughly swept with a 'magnetic broom' afterward to ensure there are no metal shard or filings left on the acrylic surface.

The Contractor shall avoid vehicles and plant traversing on the asphalt and acrylic surface. Should vehicles or plant be required to traverse across the asphalt and acrylic surface, the Contractor shall

inform the Superintendent prior to this occurring and implement appropriate protective measures such as track boards and the like.

#### **49.4.3 COURT LINEMARKING**

##### **General**

Linemarking is to be done with a textured, two coat, water base acrylic, installed in accordance with the manufacturer's specification with the same texture and non-slip finish as the remainder of the court..

Linemarking is to be free of any feathering/bleeding along the edges of all line when completed.

##### **Court Linemarking**

The linemarking for the basketball and netball courts are to be consistent with that noted on the Department of Sports and Recreation web page.

<https://www.dlgsc.wa.gov.au/sport-and-recreation/sports-dimensions-guide>

Linemarking colours to the courts are to be as nominated on the drawings.

Colours to the court playing surface and runoff areas are to be as nominated on the drawings.

#### **49.4.4 SURFACE SLIP RESISTENT FINISH**

The finished acrylic surface is to provide a slip resistant finish of Class P5 in accordance with AS4586. The Contractor is to undertake slip resistant in-situ testing to specified locations on the completed acrylic surfacing in accordance with AS4586. The testing is to be carried out by a suitably experienced and qualified NATA accredited tester in both wet and dry condition, as per Netball Australia Guidelines<sup>[1]</sup>. For each court, the in-situ testing shall be at the below:

- A minimum of 5 test sites within each courts playing areas, with at least one test within each of the shooting "D" and vicinity of the centre circle.
- A minimum of 4 tests within the abutting court run-off area.

All results are to be submitted to the Superintendent. Test location sites to be discussed prior to commencement with the Superintendent.

The Contractor is to provide product information in relation to the durability and life expectancy of the slip resistant results, based on use that can be reasonably expected before the slip resistance rating reduces from P5. This information shall be submitted by the Contractor within the tender response.

The Contractor is to ensure that the entire acrylic coated area is to be 'secured / cordoned off' on completion of the acrylic surface application and linemarking. No access is to be permitted until after the completion of the slip resistance testing and approval by the Superintendent.

#### **49.4.5 WARRANTY**

The product warranty and installation warranty periods for the acrylic sport surfacing and linemarking is to be a minimum of 5 years.

All warranties are to be in the name of the Principal.

#### **49.4.6 CURING TIME OF ASPHALT PRIOR TO ACRYLIC SURFACING INSTALLATION**

The acrylic surfacing is to be installed no sooner than 4 weeks after the installation of the completed asphalt surface to allow sufficient curing time of the asphalt, regardless of the product manufacturer's specification that may note a requirement of a lesser asphalt curing time. However the washing of the courts may be done after the initial two week curing time has elapsed.

#### **49.4.7 HIGH PRESSURE CLEANING OF THE COURTS**

The Acrylic Installation Sub-contractor is to use a suitable high pressure water cleaner to thoroughly wash the courts prior to commencing the acrylic surface application in accordance with the acrylic manufacturer's product requirements.

**CEO04 – 02/22 Muchea Recreation Centre**

<b>Applicant</b>	Shire of Chittering
<b>File ref</b>	GRT.CSRFF.Muchea Hall
<b>Author</b>	Community Development Coordinator
<b>Authorising Officer</b>	Chief Executive Officer
<b>Disclosure of interest</b>	Neither the Author nor Authorising Officer have any Impartiality, Financial or Proximity Interests that requires disclosure
<b>Voting requirements</b>	Simple Majority
<b>Attachments</b>	<ol style="list-style-type: none"> <li>1. Muchea Recreation Centre Staging Plans</li> <li>2. Schematic Design Cost Estimate Report - Muchea Recreation Centre</li> <li>3. Funding tracker</li> <li>4. Muchea Recreation Centre Reference Group Minutes – 25 October 2021</li> <li>5. OCM Minutes unconfirmed 151221</li> </ol>

**SUBSTANTIVE MOTION / COUNCIL RESOLUTION 140222**

Moved Cr Ross, seconded Cr Campbell

That Council instruct the Chief Executive Officer to:

1. Instruct Site Architecture Studio Shine to undertake the detailed design with staging to be as per the amended Staging Plan and prepare the tender documents (e.g. scope of work, specifications and design requirements);
2. Authorise additional funding to appoint an experienced individual or company to work with Site Architecture to run the tender process;
3. Prepare an agenda item for the next Ordinary Council Meeting or at a Special Council Meeting held for the specific purpose, to enable Council to decide upon the technical and commercial bid evaluation assessment criteria and tender conformance criteria;
4. Release a severable portion tender for the Muchea Recreation Centre, where portions may include Stage 1 only; Stage 2 only; Stage 3 only; Stage 4 only; Stages 1 and 2 combined; Stages 1, 2, and 3 combined; Stages 1, 2, 3 and 4 combined;
5. On receipt of tenders, with assistance from Site Architecture Studio Shine and the appointed experienced individual or company;
  - a. undertake technical bid evaluations (TBE) including but not limited to verifying conformance against the project scope of work, specifications and other tender documentation;
  - b. undertake commercial bid evaluations (CBE) including but not limited to verifying tenderer's experience, capability (resources) to complete the work, financial solvency and conformance to the agreed criteria;
  - c. derive normalised total cost for each separable portion;
  - d. prepare a Recommendation for Award (RFA);
6. Workshop the Long Term Financial Plan with Council utilising potential loan repayments; and
7. Prepare an agenda item with the Recommendation for Award (RFA) and include it on the agenda, where practicable and in line with legislative requirements, at the next Ordinary Council Meeting.

**CARRIED UNANIMOUSLY 7 / 0**

TIME: 7.59PM

	<b>Authority / Discretion</b>	<b>Definition</b>
<input type="checkbox"/>	Advocacy	<i>When Council advocates on its own behalf or on behalf of its community to another level of government/body/agency.</i>
<input checked="" type="checkbox"/>	<b>Executive</b>	<b><i>The substantial direction setting and oversight role of Council. e.g. adopting plans and reports, accepting tenders, directing operations, setting and amending budgets.</i></b>
<input type="checkbox"/>	Legislative	<i>When Council initiates or adopts a policy position, or a local law.</i>
<input type="checkbox"/>	Quasi-Judicial	<i>When Council determines an application/matter that directly affects a person's rights and interests. The judicial character arises from the obligation to abide by the principles of natural justice. Examples of Quasi-Judicial authority include development applications, building permits, applications for other permits/licences (e.g. under Health Act, Dog Act or Local Laws) and other decisions that may be appealable to the State Administrative Tribunal.</i>
<input type="checkbox"/>	Information	<i>Includes items for information purposes only and do not require a decision of Council (to 'note' only).</i>

### Executive Summary

Council is requested to instruct the Chief Executive Officer (CEO) to put the Muchea Recreation Centre Project out to tender, with a request for severable portions to the tender to reflect the 3 stages of the project.

### Background

The Muchea Recreation Centre Reference Group resolved at the 25 October 2021 meeting that the Muchea Recreation Centre project would be placed on hold to enable Shire staff to seek direction from Council with regard to the budget of the project, in light of potential funding shortfalls and sharply increasing costs of construction across Western Australia.

It was suggested that Council would need to consider the following three options:

1. Resolve not to proceed with the project;
2. Re-design the project to reduce the scale of the project to reduce the cost to within budget or;
3. Approve a contingency amount to be drawn down on, likely to be in the order of 30% of the total project cost.

The following items were to be updated and submitted to the November Ordinary Council Meeting:

- The Project Manager to provide Council with an up to date total project budget outlining inclusions/exclusions list and cost breakdown of all other materials and services to be provided by the Shire of Chittering as part of the project, any proposed future staging and an up to date funding strategy including clubs contributions and potential staging:
  - Stage 1: Construction of the Muchea Recreation centre
  - Stage 2: Demolition of Muchea Town Hall
  - Stage 3: Upgrade of the Muchea Netball Courts
- Additionally, the Shire Project Manager was to document the contracting strategy including in-kind costs as this will be required for the tendering process.

At this meeting it was acknowledged that any delays will impact on the capacity of Site Architecture Studio to meet agreed timeframes.

Due to the time required to prepare this information, the above items were not available for the November Ordinary Council Meeting and have subsequently been tabled for the February 2021 Ordinary Council Meeting. See attachments 1 – 3.

It was requested that a session for Council be held that would cover the background of the project, progress to date, and a potential path forward. As part of the discussion that was to take place, it was requested of staff to prepare costings of the following three options:

1. Option 1: Retain the current design concept, demolish the existing hall and develop a new layout over the sight of the existing hall.
2. Option 2: Retain the existing club rooms (hall), build the proposed change rooms only, and delay construction of the new club rooms to a later date:
3. Option 3: Proceed to tender based on the designs developed in conjunction with the Muchea Recreation Centre Reference Group.

A Council Workshop for the project was held on Thursday, 2 December 2021. The intention of this session was to brief new Councillors on the background of the project and progression of the project to date and for Council to consider the financial implications of any decisions pertaining to this project.

At the 15 December 2021 Ordinary Council Meeting, Council resolved the following:

*ALTERNATIVE MOTION / COUNCIL RESOLUTION 111221*

*Moved Cr King, seconded Cr Hughes*

*That Council:*

1. *Instruct the CEO to procure professional services to provide detailed cost estimates for each of the three options listed in item 2 below, including all of the assignment exclusions and services proposed to be supplied the Shire, associated infrastructure, services and utilities;*
2. *Confirm the three options to be costed are:*
  - a) *Option 1 – Retain the Muchea Hall, build the proposed new club room over the existing netball court, build the new change room, build a new fourth netball court (in a 2 x 2 configuration) with lighting, refurbish the existing three netball courts with upgraded lighting as required, replace the existing machinery storage shed, then demolish the Muchea hall and redevelop the area;*
  - b) *Option 2 – Demolish the Muchea Hall upfront, retain the current change rooms design and develop a new layout over the site of the existing hall, refurbish the netball court surfaces and upgrade lighting, and replace the existing machinery storage shed*
  - c) *Option 3 - Retain the Muchea Hall and allow for essential refurbishment only, build the new Change Rooms only, decommission the existing change rooms, and refurbish the existing four netball court surfaces and upgrade lighting.*
3. *Instruct the CEO to provide a report on the sources of secured project funding, including the Shire's contribution, community contribution from grants, donations and in-kind sources;*
4. *Authorise the Architects professional services fee to be funded from the undrawn budget allocation for professional services; or if not sufficient, authorises additional allocation from the current budget;*
5. *Instruct the CEO to table a report at the February 2022 Ordinary Council Meeting or at a Special Council Meeting if the information is available earlier.*

*CARRIED BY ABSOLUTE MAJORITY 4 / 3*

*TIME: 7.52pm*

*For: Cr King, Cr Hughes, Cr Dewar, Cr Curtis*

*Against: Cr Ross, Cr Angus, Cr Campbell*

Following this meeting, a Council briefing session was held on 22 December 2021 with Site Architecture Studio to provide more specific direction on the Muchea Recreation Centre Project.

At this meeting Council instructed Site Architecture Studio to draw up the costings for the following staging components, based on what they have already established through hydraulic and electrical consultant reports and the QS measured structural concept.

- Stage 1: Build the new change room, replace the existing machinery storage shed and do all necessary ancillary works to enable future stages, such as ATU systems.
- Stage 2: Build the proposed new club room over the existing netball court, retaining the existing hall until the completion of build.
- Stage3: Build a new fourth netball court (in a 2 x 2 configuration) with lighting, refurbish the remaining netball courts

It is Council's intention to make a determination over whether they do the complete build, what could be staged and/or when.

Each of these stages will include a commentary on what impacts need to be considered for each stage i.e. we would need to move the existing storage shed to accommodate stage one. Stage 2 would necessitate consideration to building entry points and, there would a potential need for temporary facilities for the duration of the build if the existing hall is demolished prior the new clubrooms being completed.

Site Architecture Studio as the appointed Architect for the project, provided the above costings to Council on 27 January 2022.

A subsequent Council workshop was held on 3 February 2022 to review the costings and determine the way forward for the project.

### **Consultation/Communication Implications**

#### Local

The following Muchea Recreation Centre Reference Group Meetings have been held with minutes tabled at Council.

- 22 July 2021
- 17 August 2021
- 30 August 2021
- 13 September 2021
- 28 September 2021
- 25 October 2021

The minutes of the 25 October 2021 Reference Group Meeting have been tabled as attachment 4 to the report.

A project page is available on the Shire Website with all relevant publically available documents uploaded to this page.

#### State

Not applicable

### **Legislative Implications**

#### State

Nil

Local

Nil

**Policy Implications**State

Nil

Local

Nil

**Financial Implications**

Nil – Costs for the preparation of the tender can be met by the allocated budget.

**Strategic Implications**LocalStrategic Community Plan 2017-2027

Focus area:	Our community
Objective:	S1.1 An active and supportive community
Strategy:	S1.1.2 Develop and enhance existing recreation and social facilities for local communities
Objective:	S1.2 Strong sense of community
Strategy:	S1.2.3 Activate our local centres and towns
Focus area:	Our Build Environment
Objective:	S3.1 Development of local hubs
Strategy:	S3.1.1 Plan for new and enhanced community facilities
Objective:	S3.3 Improved infrastructure and amenities
Strategy:	S3.3.1 Improved asset management across all asset classes
Focus Area	Strong Leadership
Objective:	S5.3 Accountable Governance
Strategy:	S5.3.1 Good governance which supports efficient and effective service delivery

State

Nil

**Site Inspection**

Not applicable

**Risk Assessment / Implications**

Low – The preparation and release of a tender was included in the scope of the approved project.

**Officer Comment/Details**

Nil

## OFFICER RECOMMENDATION

Moved Cr Ross, seconded Cr Campbell

That Council instruct the Chief Executive Officer to:

1. Instruct Site Architecture Studio Shine to undertake the detailed design with staging to be as per the Staging Plan in Attachment 1 and prepare the tender documents (e.g. scope of work, specifications and design requirements);
2. Authorise additional funding to appoint an experienced individual or company to work with Site Architecture to run the tender process;
3. Prepare an agenda item for the next Ordinary Council Meeting or at a Special Council Meeting held for the specific purpose, to enable Council to decide upon the technical and commercial bid evaluation assessment criteria and tender conformance criteria;
4. Release a severable portion tender for the Muchea Recreation Centre;
5. On receipt of tenders, with assistance from Site Architecture Studio Shine and the appointed experienced individual or company;
  - a. undertake technical bid evaluations (TBE) including but not limited to verifying conformance against the project scope of work, specifications and other tender documentation;
  - b. undertake commercial bid evaluations (CBE) including but not limited to verifying tenderer's experience, capability (resources) to complete the work, financial solvency and conformance to the agreed criteria;
  - c. derive normalised total cost for each separable portion;
  - d. prepare a Recommendation for Award (RFA);
6. Workshop the Long Term Financial Plan with Council utilising potential loan repayments; and
7. Prepare an agenda item with the Recommendation for Award (RFA) and include it on the agenda, where practicable and in line with legislative requirements, at the next Ordinary Council Meeting.

## AMENDMENT

Moved Cr Ross, seconded Cr Angus

That the Officer Recommendation be amended to include at the end of condition 4, "where portions may include Stage 1 only; Stage 2 only; Stage 3 only; Stages 1 and 2 combined; and Stages 1, 2 and 3 combined".

CARRIED UNANIMOUSLY 7 / 0

TIME: 7.39PM

## AMENDMENT

Moved Cr Hughes, seconded Cr Campbell

That the Staging Plan be amended to include:

1. A Stage 4 in the staging plan to include resurfacing of multi courts 2 and 3 and lighting.
2. Include Stage 4 in point 4 of the motion.

CARRIED UNANIMOUSLY 7 / 0

TIME: 7.56PM

## MOTION / COUNCIL RESOLUTION 120222

Moved Cr King, seconded Cr Ross

That Council suspend standing orders at 7.43pm

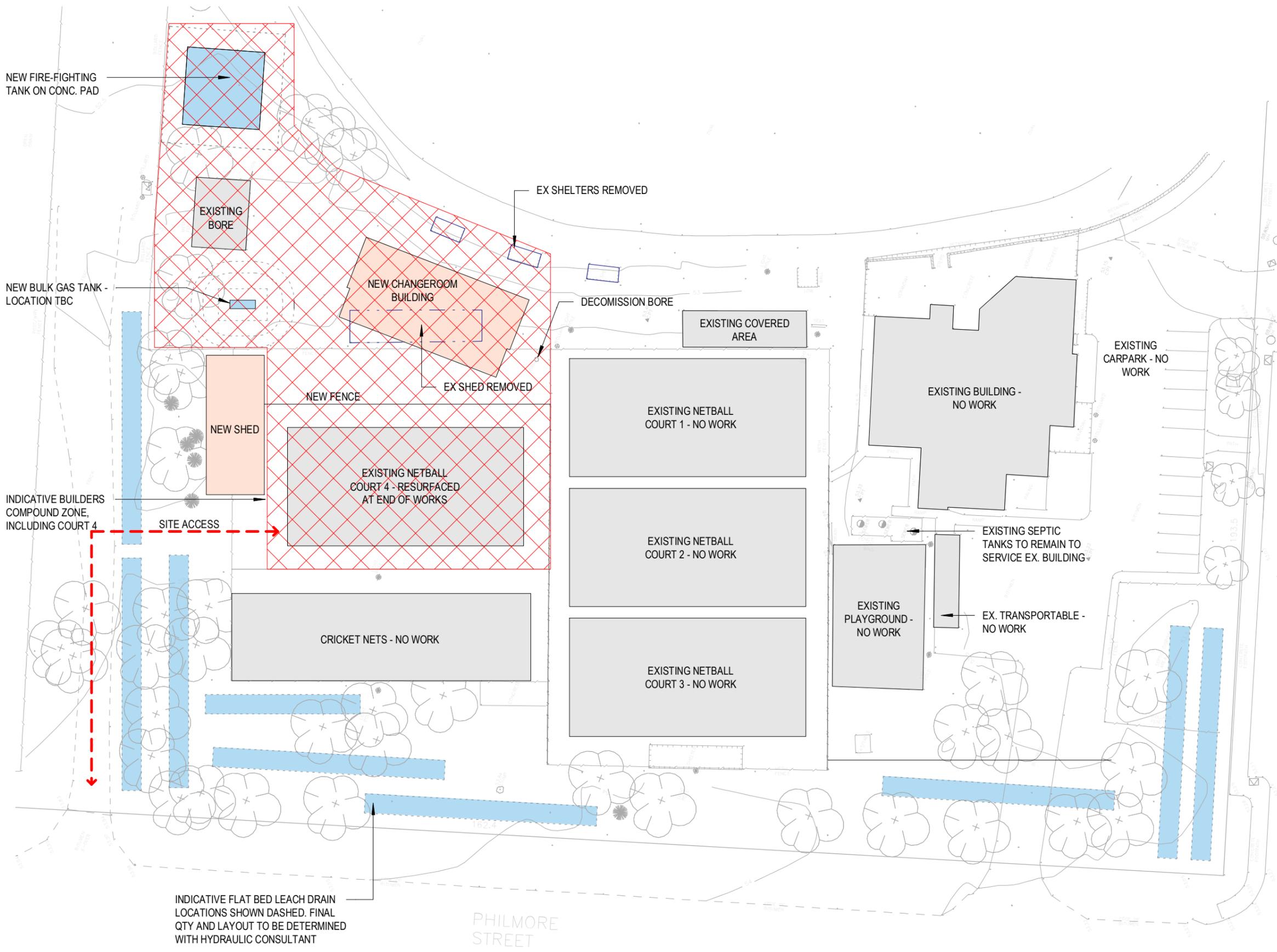
CARRIED UNANIMOUSLY 7 / 0

MOTION / COUNCIL RESOLUTION 130222

Moved Cr King, seconded Cr Ross

That Council resume standing orders at 7.54pm

CARRIED UNANIMOUSLY 7 / 0



**FORWARD WORKS BY SHIRE**

- CONSTRUCT NEW SHED
- DEMOLISH EXISTING SHED
- DEMOLISH EXISTING OVAL SHELTERS

**SITE ACCESS**

- CONTRACTORS SITE COMPOUND TO INCLUDE EX. NETBALL COURT 4
- SITE ACCESS OFF PHILMORE STREET VIA ACCESS ROAD
- EXISTING HALL, CARPARK, PLAYGROUND, 3 X NETBALL COURTS AND CRICKET NETS TO REMAIN ACCESSIBLE TO CLUBS AND PUBLIC
- EXISTING COVERED AREA TO REMAIN

**MAIN BUILDING WORKS**

- CONSTRUCT NEW CHANGEROOM BUILDING, INCLUDING AN INCREASE IN CURRENTLY PROPOSED COVERED AREAS TO FRONT AND SIDE OF BUILDING
- DEMOLISH HARDSTAND AREA ADJACENT TO COURT 4 AND CONSTRUCT NEW FENCE

**SITE SERVICES**

- INSTALL NEW FLAT BED LEACH DRAINS AND ATU SYSTEM.
- NOTE: CURRENT SYSTEM TO REMAIN TO SERVICE EXISTING BUILDING
- INSTALL WATER TANK
- INSTALL BULK GAS TANK
- ELECTRICAL UPGRADES INCLUDING PROVISION FOR FUTURE NETBALL COURT LIGHTING REPLACEMENT

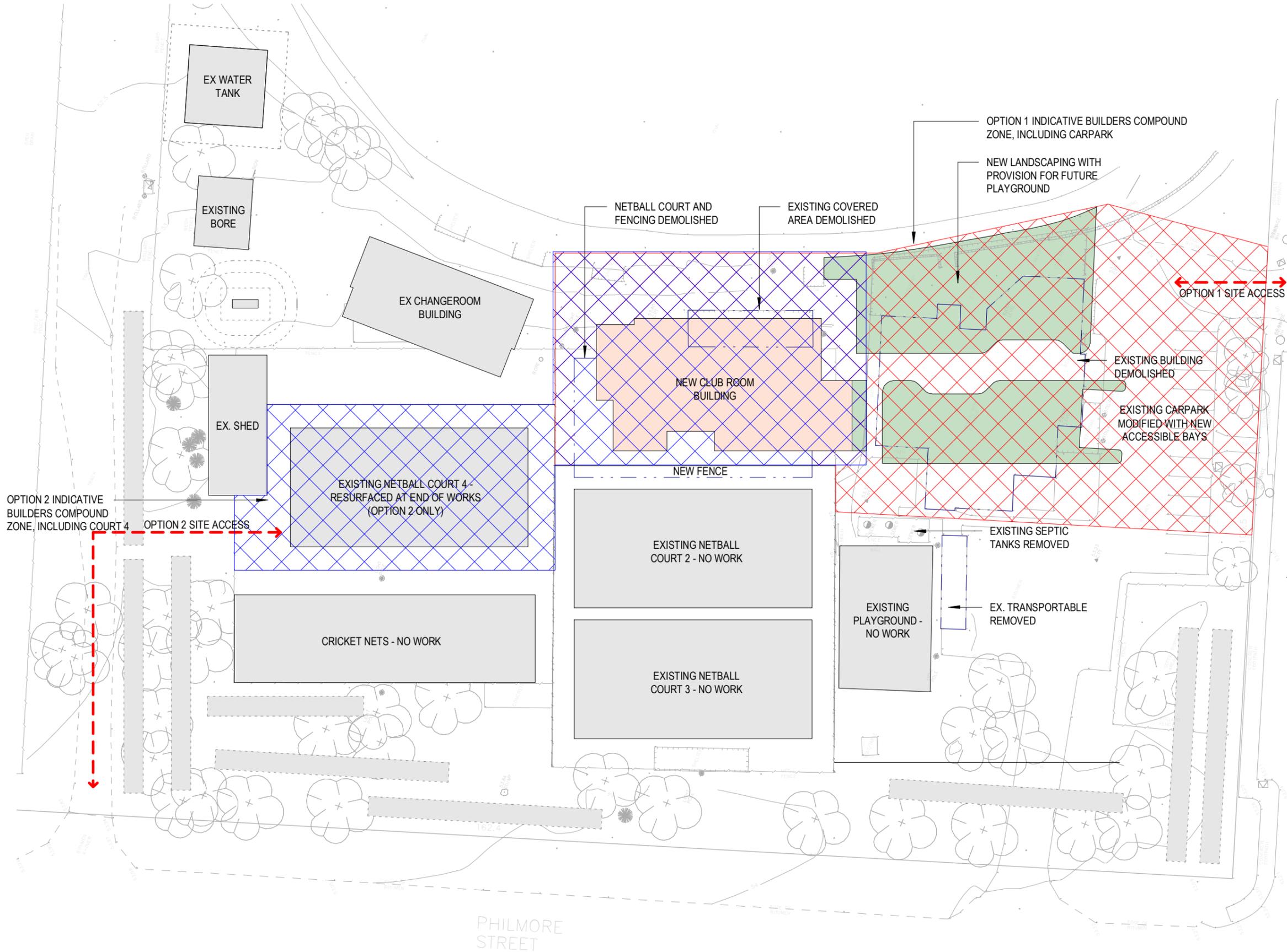
**SITE MAKE GOOD WORKS**

- RESURFACE COURT 4 AT COMPLETION OF WORKS, TO BASIC LEVEL ONLY NOT FULL NETBALL COMPETITION STANDARD
- NOTE: ALSO REFER TO OPTIONAL SCENARIO FOR STAGE 2. RE-SURFACING MAY BE HELD OFF UNTIL END OF STAGE 2

**CONSULTANT SCOPE**

- FULLY DOCUMENT 2 X TENDER PACKAGES (STAGE 1 AND STAGE 2).
- \* **ADDITIONAL CONSULTANT DOCUMENTATION FEES REQUIRED**
- CDC FOR STAGE 1 WORKS ONLY

INDICATIVE FLAT BED LEACH DRAIN LOCATIONS SHOWN DASHED. FINAL QTY AND LAYOUT TO BE DETERMINED WITH HYDRAULIC CONSULTANT



**FORWARD WORKS BY SHIRE**  
 - DEMOLISH EXISTING COVERED AREA  
 - DEMOLISH 1 X NETBALL COURT AND FENCING  
 - NEW NETBALL COURT FENCE  
 - REMOVE TRANSPORTABLE AT END OF STAGE

**SITE ACCESS**  
**OPTION 1:**  
 - SITE ACCESS OFF ARCHIBALD STREET  
 - NEW CHANGEROOM BUILDING, PLAYGROUND, 3 X NETBALL COURTS AND CRICKET NETS TO REMAIN ACCESSIBLE TO CLUBS AND PUBLIC  
 \*NOTE COURT 4 WOULD REQUIRE RESURFACING AT END OF STAGE 1 FOR THIS SCENARIO  
 - NO PUBLIC PARKING AVAILABLE ON SITE  
 - EXISTING BUILDING DEMOLISHED AT START OF WORKS

**OPTION 2:**  
 - CONTRACTORS SITE COMPOUND TO INCLUDE EX. COURT 4  
 - SITE ACCESS OFF PHILMORE STREET VIA ACCESS ROAD  
 - NEW CHANGEROOMS, CARPARK, PLAYGROUND, 2 X NETBALL COURTS AND CRICKET NETS TO REMAIN ACCESSIBLE TO CLUBS AND PUBLIC

**MAIN BUILDING WORKS**  
 - CONSTRUCT NEW CLUBROOM BUILDING AND COVERED VIEWING AREAS  
 - DEMOLISH EXISTING BUILDING. OPTION 1 @ START OF WORKS, OPTION 2 @ END OF WORKS

**SITE SERVICES**  
 - REMOVE EXISTING SEPTIC TANKS

**SITE MAKE GOOD WORKS**  
 - RESURFACE COURT 4 AT COMPLETION OF WORKS - IN OPTION 2 SCENARIO ONLY. OPTION 1 SCENARIO RESURFACING DONE AT END OF STAGE 1

**CONSULTANT SCOPE**  
 - UPDATES TO STAGE 2 DOCUMENTS FOR TENDER  
 - ADDITIONAL CDC AND CCC REQUIRED  
 \* **ADDITIONAL CONSULTANT DOCUMENTATION FEES REQUIRED**

FORWARD WORKS BY SHIRE

- CONSTRUCT NEW PLAYGROUND
- DEMOLISH EXISTING PLAYGROUND

SITE ACCESS

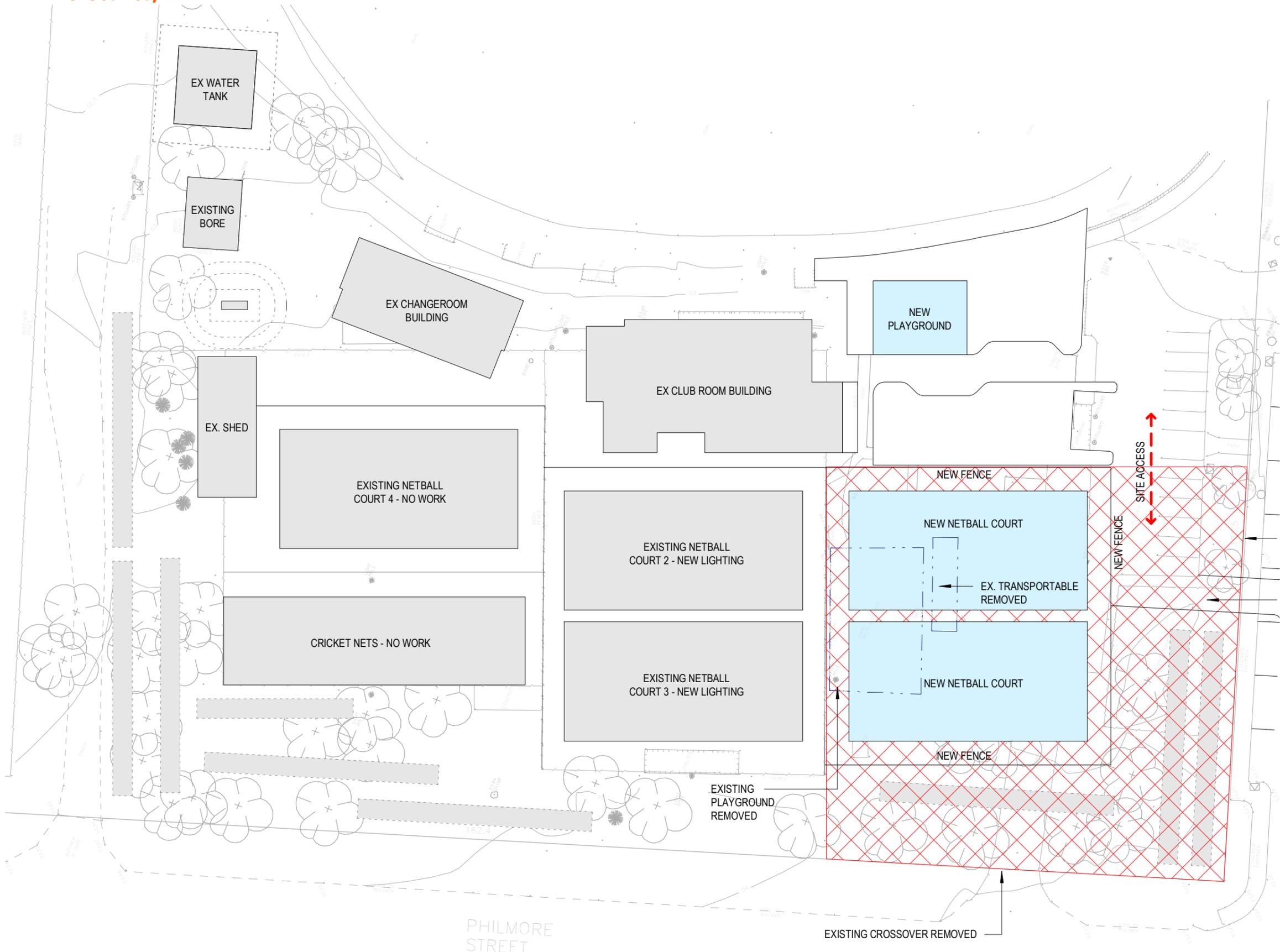
- SITE ACCESS OFF ARCHIBALD STREET
- NEW CHANGEROOM AND CLUB ROOM BUILDING, 3 X NETBALL COURTS AND CRICKET NETS TO REMAIN ACCESSIBLE TO CLUBS AND PUBLIC
- REDUCED PUBLIC PARKING AVAILABLE ON SITE

MAIN BUILDING WORKS

- CONSTRUCT 2 x NEW COURTS AND ASSOCIATED FENCING AND LIGHTING
- UPGRADE LIGHTING TO 2 x EXISTING COURTS
- MODIFY EXISTING CARPARK INCLUDING CROSSOVERS AND STREET PARKING

CONSULTANT SCOPE

- DOCUMENTATION OF NEW COURTS AND ASSOCIATED CIVIL WORKS



# Schematic Design Cost Estimate Report

## Muceha Recreation Centre



PROJECT NO.:	71930.100389
AUTHORISED BY:	Sharon Yap
DOCUMENT TITLE:	Schematic Design Cost Estimate Report (rev 3)
ISSUE DATE:	27 January 2022

**ISSUE REGISTER**

Version	Issue Date	Details	Prepared by	Checked by	Authorised by
0	28 Oct 2021	Schematic Design Cost Report	Teresa Wong	Louise Butler	Sharon Yap
1	22 Dec 2021	Added 3 design options	Sharon Yap	Louise Butler	Sharon Yap
2	26 Jan 2022	Draft issue for 3 stages	Sharon Yap	Louise Butler	Sharon Yap
3	27 Jan 2022	Final issue	Sharon Yap	Louise Butler	Sharon Yap

**DISTRIBUTION**

Company	Name	Sent via
Site Architecture Studio	Stephen Hart / Naomi McCabe	Email

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## 1. EXECUTIVE SUMMARY

Altus Group (hereinafter “AG”) have been commissioned to provide a schematic design cost plan for Muchea Recreation Centre redevelopment works. The objective of this cost plan is to provide an estimated cost for the works divided into 3 stages as detailed below:

### Stage 1

Comprises the new change room, replace the existing machinery storage shed and all necessary ancillary works to enable future stages such as ATU systems.

### Stage 2

Comprises a new club room over the existing netball court, resurface court 4 and retaining the existing hall until the completion of build.

### Stage 3

Comprises a new fourth netball court (in a 2 x 2 configuration) with lighting, refurbish the remaining netball courts and modify existing carpark with new cross-over

The estimated cost for all stages is tabulated below:

No	Stage 1	Total Amount (Ex-GST)	No	Stage 2	Total Amount (Ex-GST)	No	Stage 3	Total Amount (Ex-GST)
1	Changing Room	\$773,520	1	Community Centre	\$1,351,870	1	2 new courts and refurbish 2 existing court	\$994,605
2	Breakout and Viewing Area	\$29,770	2	Breakout and Viewing Area	\$161,580	2	Modify existing carpark and new crossover	\$31,630
3	External Services	\$267,990	3	Resurface Court 4	\$52,190			
4	<b>Total Construction Cost - Stage 1</b>	<b>\$1,071,280</b>	4	<b>Total Construction Cost - Stage 2</b>	<b>\$1,513,450</b>	4	<b>Total Construction Cost - Stage 3</b>	<b>\$1,026,235</b>
5	Contingency	\$92,930	5	Contingency	\$131,290	5	Contingency	\$89,030
6	Professional Fees	\$123,018	6	Professional Fees	\$159,681	6	Professional Fees	\$25,000
7	Escalation	\$39,400	7	Escalation	\$115,050	7	Escalation	\$127,840
8	<b>TOTAL STAGE 1 - WORKS (A)</b>	<b>\$1,326,628</b>	8	<b>TOTAL STAGE 2 - WORKS (C)</b>	<b>\$1,971,661</b>	8	<b>TOTAL STAGE 3 - WORKS (E)</b>	<b>\$1,268,105</b>
	<b>Stage 1 - Below the Line</b>			<b>Stage 2 - Below the Line</b>			<b>Stage 3 - Below the Line</b>	
9	Fire Fighting and Hardstand	\$28,400	9	Demolition works	\$115,165	9	Demolish Existing Playground	\$12,850
10	New Shed	\$41,430	10	New Netball Court Fence	\$9,015	8	New Playground	\$85,830
11	Demolition works	\$33,190	11	Remove transportable	\$3,930			
			12	New Landscaping & Irrigation	\$50,196			
	<b>TOTAL STAGE 1 - BELOW LINE ITEM</b>	<b>\$103,020</b>		<b>TOTAL STAGE 2 - BELOW LINE ITEM</b>	<b>\$178,306</b>		<b>TOTAL STAGE 3 - BELOW LINE ITEM</b>	<b>\$98,680</b>
	<b>TOTAL STAGE 1 - WORKS (A) + BELOW LINE ITEM (B)</b>	<b>\$1,429,648</b>		<b>TOTAL STAGE 2 - WORKS (C) + BELOW LINE ITEM (D)</b>	<b>\$2,149,967</b>		<b>TOTAL STAGE 3 - WORKS (E) + BELOW LINE ITEM (F)</b>	<b>\$1,366,785</b>

## 2. EXCLUSIONS

- GST
- Public Art
- Commissioning, relocation costs and disbursements

### ASSUMPTIONS

- Assumed full height wall tiles to Toilets, Amenities room, Changerooms and Umpires room
- Assumed trowel concrete finish to Breakout and viewing area
- Assumed solid timber core door to external door
- Assumed 1 no. Entrance mat at Building 2
- Allowed 12% for the Builder's Preliminaries and Margin
- Allowed Design Contingency calculated based on 3.5% of Estimated Construction Cost
- Allowed Construction Contingency calculated based on 5% of Estimated Construction Cost

### 3. COST PLAN BREAKDOWN AND DETAILS

## Cost Plan Summary

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Total
	<b><u>STAGE 1 - BUILD THE NEW CHANGE ROOM, REPLACE THE EXISTING MACHINERY STORAGE SHED AND DO ALL NECESSARY ANCILLARY WORKS TO ENABLE FUTURE STAGES SUCH AS ATU SYSTEMS.</u></b>				
1	Changing Room	223	m2	3,468.70	773,520
2	Breakout and Viewing Area	177	m2	167.97	29,770
3	External Services	400	m2	669.59	267,990
	<b>Total Construction Cost - Stage 1</b>				<b>1,071,280</b>
4	Contingency				92,930
5	Professional Fees				123,018
6	Escalation				39,400
	<b>TOTAL STAGE 1 - WORKS (A)</b>				<b>1,326,628</b>
	<b>Stage 1 - Below the Line</b>				
7	Fire Fighting and Hardstand				28,400
8	New Shed				41,430
9	Demolition works				33,190
	<b>TOTAL STAGE 1 - BELOW LINE ITEM (B)</b>				<b>103,020</b>
	<b><u>TOTAL STAGE 1 - WORKS (A) + BELOW LINE ITEM (B)</u></b>				<b><u>1,429,648</u></b>
	<b><u>STAGE 2 - BUILD THE PROPOSED NEW CLUB ROOM OVER THE EXISTING NETBALL COURT, RETAINING THE EXISTING HALL UNTIL THE COMPLETION OF BUILD.</u></b>				
10	Community Centre	465	m2	2,907.25	1,351,870
11	Breakout and Viewing Area	494	m2	327.06	161,580
12	Resurface Court 4	466	m2	112.00	52,190
	<b>Total Construction Cost - Stage 2</b>				<b>1,513,450</b>
13	Contingency				131,290
14	Professional Fees				159,681
15	Escalation				115,050
	<b>TOTAL STAGE 2 - WORKS (C)</b>				<b>1,971,661</b>
	<b>Stage 2 - Below the Line</b>				
16	Demolition works				115,165
17	New Netball Court Fence				9,015
18	Remove transportable				3,930
19	New Landscaping & Irrigation				50,196
	<b>TOTAL STAGE 2 - BELOW LINE ITEM (D)</b>				<b>178,306</b>
	<b><u>TOTAL STAGE 2 - WORKS (C) + BELOW LINE ITEM (D)</u></b>				<b><u>2,149,967</u></b>

## Cost Plan Summary

**Project:** Site Architecture Studio  
**Building:** Muehea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Total
	<b><u>STAGE 3 - BUILD A NEW FOURTH NETBALL COURT (IN A 2 X 2 CONFIGURATION) WITH LIGHTING, REFURBISH THE REMAINING NETBALL COURTS</u></b>				
20	2 new courts and new court lighting , refurbish 2 existing court and lighting,and new fence	2,327	m2	427.42	994,605
21	Modify existing carpark and new crossover	216	m2	146.52	31,630
	<b>Total Construction Cost - Stage 3</b>				<b>1,026,235</b>
22	Contingency				89,030
23	Professional Fees				25,000
24	Escalation				127,840
	<b>TOTAL STAGE 3 - WORKS (E)</b>				<b>1,268,105</b>
	<b>Stage 3 - Below the Line</b>				
25	Demolish Existing Playground				12,850
26	New Playground				85,830
	<b>TOTAL STAGE 3 - BELOW LINE ITEM (F)</b>				<b>98,680</b>
	<b><u>TOTAL STAGE 3 - WORKS (E) + BELOW LINE ITEM (F)</u></b>				<b><u>1,366,785</u></b>
	<b><u>EXCLUSION</u></b>				
27	GST				
28	Public Art				
29	Commissioning, relocation costs & disbursements				

## Cost Plan Details Breakdown

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 Changing Room</b>							
<b>1.1 Substructure</b>							
1.1.1	Allowance for concrete slab and thickening including excavation, formwork and reinforcement	223.14	m2	140.00	31,240		31,240
<b>1</b>	<b>Substructure</b>						<b>31,240</b>
<b>1.2 Columns</b>							
1.2.1	C1 - 89x89x5SHS	0.79	t	9,000.00	7,110		7,110
1.2.2	Allowance for base plate with bolts	17	No	100.00	1,700		1,700
1.2.3	Allowance for loose fittings and connection (15%)	0.12	t	9,000.00	1,067		1,067
1.2.4	Allowance for steel treatment	0.91	t	1,000.00	909		909
<b>2</b>	<b>Columns</b>						<b>10,785</b>
<b>1.3 Roof</b>							
1.3.1	Roof framing						
1.3.2	B2 - 150x150x6SHS	0.59	t	9,000.00	5,310		5,310
1.3.3	BR1 - 101x3.2CHS	0.23	t	9,000.00	2,070		2,070
1.3.4	Outrigger 150x100x4RHS	0.11	t	9,000.00	990		990
1.3.5	R1 - 200UB25	0.52	t	9,000.00	4,680		4,680
1.3.6	R2 - 150PFC	0.64	t	9,000.00	5,760		5,760
1.3.7	WB1 - 89x89x5SHS	0.38	t	9,000.00	3,420		3,420
1.3.8	WH1 - 89x89x5SHS	0.52	t	9,000.00	4,680		4,680
1.3.9	WH2 - 150x100x4RHS	0.62	t	9,000.00	5,580		5,580
1.3.10	Allow 15% for loose fitting and connection	0.54	t	9,000.00	4,874		4,874
1.3.11	Allow for surface treatment	3.61	t	1,000.00	3,610		3,610
1.3.12	Allow for bridging and purlins	529	m	25.00	13,231		13,231
1.3.13	Roof covering						
1.3.14	Metal roof covering (assumed Corrugated sheet)	314	m2	60.00	18,840		18,840
1.3.15	Allowance for insulation	314	m2	15.00	4,710		4,710
1.3.16	Miscellaneous						
1.3.17	Roof flashing and drainage	314	m2	40.00	12,560		12,560
<b>3</b>	<b>Roof</b>						<b>90,315</b>
<b>1.4 External Wall</b>							
1.4.1	Allow for lightweight wall including metal cladding and framing	143.69	m2	450.00	64,661		64,661
1.4.2	Allow for lightweight wall including pre-finish FC board and framing	111.33	m2	260.00	28,946		28,946
<b>4</b>	<b>External Wall</b>						<b>93,606</b>

## Cost Plan Details Breakdown

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 Changing Room (Continued)</b>							
<b>1.5 External Door</b>							
1.5.1	Single solid timber door including frame, hardware and painting	8	No	1,700.00	13,600		13,600
1.5.2	Double metal door including frame and hardware	2	No	2,000.00	4,000		4,000
1.5.3	Allow for door signage	10	No	150.00	1,500		1,500
<b>5</b>	<b>External Door</b>						<b>19,100</b>
<b>1.6 Window</b>							
1.6.1	Allowance for window	7	m2	650.00	4,550		4,550
<b>6</b>	<b>Window</b>						<b>4,550</b>
<b>1.7 Internal Screen and Borrow Light</b>							
1.7.1	Toilet cubicle / shower partition including door and hardware	16	No	1,500.00	24,000		24,000
1.7.2	Toilet cubicle door including hardware	4	No	500.00	2,000		2,000
<b>7</b>	<b>Internal Screen and Borrow Light</b>						<b>26,000</b>
<b>1.8 Internal Wall</b>							
1.8.1	Moisture resistance plasterboard both sides on steel stud framing including insulation	133	m2	180.00	23,953		23,953
1.8.2	Plasterboard both sides on steel stud framing including insulation	21	m2	145.00	3,025		3,025
1.8.3	1 layer plasterboard and 1 layer moisture resistance plasterboard each side on steel stud framing including insulation	182	m2	170.00	30,857		30,857
1.8.4	Moisture resistance plasterboard bulkhead (above 3.5m height)	16	m2	185.00	2,917		2,917
<b>8</b>	<b>Internal Wall</b>						<b>60,751</b>
<b>1.9 Internal Door</b>							
1.9.1	Single solid door including frame, hardware and paint finish	5	No	1,525.00	7,625		7,625
<b>9</b>	<b>Internal Door</b>						<b>7,625</b>
<b>1.10 Wall Finishes</b>							
1.10.1	Allow selected wall tiles including waterproofing	202.01	m2	135.00	27,271		27,271
1.10.2	Allowance for splashback to First Aid room	1	Sum	600.00	600		600
1.10.3	Painting to wall	460.36	m2	20.00	9,207		9,207
<b>10</b>	<b>Wall Finishes</b>						<b>37,079</b>
<b>1.11 Floor Finishes</b>							
1.11.1	Allow fully vitrified ceramic floor tile, R12 slip resistance rating	62.99	m2	135.00	8,504		8,504

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 Changing Room (Continued)</b>							
<b>1.11 Floor Finishes (Continued)</b>							
1.11.2	Fully ceramic skirting tile, 150mm high	218	m	50.00	10,921		10,921
1.11.3	Allowance for waterproofing	63	m2	INCL	0		0
1.11.4	Linear drain	8	m	250.00	2,043		2,043
1.11.5	Sealed concrete flooring	152	m2	40.00	6,070		6,070
1.11.6	Allow for Vinyl flooring to First Aid including moisture resistant	9	m2	120.00	1,080		1,080
1.11.7	Allowance for coved skirting	9	m2	35.00	315		315
<b>11</b>	<b>Floor Finishes</b>						<b>28,931</b>
<b>1.12 Ceiling Finishes</b>							
1.12.1	Flushed plasterboard suspended ceiling including paint	49.39	m2	95.00	4,692		4,692
1.12.2	Moisture resistant plasterboard suspended ceiling including paint	173.75	m2	105.00	18,244		18,244
1.12.3	Soffit lining paint finish	52	m2	120.00	6,276		6,276
1.12.4	Allowance for shadowline angle trim	266	m	5.00	1,331		1,331
1.12.5	Allowance for access panel	1	Sum	1,200.00	1,200		1,200
<b>12</b>	<b>Ceiling Finishes</b>						<b>31,743</b>
<b>1.13 Sanitaryware and fitments</b>							
1.13.1	<u>Built in joinery</u>						
1.13.2	Timber slat seat including clothes rail hook	53.95	m	300.00	16,185		16,185
1.13.3	No allowance for locker						Excluded
1.13.4	Allow built in vanity bench with cabinet at First Aid	2.70	m	750.00	2,025		2,025
1.13.5	<u>Changeroom/Umpire/Amenities</u>						
1.13.6	Toilet roll holder	10	No	100.00	1,000		1,000
1.13.7	Soap dispenser	10	No	150.00	1,500		1,500
1.13.8	Paper towel dispenser	10	No	200.00	2,000		2,000
1.13.9	Mirror	10	No	350.00	3,500		3,500
1.13.10	Grabrail set	6	No	500.00	3,000		3,000
1.13.11	Coat hook	32	No	30.00	960		960
1.13.12	Shelf	2	No	350.00	700		700
1.13.13	<u>First Aid</u>						
1.13.14	Soap dispenser	1	No	150.00	150		150
1.13.15	Paper Towel dispenser	1	No	200.00	200		200
1.13.16	Mirror	1	No	350.00	350		350
1.13.17	Coat hook	2	No	30.00	60		60

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**1 Changing Room****(Continued)****1.13 Sanitaryware and fitments****(Continued)**

1.13.18	<u>Sanitary fixtures</u>						
1.13.19	Water cistern	10	No		0		Incl in Hydraulic services
1.13.20	Shower rose	10	No		0		Incl in Hydraulic services
1.13.21	Wall basin	10	No		0		Incl in Hydraulic services
1.13.22	First aid basin	1	No		0		Incl in Hydraulic services
1.13.23	Cleaner trough	1	No		0		Incl in Hydraulic services
1.13.24	<u>Miscellaneous</u>						
1.13.25	Allowance for fire extinguisher and blanket	1	Sum	500.00	500		500
<b>13</b>	<b><u>Sanitaryware and fitments</u></b>						<b><u>32,130</u></b>

**1.14 Hydraulics Services**

1.14.1	<u>Allowance for hydraulics services (based on Hydraulic consultant's est. dated 20/10/21)</u>						
1.14.2	- Fixtures and tapware	1	Sum	32,597.50	32,598		32,598
1.14.3	- Property sewer, wastes and vents	1	Sum	7,605.00	7,605		7,605
1.14.4	- Cold water services	1	Sum	4,095.00	4,095		4,095
1.14.5	- Hotwater services and units	1	Sum	15,600.00	15,600		15,600
1.14.6	- LP Gas services	1	Sum	6,337.50	6,338		6,338
1.14.7	- Grease trap	1	Sum	9,750.00	9,750		9,750
1.14.8	- Mechanical drainage	1	Sum	1,950.00	1,950		1,950
1.14.9	Allowance for builder's work	1	Sum	3,900.00	3,900		3,900
<b>14</b>	<b><u>Hydraulics Services</u></b>						<b><u>81,835</u></b>

**1.15 Electrical Services**

1.15.1	Based on Electrical estimate dated 15/10/21	1	Sum	76,400.58	76,401		76,401
<b>15</b>	<b><u>Electrical Services</u></b>						<b><u>76,401</u></b>

**1.16 Mechanical Services**

1.16.1	Based on Mech estimate dated 15/10/21	1	Sum	58,519.59	58,520		58,520
<b>16</b>	<b><u>Mechanical Services</u></b>						<b><u>58,520</u></b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**1 Changing Room**

*(Continued)*

**1.17 Builder's Prelim & Margin**

1.17.1	Builder's Prelim & Margin	12.0	%	690,620.00	82,900		82,900
<b>17</b>	<b>Builder's Prelim &amp; Margin</b>						<b>82,900</b>
<b>1</b>	<b>Changing Room</b>						<b>773,510</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**2 Breakout and Viewing Area**

**2.1 Breakout & Viewing Covered Area**

2.1.1	Allowance for concrete slab including excavation, formwork and reinforcement	177.23	m2	140.00	24,812		24,812
2.1.2	Allow for trowel concrete finish	177.23	m2	10.00	1,772		1,772
	<b><u>Builder's Prelim &amp; Margin</u></b>						
2.1.3	Prelim & Margin	12	%	26,584.50	3,190		3,190
<b>1</b>	<b><u>Breakout &amp; Viewing Covered Area</u></b>						<b><u>29,775</u></b>
<b>2</b>	<b>Breakout and Viewing Area</b>						<b>29,775</b>

**Project:** Site Architecture Studio  
**Building:** Mueha Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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### 3 External Services

#### 3.1 External Services

3.1.1	<u>Water Treatment Works</u>						
3.1.2	Aquarius 18KL ATU and flatbed leach drains	1	Sum	132,800.00	132,800		132,800
3.1.3	RO, filtration and storage tank with chlorine dosing	1	Sum	56,480.00	56,480		56,480
3.1.4	<u>Electrical</u>						
3.1.5	Building main switchboard for the new clubroom	1	Sum	15,000.00	15,000		15,000
3.1.6	Building main switchboard for the new changeroom	1	Sum	5,000.00	5,000		5,000
3.1.7	Submain cabling for the new buildings	1	Sum	10,000.00	10,000		10,000
3.1.8	Underground trenching and conduits	1	Sum	15,000.00	15,000		15,000
3.1.9	Relocation of the Telstra lead in, including underground trenching and conduits	1	Sum	5,000.00	5,000		5,000
3.1.10	Netball Lighting				Excl		0
3.1.11	SMSB works				Excl		0
	<b><u>Builder's Prelim &amp; Margin</u></b>						
3.1.12	Prelim & Margin	12	%	239,280.00	28,710		28,710
<b>1</b>	<b><u>External Services</u></b>						<b>267,990</b>
<b>3</b>	<b>External Services</b>						<b>267,990</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**4 Contingency**

**4.1 Design Contingency**

4.1.1	Design Contingency	3.5	%	1,071,280.00	37,490		37,490
<b>1</b>	<b>Design Contingency</b>						<b>37,490</b>

**4.2 Construction Contingency**

4.2.1	Construction Contingency	5	%	1,108,770.00	55,440		55,440
<b>2</b>	<b>Construction Contingency</b>						<b>55,440</b>
<b>4</b>	<b>Contingency</b>						<b>92,930</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**5 Professional Fees**

**5.1 Professional Fee**

5.1.1	Professional Fee	1	Sum	109,520.00	109,520		109,520
5.1.2	Additional Fee for stage 1 as per Site Email dated 26/01/2022	1	Sum	13,498.00	13,498		13,498
<b>1</b>	<b><u>Professional Fee</u></b>						<b><u>123,018</u></b>
<b>5</b>	<b>Professional Fees</b>						<b>123,018</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**6 Escalation**

**6.1 Escalation**

6.1.1	<u>Escalation</u>				0		0
6.1.2	Current Index Jan 2022	204					
6.1.3	Index in June 2022	211					
6.1.4	Escalation	3.7	%	1,071,280.00	39,400		39,400
<b>1</b>	<b><u>Escalation</u></b>						<b><u>39,400</u></b>
<b>6</b>	<b>Escalation</b>						<b>39,400</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**7 New Shed**

**7.1 New Machinery Shed**

7.1.1	New machinery shed	90	m2	303.88	27,350		27,350
7.1.2	Builder's prelim & margin	12	%	27,349.50	3,280		3,280
<b>1</b>	<b><u>New Machinery Shed</u></b>						<b>30,630</b>
<b>7</b>	<b>New Shed</b>						<b>41,430</b>

## Cost Plan Details Breakdown

**Project:** Site Architecture Studio  
**Building:** Mucua Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**8 Community Centre****8.1 Substructure**

8.1.1	Allowance for concrete slab and thickening including excavation, formwork and reinforcement	465	m2	140.00	65,031		65,031
<b>1</b>	<b>Substructure</b>						<b>65,031</b>

**8.2 Columns**

<b>Steel Columns</b>							
8.2.1	C1 - 89 x 89 x 5.0 SHA	1.02	t	9,000.00	9,180		9,180
8.2.2	C2 - 150 x 150 x 5.0 SHS	0.32	t	9,000.00	2,880		2,880
8.2.3	C3 - 150 x 100 x 6.0 RHS	0.48	t	9,000.00	4,320		4,320
8.2.4	Baseplate	33	No	100.00	3,300		3,300
8.2.5	Allowance for loose and attached connection	0.27	t	9,000.00	2,457		2,457
8.2.6	Allowance for surface treatment	2.09	t	1,000.00	2,093		2,093
<b>2</b>	<b>Columns</b>						<b>24,230</b>

**8.3 Roof**

<b>Roof Steel Structure</b>							
8.3.1	B1 - 89x89x5.0 SHS	0.18	t	9,000.00	1,620		1,620
8.3.2	B2 - 150x150x5.0 SHS	N/A	t	9,000.00	0		0
8.3.3	B3 - 150x100x6.0 RHS	0.78	t	9,000.00	7,020		7,020
8.3.4	R1 - 200UB25	N/A	t	9,000.00	0		0
8.3.5	R2 - 150 PFC	1.43	t	9,000.00	12,870		12,870
8.3.6	BR1 - 101x3.2 CHS	0.51	t	9,000.00	4,590		4,590
8.3.7	BR2 - 139x3.5 CHS	0.68	t	9,000.00	6,120		6,120
8.3.8	BR3 - 75x75x8 EA	0.14	t	9,000.00	1,260		1,260
8.3.9	WB1 - 89x89x5.0 SHS	N/A	t	9,000.00	0		0
8.3.10	WH1 - 89x89x5.0 SHS	0.71	t	9,000.00	6,390		6,390
8.3.11	<b>Truss</b>						
8.3.12	T1 - 150x100x4.0 Horizontal Top	0.34	t	11,000.00	3,740		3,740
8.3.13	T1 - 100x100x4.0 Horizontal Bottom	0.27	t	11,000.00	2,970		2,970
8.3.14	T1 - 75x50x4.0 RHS Diagonal and Vertical	0.60	t	11,000.00	6,600		6,600
8.3.15	T2 - 100x100x4.0 Horizontal Top	0.24	t	11,000.00	2,640		2,640
8.3.16	T2- 200 PFC	0.48	t	11,000.00	5,280		5,280
8.3.17	T2 - 75x50x4.0 RHS Diagonal and Vertical	0.50	t	11,000.00	5,500		5,500
8.3.18	FR1 - 100x100x4.0 Horizontal Top	0.38	t	11,000.00	4,180		4,180
8.3.19	FR1 - 100x100x4.0 Horizontal Bottom	0.38	t	11,000.00	4,180		4,180

## Cost Plan Details Breakdown

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>8 Community Centre (Continued)</b>							
<b>8.3 Roof (Continued)</b>							
8.3.20	FR1 - 75x50x4.0 RHS Diagonal and Vertical	0.85	t	11,000.00	9,350		9,350
8.3.21	<u>Miscellaneous</u>						
8.3.22	Loose and attached connection	1.27	t	9,000.00	11,435		11,435
8.3.23	Surface treatment	9.74	t	1,000.00	9,741		9,741
8.3.24	<u>Purlin</u>						
8.3.25	B2-Purlin 200x100x4.0 RHS	96	m	90.00	8,640		8,640
8.3.26	B2-Purlin 20019_1000CC	263	m	18.00	4,734		4,734
8.3.27	B2-Purlin Z15019_1000cc	279	m	15.00	4,185		4,185
8.3.28	Allow roof steel structure for link roof	71	m2	150.00	10,650		10,650
8.3.29	<u>Roof Covering</u>						
8.3.30	Metal roof covering (assumed Corrugated sheet)	735	m2	55.00	40,425		40,425
8.3.31	Allowance for insulation	735	m2	15.00	11,025		11,025
8.3.32	Roof flashing and drainage	735	m2	40.00	29,400		29,400
<b>3</b>	<b>Roof</b>						<b>214,544</b>
<b>8.4 External Wall</b>							
8.4.1	Allow for lightweight wall including metal cladding and framing	257.77	m2	450.00	115,997		115,997
8.4.2	Allow for fixed glazed wall	104.69	m2	650.00	68,049		68,049
8.4.3	Allow for lightweight wall including pre-finish FC board and framing	54.78	m2	260.00	14,243		14,243
<b>4</b>	<b>External Wall</b>						<b>198,288</b>
<b>8.5 External Door</b>							
8.5.1	Single solid timber door including frame, hardware and painting	3	No	1,700.00	5,100		5,100
8.5.2	Double metal door including frame and hardware	1	No	2,000.00	2,000		2,000
8.5.3	Extra over double door including frame and hardware	5	No	1,476.00	7,380		7,380
8.5.4	Allow for door signage	2	No	150.00	300		300
<b>5</b>	<b>External Door</b>						<b>14,780</b>
<b>8.6 Window</b>							
8.6.1	Allowance for window	6	m2	650.00	3,900		3,900
<b>6</b>	<b>Window</b>						<b>3,900</b>
<b>8.7 Internal Screen and Borrow Light</b>							
8.7.1	Toilet partition including door and hardware	3	No	1,500.00	4,500		4,500

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>8 Community Centre (Continued)</b>							
<b>8.7 Internal Screen and Borrow Light (Continued)</b>							
8.7.2	Allow for operable wall	62	m2	1,200.00	74,664		74,664
<b>7</b>	<b>Internal Screen and Borrow Light</b>						<b>79,164</b>
<b>8.8 Internal Wall</b>							
8.8.1	Moisture resistance plasterboard both sides on steel stud framing including insulation	10.89	m2	180.00	1,960		1,960
8.8.2	Plasterboard both sides on steel stud framing including insulation	144.09	m2	145.00	20,893		20,893
8.8.3	1 layer plasterboard and 1 layer moisture resistance plasterboard each side on steel stud framing including insulation	113.04	m2	170.00	19,217		19,217
8.8.4	Allowance for bulkhead (above 3.5m)	35.84	m2	85.00	3,046		3,046
<b>8</b>	<b>Internal Wall</b>						<b>45,116</b>
<b>8.9 Internal Door</b>							
8.9.1	Single solid door including frame, hardware and paint finish	10	No	1,525.00	15,250		15,250
8.9.2	Allow for door signage	10	No	150.00	1,500		1,500
8.9.3	Allow roller shutter at Kitchen (assumed 2200x900mmH)	2	No	2,100.00	4,200		4,200
8.9.4	Allow roller shutter at Bar (assumed 2760x1500mmH)	3	No	2,500.00	7,500		7,500
8.9.5	Allow roller door at Judo and Furn store	2	No	3,000.00	6,000		6,000
<b>9</b>	<b>Internal Door</b>						<b>34,450</b>
<b>8.10 Wall Finishes</b>							
8.10.1	Allow selected wall tiles including waterproofing	110	m2	140.00	15,340		15,340
8.10.2	Allowance for splashback to Kitchen	1	Sum	2,800.00	2,800		2,800
8.10.3	Painting to wall	586	m2	15.00	8,784		8,784
<b>10</b>	<b>Wall Finishes</b>						<b>26,923</b>
<b>8.11 Floor Finishes</b>							
8.11.1	<u>Tile floor finish</u>						
8.11.2	Allow fully vitrified ceramic floor tile, R12 slip resistance rating	34	m2	135.00	4,554		4,554
8.11.3	Fully ceramic skirting tile, 150mm high	68	m	50.00	3,424		3,424
8.11.4	Allow for waterproofing	34	m2	INCL	0		0
8.11.5	<u>Vinyl floor finish</u>						
8.11.6	Allowance for Vinyl flooring	58	m2	80.00	4,627		4,627
8.11.7	Allowance for coved skirting	20	m2	35.00	707		707
8.11.8	Allow for moisture barrier underneath vinyl	58	m2	40.00	2,314		2,314

## Cost Plan Details Breakdown

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**8 Community Centre****(Continued)****8.11 Floor Finishes****(Continued)**

8.11.9	<u>Carpet floor finish</u>						
8.11.10	Allowance for carpet flooring	320	m2	55.00	17,617		17,617
8.11.11	Allowance for skirting	72	m	35.00	2,534		2,534
8.11.12	<u>Concrete floor</u>						
8.11.13	Sealed concrete flooring	36	m2	25.00	904		904
8.11.14	<u>Entrance Mats</u>						
8.11.15	Allow entrance mats at corridor	1	No	1,500.00	1,500		1,500
<b>11</b>	<b>Floor Finishes</b>						<b>38,180</b>

**8.12 Ceiling Finishes**

8.12.1	Perforated acoustic ceiling at Hall	251	m2	125.00	31,375		31,375
8.12.2	Flushed plasterboard suspended ceiling including paint	168	m2	100.00	16,774		16,774
8.12.3	Moisture resistant plasterboard suspended ceiling including paint	29	m2	110.00	3,229		3,229
8.12.4	Soffit lining paint finish	194	m2	120.00	23,263		23,263
8.12.5	Allowance for shadowline angle trim	287	m	5.00	1,437		1,437
8.12.6	Allowance for access panel	1	Sum	1,500.00	1,500		1,500
<b>12</b>	<b>Ceiling Finishes</b>						<b>77,578</b>

**8.13 Fitments**

8.13.1	<u>Built in joinery</u>						
8.13.2	Kitchenette bench with cabinet below	3	m	850.00	2,873		2,873
8.13.3	No allowance for Kitchen U shape bench with cabinet below						Excluded
8.13.4	No allowance for bar counter						Excluded
8.13.5	<u>Toilet</u>						
8.13.6	Toilet roll holder	6	No	100.00	600		600
8.13.7	Soap dispenser	5	No	150.00	750		750
8.13.8	Paper towel dispenser	5	No	200.00	1,000		1,000
8.13.9	Mirror	5	No	350.00	1,750		1,750
8.13.10	Grabrail set	1	No	500.00	500		500
8.13.11	Grab bar	2	No	150.00	300		300
8.13.12	Coat hook	6	No	30.00	180		180
8.13.13	Curtain track and curtain	1	No	700.00	700		700
8.13.14	Cistern backrest	1	No				Incl in Hydraulic services

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**8 Community Centre****(Continued)****8.13 Fitments****(Continued)**

8.13.15	Folding shower seat	1	No				Incl in Hydraulic services
8.13.16	<u>Sanitary fixtures</u>						
8.13.17	Water cistern	6	No				Incl in Hydraulic services
8.13.18	Shower rose	1	No				Incl in Hydraulic services
8.13.19	Wall basin	5	No				Incl in Hydraulic services
8.13.20	Kitchen sink	2	No				Incl in Hydraulic services
8.13.21	Kitchen hand basin	1	No				Incl in Hydraulic services
8.13.22	Urinal	2	No				Incl in Hydraulic services
<b>13</b>	<b><u>Fitments</u></b>						<b><u>8,653</u></b>

**8.14 Kitchen and Bar Cool Room**

8.14.1	<u>Cool room - Kitchen (PROVISIONAL)</u>						
8.14.2	Cool room to kitchen including shelving	1	Sum	15,000.00	15,000		15,000
8.14.3	Cool room to bar and stainless steel shelving	1	Sum	35,000.00	35,000		35,000
<b>14</b>	<b><u>Kitchen and Bar Cool Room</u></b>						<b><u>50,000</u></b>

**8.15 Fire Services**

8.15.1	Not required						
<b>15</b>	<b><u>Fire Services</u></b>						<b><u>0</u></b>

**8.16 Hydraulics Services**

8.16.1	Allowance for hydraulics services (based on Hydraulic consultant's est. dated 20/10/21)						
8.16.2	- Fixtures and tapware	1	Sum	17,552.50	17,553		17,553
8.16.3	- Property sewer, wastes and vents	1	Sum	4,095.00	4,095		4,095
8.16.4	- Cold water services	1	Sum	2,205.00	2,205		2,205
8.16.5	- Hotwater services and units	1	Sum	8,400.00	8,400		8,400
8.16.6	- LP Gas services	1	Sum	3,412.50	3,413		3,413
8.16.7	- Grease trap	1	Sum	5,250.00	5,250		5,250

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**8 Community Centre (Continued)**

**8.16 Hydraulics Services (Continued)**

8.16.8	- Mechanical drainage	1	Sum	1,050.00	1,050		1,050
8.16.9	Allowance for builder's work	1	Sum	4,200.00	4,200		4,200
<b>16</b>	<b>Hydraulics Services</b>						<b>46,165</b>

**8.17 Electrical Services**

8.17.1	Based on Electrical estimate dated 15/10/21	1	Sum	158,599.42	158,599		158,599
<b>17</b>	<b>Electrical Services</b>						<b>158,599</b>

**8.18 Mechanical Services**

8.18.1	Based on Mech estimate dated 15/10/21	1	Sum	121,480.41	121,480		121,480
<b>18</b>	<b>Mechanical Services</b>						<b>121,480</b>

**8.19 Builder's Prelim & Margin**

8.19.1	Builder's Prelim & Margin	12.0	%	1,207,070.00	144,800		144,800
<b>19</b>	<b>Builder's Prelim &amp; Margin</b>						<b>144,800</b>
<b>8</b>	<b>Community Centre</b>						<b>1,351,883</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muehea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**9 Breakout and Viewing Area**

**9.1 Spectator limestone retaining wall tier seating**

9.1.1	Terraced seating	74.90	m2	675.00	50,558		50,558
9.1.2	Staircase at terraced seating	2	Nos	3,375.00	6,750		6,750
9.1.3	Allow step at grass bank	1	Sum	2,000.00	2,000		2,000
<b>1</b>	<b>Spectator limestone retaining wall tier seating</b>						<b>59,308</b>

**9.2 Breakout and viewing area**

9.2.1	Allowance for concrete slab including excavation, formwork and reinforcement	494	m2	140.00	69,226		69,226
9.2.2	Allow for trowel concrete finish	494	m2	10.00	4,945		4,945
<b>2</b>	<b>Breakout and viewing area</b>						<b>74,171</b>

**9.3 Retaining wall and grass bank**

9.3.1	Retaining wall grass bank	86	m2	325.00	28,100		28,100
<b>3</b>	<b>Retaining wall and grass bank</b>						<b>28,100</b>
<b>9</b>	<b>Breakout and Viewing Area</b>						<b>161,578</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**10 Resurface Court 4**

**10.1 Resurface existing court & Upgrade Existing Light**

10.1.1	Resurface existing court including grind off top layer completely, new asphalt pavement to top layer, new top coating and new line marking	466	m2	100.00	46,600		46,600
10.1.2	Builder's prelim & margin	12	%	46,600.00	5,590		5,590
<b>1</b>	<b><u>Resurface existing court &amp; Upgrade Existing Light</u></b>						<b><u>52,190</u></b>
<b>10</b>	<b>Resurface Court 4</b>						<b>52,190</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**11 Contingency**

**11.1 Design Contingency**

11.1.1	Design Contingency	3.5	%	1,513,450.00	52,970		52,970
<b>1</b>	<b>Design Contingency</b>						<b>52,970</b>

**11.2 Construction Contingency**

11.2.1	Construction Contingency	5	%	1,566,420.00	78,320		78,320
<b>2</b>	<b>Construction Contingency</b>						<b>78,320</b>
<b>11</b>	<b>Contingency</b>						<b>131,290</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**12 Professional Fees**

**12.1 Professional Fee**

12.1.1	Professional Fee	1	Sum	109,121.00	109,121		109,121
12.1.2	Additional Fee for stage 2 as per Site Email dated 26/01/2022	1	Sum	50,560.00	50,560		50,560
<b>1</b>	<b><u>Professional Fee</u></b>						<b><u>159,681</u></b>
<b>12</b>	<b>Professional Fees</b>						<b>159,681</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**13 Escalation**

**13.1 Escalation**

13.1.1	<u>Escalation</u>				0		0
13.1.2	Current Index Jan 2022	204					
13.1.3	Index in Jan 2023	219					
13.1.4	Escalation	7.6	%	1,513,450.00	115,050		115,050
<b>1</b>	<b><u>Escalation</u></b>						<b><u>115,050</u></b>
<b>13</b>	<b>Escalation</b>						<b>115,050</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**14 New Netball Court Fence**

**14.1 New Chain link Fencing**

14.1.1	New Chain link fencing including post, footing and PVC coated Chain link fence (assumed 2100mm high)	37	m	155.00	5,735		5,735
14.1.2	Builder's prelim & margin	12	%	5,735.11	690		690
<b>1</b>	<b><u>New Chain link Fencing</u></b>						<b>6,425</b>
<b>14</b>	<b>New Netball Court Fence</b>						<b>9,015</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**15 Remove transportable**

**15.1 Remove transportatble**

15.1.1	Remove transportable	1	Sum	2,500.00	2,500		2,500
15.1.2	Builder's prelim & margin	12	%	2,500.00	300		300
<b>1</b>	<b>Remove transportatble</b>						<b>2,800</b>
<b>15</b>	<b>Remove transportable</b>						<b>3,930</b>

## Cost Plan Details Breakdown

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>16 2 new courts and new court lighting , refurbish 2 existing court and lighting,and new fence</b>							
<b>16.1 Resurface existing court &amp; Upgrade Existing Light</b>							
16.1.1	Resurface existing court including lightly grind off top layer, new top coating, new line marking	931	m2	15.00	13,965		13,965
16.1.2	Upgrade existing court lighting (assumed total 2 lights tower per court)	4	No	90,000.00	360,000		360,000
16.1.3	Builder's prelim & margin	12	%	373,965.00	44,880		44,880
<b>1</b>	<b><u>Resurface existing court &amp; Upgrade Existing Light</u></b>						<b><u>418,845</u></b>
<b>16.2 New Netball Court &amp; Court lighting</b>							
16.2.1	New netball court including sub-base, asphalt pavement, acrylic top coat, line marking	930	m2	150.00	139,500		139,500
16.2.2	New net ball court lighting (assumed 2 light pole per court and 100 lux luminaire)	4	No	90,000.00	360,000		360,000
16.2.3	Builder's prelim & margin	12	%	499,500.00	59,940		59,940
<b>2</b>	<b><u>New Netball Court &amp; Court lighting</u></b>						<b><u>559,440</u></b>
<b>16.3 New Chain link Fencing</b>							
16.3.1	New Chain link fencing including post, footing and PVC coated Chain link fence (assumed 2100mm high)	94	m	155.00	14,570		14,570
16.3.2	Builder's prelim & margin	12	%	14,570.28	1,750		1,750
<b>3</b>	<b><u>New Chain link Fencing</u></b>						<b><u>16,320</u></b>
<b>16</b>	<b>2 new courts and new court lighting , refurbish 2 existing court and lighting,and new fence</b>						<b>994,605</b>

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

**Details:** 220126\_Schematic Design Cost Plan  
(R3.1)- 3 Stages

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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## 17 Modify existing carpark and new crossover

### 17.1 Modify car parking

17.1.1	Modify bitumen car park including asphalt pavement, kerbing, car wheel stopper, line marking	216	m2	100.00	21,600		21,600
17.1.2	New cross over	11	m2	150.00	1,640		1,640
17.1.3	Upgrade carpark lighting	1	Sum	5,000.00	5,000		5,000
17.1.4	Builder's prelim & margin	12	%	28,239.50	3,390		3,390
<b>1</b>	<b>Modify car parking</b>						<b>31,630</b>
<b>17</b>	<b>Modify existing carpark and new crossover</b>						<b>31,630</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**18 Contingency**

**18.1 Design Contingency**

18.1.1	Design Contingency	3.5	%	1,026,234.78	35,920		35,920
<b>1</b>	<b>Design Contingency</b>						<b>35,920</b>

**18.2 Construction Contingency**

18.2.1	Construction Contingency	5	%	1,062,154.78	53,110		53,110
<b>2</b>	<b>Construction Contingency</b>						<b>53,110</b>
<b>18</b>	<b>Contingency</b>						<b>89,030</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**19 Professional Fees**

**19.1 Professional Fee**

19.1.1	Additional Fee for stage 3 as per Site Email dated 26/01/2022	1	Sum	25,000.00	25,000		25,000
<b>1</b>	<b>Professional Fee</b>						<b>25,000</b>
<b>19</b>	<b>Professional Fees</b>						<b>25,000</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 220126_Schematic Design Cost Plan (R3.1)- 3 Stages
<b>Building:</b> Mucnea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**20 Escalation**

**20.1 Escalation**

20.1.1	<u>Escalation</u>				0		0
20.1.2	Current Index Jan 2022	204					
20.1.3	Index in Jan 2024	229					
20.1.4	Escalation	12.5	%	1,026,234.78	127,840		127,840
<b>1</b>	<b><u>Escalation</u></b>						<b><u>127,840</u></b>
<b>20</b>	<b>Escalation</b>						<b>127,840</b>
							<b>4,606,253</b>

Source of funds	confirmed funding amount	pending funding	%	Funding type	scheduled date of gift to Shire	responsible stakeholder	purpose of funding method in grant	reporting requirements	responsible officer/club	acquired requirements	Grant acknowledgment requirements
Shire of Chitting			0.0%	Cash (loan)	secured	Shire hold ultimate responsibility for final project costs					
MIRIG - CRC, MNC, CDC, Muchea Cricket	\$48,830		1.8%	Cash (in sponsorship)		held in MUCHEA SPORTING FUND ACCOUNT as at 25/10/20 includes funding contributions from Barnidge Bank (48,830)	See CSRF Grant requirements	as per CSRF grant	Project Manager / CDC	as per CSRF grant	
MIRIG - CRC, MNC, CDC, Muchea Cricket		\$22,954	1.8%	volunteer labour		held in MUCHEA SPORTING FUND ACCOUNT as at 25/10/20 includes funding contributions from Australian Financial Services (20,000), Barnidge Bank (referral program (2,950))	See CSRF Grant requirements	log of hours and activities required for CSRF grant acquired	Project Manager / CDC	as per CSRF grant	
Federal Government - Stronger Communities Fund	\$12,000		0.6%	cash		held in MUCHEA SPORTING FUND ACCOUNT as at 25/10/20 includes funding contributions from Australian Financial Services (20,000), Barnidge Bank (referral program (2,950))					
State Government - CSRF Forward Planning Grant	\$300,000		6.1%	cash	2022/23: \$75,000 2023/24: \$250,000	Funds held by Shire as applicant	Construction of a pavilion at Muchea Oval	Monthly progress reports	Project Manager / CDC	15 June 2023 see apply for 25% payment on signing of major works contract. 25% claim at completion of project. 50% claim once 50% of expenditure reached	signage acknowledging the State's Contribution must be erected during construction - any other signage erected promoting the project or informing the public must include the State's logo (available from the CDC, website) and acknowledge the contribution by the State. Signage should be sent to CDC for approval prior to erection. The State may choose to provide signage for erection upon project completion. If so, this should be displayed in a prominent place for at least three years from erection. Should the organization choose to erect their own signage or plaque, it must display the State's logo and be approved by CDC prior to erection. The Minister for Sport and Recreation and a representative from CDC must be invited to any official opening or media opportunities regarding the Project. Verbal acknowledgements in public announcements and public written materials.
State Government - Darren West Election Contest	\$150,000		7.0%	cash		held in MUCHEA SPORTING FUND ACCOUNT	commitment outlined in CSRF grant. Forfeited on successful building tender invite to utilise other contractors/ materials	detailed records required as part of CSRF grant acquired	Project Manager / CDC	Muchea sporting club	as per CSRF grant
Local Business donated materials		\$48,830		materials							
ATL - AFF grant	\$100,000		2.0%	cash	at completion	Shire to final project costs	construction of new clubrooms and (dependencies to enhance football participation and provide the local community with quality sporting and recreation infrastructure. In particular, the project will ensure adequate facilities are provided to meet the growth of female participation.	acquired at completion of project	Shire - CDC	Completion of an online sign-off form via SecurityForms that includes an invoice made out to AFL Application Number 86-AFFP_21005 to be included on invoice verification that the project has been completed as per	The AFL are appropriately acknowledged in any formal publicity or events regarding the project. That the State/Territory body is involved in the development of the details design and sign off on the final plans (include the involvement of a Project Control Group)
WACA grant	\$30,000		0.6%	cash		funds held by Chitting Junior Cricket Club	Pavilion and gender-neutral player change rooms and supporting amenities.	Quarterly reports evidence of funding contributions to project proposed components of the Project must meet requirements within the Guidelines, any changes will require the applicant to gain approval from the WACA	CDC - Leahlan Chitman	50% funding provided upfront 50% and on completion of project	No public announcements, promotion or advertisement about the grant or the project without prior involvement with the WACA and Cricket Australia.
Muchea Oval Club						Muchea Oval Club					
<b>Total Project Budget</b>	<b>\$4,946,400</b>										
<b>Total Income</b>	<b>\$480,530</b>										
<b>Shire shortfall</b>	<b>\$4,465,870</b>										

N.B. additional funding included in Shire loan for \$120,000 lighting towers  
total budget \$ 1,998,251



project description	source	type	open	funding limits	considerations	grant guidelines	Sport & recreation	
							Plan	implications to other strategic projects
netball court refurbishment	DLSO - CSRF	Small grant	July and Feb rounds	maximum \$100,000 for projects up to \$300,000	low likelihood of funding - maintenance and resurfacing considered responsibility of facility owner	fund new or upgraded facilities which will maintain or increase physical activity, or result in a more rational use of facilities.	23/2024	
	DLSO - Club Night Lights program	floodlighting infrastructure	June	The maximum grant offered for standard grant applications is one third of the total estimated project cost (excluding GST) up to a maximum grant of \$1 million.	will not be considered for recurrent maintenance. A life cycle cost analysis must be provided for projects with a total cost over \$500,000.	fund new or upgraded facilities which will maintain or increase physical activity and participation through the provision of floodlighting.		
netball court redevelopment		Small grant or Annual Grant	July and Feb rounds June	maximum \$100,000 for projects up to \$300,000 Minimum grant of \$100,001 Maximum grant of \$166,666 for projects between \$300,000- \$500,000	targets projects involving a detailed level of planning		23/2024	
	DLSO - CSRF	floodlighting infrastructure	June	The maximum grant offered for standard grant applications is one third of the total estimated project cost (excluding GST) up to a maximum grant of \$1 million.	will not be considered for recurrent maintenance. A life cycle cost analysis must be provided for projects with a total cost over \$500,000.	fund new or upgraded facilities which will maintain or increase physical activity and participation through the provision of floodlighting.		
Clubrooms / function centre	Lotterywest	Inclusive thriving community	year round	no upper limit and seek co-contributions up to 100% of eligible project costs except for local governing bodies where grant funding will be up to 50% of eligible projects costs. Your grant request must be between \$2500 and \$20,000.		must have a clear community benefit within a Community Investment Framework	21/2022	Lower Chittering Community Centre Djal Djal Ridge Bindoon Mountain Bike Park
	Stronger Communities	small capital projects	Nov - January	Funding allocations for the LRCI Program are determined by formula and take into account road length and population.		Federal funding offered by local MP through competitive round. LRCI Program Phase 3, with projects under the Program to be delivered by 30 June 2023.		Lower Chittering Community Centre Bindoon Mountain Bike Park

**MUCHEA RECREATION CENTRE REFERENCE (MRC) GROUP****MINUTES**

Monday, 25 October 2021

Muchea Fire Station

Chittering Street, Muchea

**1. DECLARATION OF OPENING OF MEETING - Cr Ross**

Meeting open: 6:05pm

We wish to acknowledge the traditional custodians of the land we are meeting on, the Yued people. We would like to pay respect to the Elders of the Nyoongar nation, past and present, who have walked and cared for the land, we acknowledge and respect their continuing culture, and the contributions made to this region.

Welcome to Cr Aaron King, newly appointed Shire President.

**2. RECORD OF ATTENDANCE / APOLOGIES****2.1 MEMBERSHIP**

Membership of the Reference Group shall consist of:

- o The elected representative appointed to the Muchea Hall User Group (MHUG)
- o Project Manager;
- o 4 representatives of the existing Muchea Hall User Group – 1 (Cricket) 1 (Football) 1 (Netball) 1 (Judo);
- o 3 independent Community representatives and;
- o Other intermittent stakeholders as determined and invited by the Project Manager.

**2.2 Attendance**

Reference Group Members:

Shire: Cr Ross (Chairperson), Nathan Gough (Project Manager), Lisa Kay (minute taker)

Community representatives: Simon Cox, Brian Chipchase,

MHUG representatives: Liz Pugsley (Netball), Will Grimshaw (Football), Lachlan Chilman, (Cricket)

Architect: Steven Hart, Naomi McCabe (Site Architecture Studio)

Invited stakeholder: Cr Aaron King

Also in attendance Cr Kylie Hughes, on behalf of netball club

**2.3 Apologies**

Louise Yates (6pm commencement time does not suit her)

**3. DISCLOSURE OF INTEREST**

It is noted that the club representatives of Chittering Junior Football, Chittering Junior Cricket, Muchea Senior Cricket, Muchea Netball Club, and Muchea Judo Club have an inherent interest in this project as existing users of this facility.

#### 4. PREVIOUS MINUTES

Simon advised that he did not receive previous minutes.

Consensus by all present that these are a true record.

#### 5. ARCHITECT

Recap from last meeting.

Arranged for quantity surveyor to draft cost estimate on simple drawings and design. To date the QS has been largely done on a m<sup>2</sup> estimate. Since the last meeting have been working on a more detailed design to prove up spaces and the size of the building as well as defining the structure. The work undertaken since the last meeting has enabled structural and hydraulic input to work through a cost estimate with the quantity surveyor. Geo tech survey to date is indicating the soil conditions are pretty good with a reduction in the ground system costs previously accounted for, as it should not require 600mm sand fill under slabs, and no special footing/ structural design.

ATU and waste water watering area.

Two key allowances that needed consideration were the water and subsequent cost of filtration system. Results from the water quality testing indicate a less expensive filtration system is required than allowed for in the previous estimate.

Other service systems

Instantaneous gas system would be the advice of the Architect. Bushfire water systems are still to be followed up with Site Architecture Studio seeking advice on these.

Cost Estimate

Refer to attached 1

1. To keep costs down architects have excluded any new landscaping (turf and irrigation) but have allowed for paving between the carpark and the building
2. Fit out of the bar (benches, glass washers etc.) has been excluded
3. Contingencies have been included (4% design and 5% construction) which equate to more than the Shire's original \$100,000 allowance however given the current market we recommended that sufficient is allowed to cover unexpected costs
4. Escalation has been excluded
5. Refer to the estimate for other exclusions

Had input from mechanical consultations to do heat load calculations. Aircon system has been considered through a ducted refrigerated system.

Portico areas have been incorporated at entrance and directly above canteen. Covered areas could be extended at later stages. Concerns expressed by Netball representatives that there is limited covered area for viewing netball. It is the considered opinion of the Architect that there is quite a good connection for viewing of netball courts and with the redevelopment of the courts this will enable 3 metres around all of them, which they do not currently have.

Cr Hughes raised maintenance of existing western court – Cr Ross outlined that this is a maintenance issue for the Shire to address, rather than an architect issue for discussion as part of this meeting.

Discussion over the provision for counter lever roof to the terraced spectator areas. At present the proposed pavilion area is about 3m. This could extend over the terraced areas, however if the intention is to not have columns then the cantilever cannot extend much more than it is currently proposed. Architects to discuss with the structural engineer, however it is noted that any extension is not currently accounted for in the budget. Proposed cantilever is not lined. Structure will be well formed and aesthetically pleasing. Proposal for translucent roof sheeting to draw more natural light into the pavilion area would need to be durable to accommodate some natural light and wear and tear from stray balls. Cr King suggested that a simple post structure might be a compromise for a larger pavilion area. MRC may need to consider what can be compromised on to meet budget.

Cr King asked all user representatives if their user requirements have been met. Also expressed a desire to have the user requirements clearly defined as these would normally be signed off at the commencement of the project. Discussion outlined that the process to date has involved extensive conversations and input from the current users and community representatives to ensure that the facility meets user requirements. Architects Steve and Naomi also pointed out that at the commencement of their involvement in this project, they were presented with concept plans that had been developed by the users of which were endorsed by Council. These concept plans informed the initial stages of the project.

Cr King expressed that there is no question that Council fully supports the project but is concerned that we consider what is essential and what could be considered gold plating aspects that could be better utilised elsewhere. Also need to ensure that we consider all users of the facility.

Architect Steven outlined that they have utilised the design brief provided by Clubs and have considered this in line with architectural experience and proposed changes to enhance the usability of the facility. This led to a loosely prepared Masterplan that improved user ability and connectivity. Steve expressed that ALF and Cricket held a strong drive for users to view activities on the oval. Netball also held a strong vision for connectivity to the courts and viewing areas. This sentiment was shared by all reference group members. User group requirements have been addressed and played a role in the design solutions that have been presented to date. It is important from all stakeholders' perspective that the clubs and users have ownership of the project that is produced. Steven outlined that he does not believe there has been competing ideas by Shire or users. What did become evident through investigations was the requirement for an additional 2 change rooms to enable the provision of unisex games. The original brief only contained 2 change rooms.

Reference Group members expressed that they have been really happy with the process so far and resulting in a multi-purpose approach to the facility.

Cr Hughes expressed that the current positioning of the facility does not meet any of the Netball club's needs. With only 3 courts and one of these requiring maintenance to bring up to capacity, netball will be heavily impacted, especially with another club utilising the facility and requiring competition standards. General discussion highlighted that the redevelopment of the Netball courts is not part of the building development budget (\$2.7m) however, it is agreed by the reference group that the courts are fundamental to the overall redevelopment of the facility. The Shire should consider the netball court refurbishment/redevelopment as a staged approach to the overall site redevelopment.

Cr King – Council has only certain amount of capital to cover all projects. Have to spend money wisely. If these costs don't come back in budget will need to find some compromise. Due to the shortage of resources and materials and related escalation, there is considerable risk that the total project cost will exceed budget. If building costs go up, will need to compromise.

**Outcome: Cr King expressed that we won't know true costs until we go out to tender and should we exceed budget it is his opinion that we have 3 options:**

- 1. Resolve not to proceed with the project**
- 2. Re-design the project to reduce the scale of the project to reduce the cost to within budget. This will cause considerable delay.**
- 3. Approve an additional contingency amount - suggest 30% of total budget.**

Site Architecture Studio are confident that the QS is based on rates that are anticipated at time of tender. Even with an experienced Quantity surveyor who has achieved good results in the past, it is a difficult science and there are risks in design development and documentation. With this in mind they have always envisaged another 2 estimates before we go to tender to test for further issues prior to going to tender.

Cr King – expressed that in order to prevent delays it would be wise to agree on a level of contingency before we go to tender. Believe that Council should consider the contingency as part of risk mitigation as a result of market contentions. Council need to have discussions as to how they will handle the risks.

It has always been the intention of the Architect and the Reference group that we keep to budget and where we have considered ways to massage the project down to work within the budget. However we are not in control of external factors i.e. steel fab, trades etc. Council may need to stretch to accommodate the contingency. View that it would be undesirable to scale back as this has already been done. Council would need to consider whether they are willing to commit further Shire funds as contingency for the project.

Cr King would like to see full project budget - exclusion and inclusion and what is in Architect budget and what Shire responsibility is. Being very mindful that any published costs are the total costs and include any excluded on costs borne by the Shire.

Cr Hughes asked whether the original brief has gone beyond what was originally proposed. Site Architecture Studio and Shire Officers outlined that other than the inclusion of the 2 change rooms, which as previously discussed, were identified as a critical need that was overlooked in the original brief, the design brief has not changed.

Draft elevations and plans

Refer to attachment 2

Steven outlined that there have been no changes to floor plans as determined at previous meetings. Have focussed on the external form of the building. The proposed form aims to sit quite well in landscape and reflect architecture in the area, keeping costs in mind.

The external cladding was discussed in relation to the building not looking like a hay shed. Type of cladding proposed is higher profile than normally used in sheds along with the composition of compressed fibre sheeting and glass, means it won't look like a shed. Proposed differentiation of the cladding used, and colour, to depict the different portions of the building with a view to creating architectural interest to the change room entry areas. Fibre rock is proposed for the internal areas of the change rooms to ensure longevity related to the inherent wear and tear in these areas. This is a common product which has been utilised in schools and other recreation centres. If this product is not available, would utilise a product that has similar capabilities to maintain hard wearing.

The entire structure is proposed as a steel frame building with cladding on the outside. Full height tiling in all wet areas. Floors in change rooms concrete. Wet areas will be tiled and carpet in multipurpose area. – may need to work through this to incorporate a vinyl flooring to accommodate Judo.

**Outcome:**

**Require more discussion to understand the provisioning of the flooring to accommodate these needs. Seek solutions that provide a flexible space that is suitable to everyone. Potential for timber vinyl planks.**

## Next steps

Stephen – the full consultant group will consider the design development through a sharper lens and develop further detail to the plans. At end of this stage will do another QS cost report including more specific input from consultants with regard to services.

They will also commence the contract documentation phase producing construction detail including finishes of building, writing specs etc. This will enable a pre-tender estimate. Expect QS to be pretty accurate and Site Architecture Studio have an expectation that this will be a little conservative. In their experience they haven't been the cheapest tender at market. In the original project brief and established timeframes it was expected to go to tender in December. We are behind program as we have been working to get it right. Aside from the Christmas period and, with no further delays, would expect to go to tender in February.

**Outcome: The project will be on hold to enable Shire staff to seek direction from Council with regard to the budget. The following items will be updated and submitted to the November Ordinary Council Meeting:**

- **Nathan to provide Council with an up to date total project budget outlining inclusions/ exclusions, list and cost breakdown of all other materials and services to be provided by SOC as part of the project, any proposed future staging and an up to date funding strategy including clubs contributions.**
  - **Stage 1: Construction of the Muchea Recreation centre**
  - **Stage 2: Demolition of Muchea Town Hall**
  - **Stage 3; Upgrade of the Muchea Netball Courts**
- **It is acknowledged that any delays will impact on the capacity of Site Architecture Studio to meet agreed timeframes.**
- **Nathan to document the contracting strategy including in-kind costs as this will be required for the tendering process.**

## 6. NATHAN PROJECT UPDATE

### Netball courts

As discussed previously the rather than turn this into a secondary project that impacts this budget, consider the netball courts as an incidental cost arising from this project and be put to Council as a future funded Stage 3 aspect of the project. This stage would propose 4 court redevelopment and upgrades.

### Liquor Licence

Liquor licensing will be considered in line with the governance model for the facility. Brian has met with Liquor Licencing and they appear to be comfortable with the entire interior being licenced (which would be needed for functions), with restricted areas being used when club room is in use.

## 7. NEXT MEETING

Next meeting to be advised, but will be after the November OCM.

## 8. CLOSURE: 7:57pm

## Cost Plan Summary

Project: Site Architecture Studio

Details: 211020\_Schematic Design Cost plan

Building: Muehea Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Total
1	BUILDING 1 - CHANGING ROOM	223	m2	3,258.99	726,754
2	BUILDING 2 - COMMUNITY CENTRE	465	m2	2,596.26	1,207,260
3	LANDSCAPE TURFING	716	m2	0.00	0
4	BREAKOUT & VIEWING AREA	681	m2	270.33	184,045
5	EXTERNAL SERVICES	2,206	m2	108.45	239,280
	<b>TOTAL ESTIMATED CONSTRUCTION COST</b>	<b>2,206</b>	<b>m2</b>	<b>1,068.43</b>	<b>2,357,339</b>
6	DESIGN CONTINGNECY	2,206	m2	42.74	94,300
7	CONSTRUCTION CONTINGENCY	2,206	m2	53.44	117,900
8	PROFESSIONAL FEES	2,206	m2	90.65	200,000
9	ESCALATION (EXCLUDED)	2,206	m2	0.00	0
	<b>TOTAL ESTIMATED PROJECT COST</b>	<b>2,206</b>	<b>m2</b>	<b>1,255.26</b>	<b>2,769,539</b>
	<b><u>EXCLUSION</u></b>				
10	Carpark				
11	Shed				
12	Court				
13	Playground				
14	Covered breakout - Fully Covered				
15	Forecourt / Netball viewing - 50% Covered				
16	Netball viewing - 50% Covered				
17	Social room breakout - 50% Covered				
18	Public Art				
19	Contingency				
20	Escalation				
21	Professional Fees				
22	Commissioning, relocation costs & disbursements				
23	Latent Conditions				
24	Turf and landscape				

Project: Site Architecture Studio

Details: 211020\_Schematic Design Cost plan

Building: Mueha Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 BUILDING 1 - CHANGING ROOM</b>							
<b>1.1 Substructure</b>							
1.1.1	Allowance for concrete slab and thickening including excavation, formwork and reinforcement	223.14	m2	150.00	33,471		33,471
<b>1</b>	<b>Substructure</b>						<b>33,471</b>
<b>1.2 Columns</b>							
1.2.1	C1 - 89x89x5SHS	0.79	t	10,000.00	7,900		7,900
1.2.2	Allowance for base plate with bolts	17	No	150.00	2,550		2,550
1.2.3	Allowance for loose fittings and connection (15%)	0.12	t	10,000.00	1,185		1,185
1.2.4	Allowance for steel treatment	0.91	t	1,000.00	909		909
<b>2</b>	<b>Columns</b>						<b>12,544</b>
<b>1.3 Roof</b>							
1.3.1	Roof framing						
1.3.2	B2 - 150x150x6SHS	0.59	t	10,000.00	5,900		5,900
1.3.3	BR1 - 101x3.2CHS	0.23	t	10,000.00	2,300		2,300
1.3.4	Outrigger 150x100x4RHS	0.11	t	10,000.00	1,100		1,100
1.3.5	R1 - 200UB25	0.52	t	10,000.00	5,200		5,200
1.3.6	R2 - 150PFC	0.64	t	10,000.00	6,400		6,400
1.3.7	WB1 - 89x89x5SHS	0.38	t	10,000.00	3,800		3,800
1.3.8	WH1 - 89x89x5SHS	0.52	t	10,000.00	5,200		5,200
1.3.9	WH2 - 150x100x4RHS	0.62	t	10,000.00	6,200		6,200
1.3.10	Allow 15% for loose fitting and connection	0.54	t	10,000.00	5,415		5,415
1.3.11	Allow for surface treatment	3.61	t	1,000.00	3,610		3,610
1.3.12	Allow for bridging and purlins	529	m	30.00	15,877		15,877
1.3.13	Roof covering						
1.3.14	Metal roof covering (assumed Corrugated sheet)	314	m2	65.00	20,410		20,410
1.3.15	Allowance for insulation	314	m2	15.00	4,710		4,710
1.3.16	Miscellaneous						
1.3.17	Roof flashing and drainage	314	m2	50.00	15,700		15,700
<b>3</b>	<b>Roof</b>						<b>101,822</b>
<b>1.4 External Wall</b>							
1.4.1	Allow for lightweight wall including metal cladding and framing	143.69	m2	480.00	68,971		68,971
1.4.2	Allow for lightweight wall including pre-finish FC board and framing	111.33	m2	270.00	30,059		30,059
<b>4</b>	<b>External Wall</b>						<b>99,030</b>

Project: Site Architecture Studio

Details: 211020\_Schematic Design Cost plan

Building: Muchea Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 BUILDING 1 - CHANGING ROOM (Continued)</b>							
<b>1.5 External Door</b>							
1.5.1	Single solid timber door including frame, hardware and painting	8	No	1,700.00	13,600		13,600
1.5.2	Double metal door including frame and hardware	2	No	2,000.00	4,000		4,000
1.5.3	Allow for door signage	10	No	150.00	1,500		1,500
<b>5</b>	<b>External Door</b>						<b>19,100</b>
<b>1.6 Window</b>							
1.6.1	Allowance for window	7	m2	650.00	4,550		4,550
<b>6</b>	<b>Window</b>						<b>4,550</b>
<b>1.7 Internal Screen and Borrow Light</b>							
1.7.1	Toilet cubicle / shower partition including door and hardware	16	No	1,750.00	28,000		28,000
1.7.2	Toilet cubicle door including hardware	4	No	800.00	3,200		3,200
<b>7</b>	<b>Internal Screen and Borrow Light</b>						<b>31,200</b>
<b>1.8 Internal Wall</b>							
1.8.1	Moisture resistance plasterboard both sides on steel stud framing including insulation	133.07	m2	195.50	26,015		26,015
1.8.2	Plasterboard both sides on steel stud framing including insulation	20.86	m2	170.50	3,557		3,557
1.8.3	1 layer plasterboard and 1 layer moisture resistance plasterboard each side on steel stud framing including insulation	181.51	m2	185.50	33,670		33,670
1.8.4	Moisture resistance plasterboard bulkhead (above 3.5m height)	15.77	m2	211.00	3,327		3,327
<b>8</b>	<b>Internal Wall</b>						<b>66,569</b>
<b>1.9 Internal Door</b>							
1.9.1	Single solid door including frame, hardware and paint finish	5	No	1,525.00	7,625		7,625
<b>9</b>	<b>Internal Door</b>						<b>7,625</b>
<b>1.10 Wall Finishes</b>							
1.10.1	Allow selected wall tiles including waterproofing	202.01	m2	140.00	28,281		28,281
1.10.2	Allowance for splashback to First Aid room	1	Sum	600.00	600		600
1.10.3	Painting to wall	460.36	m2	20.00	9,207		9,207
<b>10</b>	<b>Wall Finishes</b>						<b>38,089</b>
<b>1.11 Floor Finishes</b>							
1.11.1	Allow fully vitrified ceramic floor tile, R12 slip resistance rating	62.99	m2	140.00	8,819		8,819

**Project:** Site Architecture Studio  
**Building:** Mueha Recreation Centre

**Details:** 211020\_Schematic Design Cost plan

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 BUILDING 1 - CHANGING ROOM (Continued)</b>							
<b>1.11 Floor Finishes (Continued)</b>							
1.11.2	Fully ceramic skirting tile, 150mm high	218.41	m	20.00	4,368		4,368
1.11.3	Allowance for waterproofing	63	m2	40.00	2,520		2,520
1.11.4	Linear drain	8.17	m	250.00	2,043		2,043
1.11.5	Sealed concrete flooring	151.74	m2	40.00	6,070		6,070
1.11.6	Allow for Vinyl flooring to First Aid	9	m2	80.00	720		720
1.11.7	Allowance for coved skirting	9.00	m2	35.00	315		315
<b>11</b>	<b>Floor Finishes</b>						<b>24,854</b>
<b>1.12 Ceiling Finishes</b>							
1.12.1	Flushed plasterboard suspended ceiling including paint	49.39	m2	100.00	4,939		4,939
1.12.2	Moisture resistant plasterboard suspended ceiling including paint	173.75	m2	110.00	19,113		19,113
1.12.3	Soffit lining paint finish	52.30	m2	75.00	3,923		3,923
1.12.4	Allowance for shadowline angle trim	266.25	m	10.00	2,663		2,663
1.12.5	Allowance fo access panel	1	Sum	1,500.00	1,500		1,500
<b>12</b>	<b>Ceiling Finishes</b>						<b>32,137</b>
<b>1.13 Sanitaryware and fitments</b>							
1.13.1	<u>Built in joinery</u>						
1.13.2	Timber slat seat including clothes rail hook	53.95	m	300.00	16,185		16,185
1.13.3	No allowance for locker						Excluded
1.13.4	Allow built in vanity bench with cabinet at First Aid	2.70	m	750.00	2,025		2,025
1.13.5	<u>Changeroom/Umpire/Amenities</u>						
1.13.6	Toilet roll holder	10	No	125.00	1,250		1,250
1.13.7	Soap dispenser	10	No	180.00	1,800		1,800
1.13.8	Paper towel dispenser	10	No	200.00	2,000		2,000
1.13.9	Mirror	10	No	350.00	3,500		3,500
1.13.10	Grabrail set	6	No	650.00	3,900		3,900
1.13.11	Coat hook	32	No	40.00	1,280		1,280
1.13.12	Shelf	2	No	650.00	1,300		1,300
1.13.13	<u>First Aid</u>						
1.13.14	Soap dispenser	1	No	180.00	180		180
1.13.15	Paper Towel dispenser	1	No	200.00	200		200
1.13.16	Mirror	1	No	350.00	350		350
1.13.17	Coat hook	2	No	40.00	80		80
1.13.18	<u>Sanitary fixtures</u>						

Project: Site Architecture Studio

Details: 211020\_Schematic Design Cost plan

Building: Mueha Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>1 BUILDING 1 - CHANGING ROOM (Continued)</b>							
<b>1.13 Sanitaryware and fitments (Continued)</b>							
1.13.19	Water cistern	10	No		0		Incl in Hydraulic services
1.13.20	Shower rose	10	No		0		Incl in Hydraulic services
1.13.21	Wall basin	10	No		0		Incl in Hydraulic services
1.13.22	First aid basin	1	No		0		Incl in Hydraulic services
1.13.23	Cleaner trough	1	No		0		Incl in Hydraulic services
1.13.24	<u>Miscellaneous</u>						
1.13.25	Allowance for fire extinguisher and blanket	1	Sum	1,000.00	1,000		1,000
<b>13</b>	<b><u>Sanitaryware and fitments</u></b>						<b>35,050</b>
<b>1.14 Hydraulics Services</b>							
1.14.1	Allowance for hydraulics services (based on Hydraulic consultant's est. dated 20/10/21)						
1.14.2	- Fixtures and tapware	1	Sum	32,597.50	32,598		32,598
1.14.3	Property sewer, wastes and vents	1	Sum	7,605.00	7,605		7,605
1.14.4	- Cold water services	1	Sum	4,095.00	4,095		4,095
1.14.5	- Hotwater services and units	1	Sum	15,600.00	15,600		15,600
1.14.6	- LP Gas services	1	Sum	6,337.50	6,338		6,338
1.14.7	- Grease trap	1	Sum	9,750.00	9,750		9,750
1.14.8	- Mechanical drainage	1	Sum	1,950.00	1,950		1,950
1.14.9	Allowance for builder's work	1	Sum	7,790.00	7,790		7,790
<b>14</b>	<b><u>Hydraulics Services</u></b>						<b>85,725</b>
<b>1.15 Electrical Services</b>							
1.15.1	Based on Electrical estimate dated 15/10/21	1	Sum	76,400.58	76,401		76,401
<b>15</b>	<b><u>Electrical Services</u></b>						<b>76,401</b>
<b>1.16 Mechanical Services</b>							
1.16.1	Based on Mech estimate dated 15/10/21	1	Sum	58,519.59	58,520		58,520
<b>16</b>	<b><u>Mechanical Services</u></b>						<b>58,520</b>
<b>1</b>	<b>BUILDING 1 - CHANGING ROOM</b>						<b>726,685</b>

Project: Site Architecture Studio

Details: 211020\_Schematic Design Cost plan

Building: Mueha Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**2 BUILDING 2 - COMMUNITY CENTRE****2.1 Substructure**

2.1.1	Allowance for concrete slab and thickening including excavation, formwork and reinforcement	465	m2	150.00	69,677		69,677
<b>1</b>	<b>Substructure</b>						<b>69,677</b>

**2.2 Columns**

<b>Steel Columns</b>							
2.2.1	C1 - 89 x 89 x 5.0 SHA	1.02	t	10,000.00	10,200		10,200
2.2.2	C2 - 150 x 150 x 5.0 SHS	0.32	t	10,000.00	3,200		3,200
2.2.3	C3 - 150 x 100 x 6.0 RHS	0.48	t	10,000.00	4,800		4,800
2.2.4	Baseplate	33	No	150.00	4,950		4,950
2.2.5	Allowance for loose and attached connection	0.27	t	10,000.00	2,730		2,730
2.2.6	Allowance for surface treatment	2.09	t	1,000.00	2,093		2,093
<b>2</b>	<b>Columns</b>						<b>27,973</b>

**2.3 Roof**

<b>Roof Steel Structure</b>							
2.3.1	B1 - 89x89x5.0 SHS	0.18	t	10,000.00	1,800		1,800
2.3.2	B2 - 150x150x5.0 SHS	N/A	t	10,000.00	0		0
2.3.3	B3 - 150x100x6.0 RHS	0.78	t	10,000.00	7,800		7,800
2.3.4	R1 - 200UB25	N/A	t	10,000.00	0		0
2.3.5	R2 - 150 PFC	1.43	t	10,000.00	14,300		14,300
2.3.6	BR1 - 101x3.2 CHS	0.51	t	10,000.00	5,100		5,100
2.3.7	BR2 - 139x3.5 CHS	0.68	t	10,000.00	6,800		6,800
2.3.8	BR3 - 75x75x8 EA	0.14	t	10,000.00	1,400		1,400
2.3.9	WB1 - 89x89x5.0 SHS	N/A	t	10,000.00	0		0
2.3.10	WH1 - 89x89x5.0 SHS	0.71	t	10,000.00	7,100		7,100
2.3.11	<b>Truss</b>						
2.3.12	T1 - 150x100x4.0 Horizontal Top	0.34	t	12,000.00	4,080		4,080
2.3.13	T1 - 100x100x4.0 Horizontal Bottom	0.27	t	12,000.00	3,240		3,240
2.3.14	T1 - 75x50x4.0 RHS Diagonal and Vertical	0.60	t	12,000.00	7,200		7,200
2.3.15	T2 - 100x100x4.0 Horizontal Top	0.24	t	12,000.00	2,880		2,880
2.3.16	T2- 200 PFC	0.48	t	12,000.00	5,760		5,760
2.3.17	T2 - 75x50x4.0 RHS Diagonal and Vertical	0.50	t	12,000.00	6,000		6,000
2.3.18	FR1 - 100x100x4.0 Horizontal Top	0.38	t	12,000.00	4,560		4,560
2.3.19	FR1 - 100x100x4.0 Horizontal Bottom	0.38	t	12,000.00	4,560		4,560

## Cost Plan Details Breakdown

Project: Site Architecture Studio

Details: 211020\_Schematic Design Cost plan

Building: Muchea Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>2 BUILDING 2 - COMMUNITY CENTRE (Continued)</b>							
<b>2.3 Roof (Continued)</b>							
2.3.20	FR1 - 75x50x4.0 RHS Diagonal and Vertical	0.85	t	12,000.00	10,200		10,200
2.3.21	<u>Miscellaneous</u>						
2.3.22	Loose and attached connection	1.27	t	10,000.00	12,705		12,705
2.3.23	Surface treatment	9.74	t	1,000.00	9,741		9,741
2.3.24	<u>Purlin</u>						
2.3.25	B2-Purlin 200x100x4.0 RHS	96	m	100.00	9,600		9,600
2.3.26	B2-Purlin 20019_1000CC	263	m	20.00	5,260		5,260
2.3.27	B2-Purlin Z15019_1000cc	279	m	18.00	5,022		5,022
2.3.28	Allow roof steel structure for link roof	71	m2	196.00	13,916		13,916
2.3.29	<u>Roof Covering</u>						
2.3.30	Metal roof covering (assumed Corrugated sheet)	735	m2	65.00	47,775		47,775
2.3.31	Allowance for insulation	735	m2	15.00	11,025		11,025
2.3.32	Roof flashing and drainage	735	m2	50.00	36,750		36,750
<b>3</b>	<b><u>Roof</u></b>						<b><u>244,573</u></b>
<b>2.4 External Wall</b>							
2.4.1	Allow for lightweight wall including metal cladding and framing	257.77	m2	480.00	123,730		123,730
2.4.2	Allow for fixed glazed wall	104.69	m2	700.00	73,283		73,283
2.4.3	Allow for lightweight wall including pre-finish FC board and framing	54.78	m2	270.00	14,791		14,791
<b>4</b>	<b><u>External Wall</u></b>						<b><u>211,803</u></b>
<b>2.5 External Door</b>							
2.5.1	Single solid timber door including frame, hardware and painting	3	No	1,700.00	5,100		5,100
2.5.2	Double metal door including frame and hardware	1	No	2,000.00	2,000		2,000
2.5.3	Extra over double door including frame and hardware	5	No	1,476.00	7,380		7,380
2.5.4	Allow for door signage	2	No	150.00	300		300
<b>5</b>	<b><u>External Door</u></b>						<b><u>14,780</u></b>
<b>2.6 Window</b>							
2.6.1	Allowance for window	6	m2	650.00	3,900		3,900
<b>6</b>	<b><u>Window</u></b>						<b><u>3,900</u></b>
<b>2.7 Internal Screen and Borrow Light</b>							
2.7.1	Toilet partition including door and hardware	3	No	1,750.00	5,250		5,250

**Project:** Site Architecture Studio  
**Building:** Muecha Recreation Centre

**Details:** 211020\_Schematic Design Cost plan

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
<b>2 BUILDING 2 - COMMUNITY CENTRE (Continued)</b>							
<b>2.7 Internal Screen and Borrow Light (Continued)</b>							
<b>7</b>	<b>Internal Screen and Borrow Light</b>						<b>5,250</b>
<b>2.8 Internal Wall</b>							
2.8.1	Assumed internal wall 2.80m height						
2.8.2	Moisture resistance plasterboard both sides on steel stud framing including insulation	10.89	m2	195.50	2,129		2,129
2.8.3	Plasterboard both sides on steel stud framing including insulation	144.09	m2	170.50	24,567		24,567
2.8.4	1 layer plasterboard and 1 layer moisture resistance plasterboard each side on steel stud framing including insulation	113.04	m2	185.50	20,969		20,969
2.8.5	Allow for operable wall	65.50	m2	500.00	32,750		32,750
2.8.6	Allowance for bulkhead (above 3.5m)	35.84	m2	190.00	6,810		6,810
<b>8</b>	<b>Internal Wall</b>						<b>87,225</b>
<b>2.9 Internal Door</b>							
2.9.1	Single solid door including frame, hardware and paint finish	10	No	1,525.00	15,250		15,250
2.9.2	Allow for door signage	10	No	150.00	1,500		1,500
2.9.3	Allow roller shutter at Kitchen (assumed 2200x900mmH)	2	No	2,100.00	4,200		4,200
2.9.4	Allow roller shutter at Bar (assumed 2760x1500mmH)	3	No	2,500.00	7,500		7,500
2.9.5	Allow roller door at Judo and Furn store	2	No	3,000.00	6,000		6,000
<b>9</b>	<b>Internal Door</b>						<b>34,450</b>
<b>2.10 Wall Finishes</b>							
2.10.1	Allow selected wall tiles including waterproofing	110	m2	140.00	15,340		15,340
2.10.2	Allowance for splashback to Kitchen	1	Sum	2,800.00	2,800		2,800
2.10.3	Painting to wall	586	m2	20.00	11,711		11,711
<b>10</b>	<b>Wall Finishes</b>						<b>29,851</b>
<b>2.11 Floor Finishes</b>							
2.11.1	Tile floor finish						
2.11.2	Allow fully vitrified ceramic floor tile, R12 slip resistance rating	34	m2	140.00	4,722		4,722
2.11.3	Fully ceramic skirting tile, 150mm high	68	m	20.00	1,370		1,370
2.11.4	Allow for waterproofing	34	m2	40.00	1,349		1,349
2.11.5	Vinyl floor finish						
2.11.6	Allowance for Vinly flooring	58	m2	80.00	4,627		4,627
2.11.7	Allowance for coved skirting	20	m2	35.00	707		707

Project: Site Architecture Studio

Details: 211020\_Schematic Design Cost plan

Building: Muchea Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**2 BUILDING 2 - COMMUNITY CENTRE****(Continued)****2.11 Floor Finishes****(Continued)**

2.11.8	Allow for moisture barrier underneath vinyl	58	m2	15.00	868		868
2.11.9	<u>Carpet floor finish</u>						
2.11.10	Allowance for carpet flooring	320	m2	55.00	17,617		17,617
2.11.11	Allowance for skirting	72	m	35.00	2,534		2,534
2.11.12	<u>Concrete floor</u>						
2.11.13	Sealed concrete flooring	36	m2	40.00	1,446		1,446
2.11.14	<u>Entrance Mats</u>						
2.11.15	Allow entrance mats at corridor	1	No	2,000.00	2,000		2,000
<b>11</b>	<b>Floor Finishes</b>						<b>37,240</b>

**2.12 Ceiling Finishes**

2.12.1	Perforated acoustic ceiling at Hall	251	m2	140.00	35,140		35,140
2.12.2	Flushed plasterboard suspended ceiling including paint	168	m2	100.00	16,774		16,774
2.12.3	Moisture resistant plasterboard suspended ceiling including paint	29	m2	110.00	3,229		3,229
2.12.4	Soffit lining paint finish	194	m2	75.00	14,540		14,540
2.12.5	Allowance for shadowline angle trim	287	m	10.00	2,875		2,875
2.12.6	Allowance fo access panel	1	Sum	2,000.00	2,000		2,000
<b>12</b>	<b>Ceiling Finishes</b>						<b>74,557</b>

**2.13 Fitments**

2.13.1	<u>Built in joinery</u>						
2.13.2	Kitchenette bench with cabinet below	3	m	850.00	2,873		2,873
2.13.3	No allowance for Kitchen U shape bench with cabinet below						Excluded
2.13.4	No allowance for bar counter						Excluded
2.13.5	<u>Toilet</u>						
2.13.6	Toilet roll holder	6	No	125.00	750		750
2.13.7	Soap dispenser	5	No	180.00	900		900
2.13.8	Paper towel dispenser	5	No	200.00	1,000		1,000
2.13.9	Mirror	5	No	350.00	1,750		1,750
2.13.10	Grabrail set	1	No	650.00	650		650
2.13.11	Grab bar	2	No	400.00	800		800
2.13.12	Coat hook	6	No	40.00	240		240
2.13.13	Curtain track and curtain	1	No	700.00	700		700

**Project:** Site Architecture Studio  
**Building:** Muecha Recreation Centre

**Details:** 211020\_Schematic Design Cost plan

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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## 2 BUILDING 2 - COMMUNITY CENTRE

(Continued)

### 2.13 Fitments

(Continued)

2.13.14	Cistern backrest	1	No				Incl in Hydraulic services
2.13.15	Folding shower seat	1	No				Incl in Hydraulic services
2.13.16	<u>Sanitary fixtures</u>						
2.13.17	Water cistern	6	No				Incl in Hydraulic services
2.13.18	Shower rose	1	No				Incl in Hydraulic services
2.13.19	Wall basin	5	No				Incl in Hydraulic services
2.13.20	Kitchen sink	2	No				Incl in Hydraulic services
2.13.21	Kitchen hand basin	1	No				Incl in Hydraulic services
2.13.22	Urinal	2	No				Incl in Hydraulic services
<b>13</b>	<b>Fitments</b>						<b>9,663</b>

### 2.14 Special Equipment

2.14.1	<u>Coolroom and freezer room</u>						
2.14.2	Coolroom and freezer room door including hardware	2	No	2,550.00	5,100		5,100
2.14.3	Cool room and freezer insulated ceiling panel	16	m2	300.00	4,944		4,944
2.14.4	Cool room and freezer insulated panel	64	m2	300.00	19,161		19,161
2.14.5	Sealed concrete flooring	16	m2	40.00	659		659
2.14.6	No allowance for refrigerator and shelving	Note					
<b>14</b>	<b>Special Equipment</b>						<b>29,864</b>

### 2.15 Fire Services

2.15.1	Not required						
<b>15</b>	<b>Fire Services</b>						<b>0</b>

### 2.16 Hydraulics Services

2.16.1	Allowance for hydraulics services (based on Hydraulic consultant's est. dated 20/10/21)						
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<b>Project:</b> Site Architecture Studio	<b>Details:</b> 211020_Schematic Design Cost plan
<b>Building:</b> Muehea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**2 BUILDING 2 - COMMUNITY CENTRE**

*(Continued)*

**2.16 Hydraulics Services**

*(Continued)*

2.16.2	- Fixtures and tapware	1	Sum	17,552.50	17,553		17,553
2.16.3	Property sewer, wastes and vents	1	Sum	4,095.00	4,095		4,095
2.16.4	- Cold water services	1	Sum	2,205.00	2,205		2,205
2.16.5	- Hotwater services and units	1	Sum	8,400.00	8,400		8,400
2.16.6	- LP Gas services	1	Sum	3,412.50	3,413		3,413
2.16.7	- Grease trap	1	Sum	5,250.00	5,250		5,250
2.16.8	- Mechanical drainage	1	Sum	1,050.00	1,050		1,050
2.16.9	Allowance for builder's work	1	Sum	4,200.00	4,200		4,200
<b>16</b>	<b>Hydraulics Services</b>						<b>46,165</b>

**2.17 Electrical Services**

2.17.1	Based on Electrical estimate dated 15/10/21	1	Sum	158,599.42	158,599		158,599
<b>17</b>	<b>Electrical Services</b>						<b>158,599</b>

**2.18 Mechanical Services**

2.18.1	Based on Mech estimate dated 15/10/21	1	Sum	121,480.41	121,480		121,480
<b>18</b>	<b>Mechanical Services</b>						<b>121,480</b>
<b>2</b>	<b>BUILDING 2 - COMMUNITY CENTRE</b>						<b>1,207,051</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 211020_Schematic Design Cost plan
<b>Building:</b> Muchea Recreation Centre	

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**3 LANDSCAPE TURFING**

**3.1 Landscaping**

3.1.1	No allowance for turf and irrigation	715.52	m2	40.00	28,621		Excluded
<b>1</b>	<b>Landscaping</b>						<b>0</b>
<b>3</b>	<b>LANDSCAPE TURFING</b>						<b>0</b>

Project: Site Architecture Studio

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Building: Muchea Recreation Centre

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**4 BREAKOUT & VIEWING AREA****4.1 Spectator limestone retaining wall tier seating**

4.1.1	Terraced seating	74.90	m2	700.00	52,430		52,430
4.1.2	Staircase at terraced seating	2	Nos	3,750.00	7,500		7,500
4.1.3	Allow step at grass bank	1	Sum	2,000.00	2,000		2,000
<b>1</b>	<b>Spectator limestone retaining wall tier seating</b>						<b>61,930</b>

**4.2 Breakout and viewing area**

4.2.1	Allowance for concrete slab including excavation, formwork and reinforcement	567	m2	150.00	85,050		85,050
4.2.2	Allow for trowel concrete finish	567	m2	12.00	6,804		6,804
<b>2</b>	<b>Breakout and viewing area</b>						<b>91,854</b>

**4.3 Retaining wall and grass bank**

4.3.1	Retaining wall grass bank	86	m2	350.00	30,261		30,261
<b>3</b>	<b>Retaining wall and grass bank</b>						<b>30,261</b>
<b>4</b>	<b>BREAKOUT &amp; VIEWING AREA</b>						<b>184,045</b>

Project: Site Architecture Studio

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Building: Mueha Recreation Centre

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**5 EXTERNAL SERVICES****5.1 External Services**

5.1.1	<u>Water Treatment Works</u>						
5.1.2	Aquarius 18KL ATU and flatbed leach drains	1	Sum	132,800.00	132,800		132,800
5.1.3	RO, filtration and storage tank with chlorine dosing	1	Sum	56,480.00	56,480		56,480
5.1.4	<u>Electrical</u>						
5.1.5	Building main switchboard for the new clubroom	1	Sum	15,000.00	15,000		15,000
5.1.6	Building main switchboard for the new changeroom	1	Sum	5,000.00	5,000		5,000
5.1.7	Submain cabling for the new buildings	1	Sum	10,000.00	10,000		10,000
5.1.8	Underground trenching and conduits	1	Sum	15,000.00	15,000		15,000
5.1.9	Relocation of the Telstra lead in, including underground trenching and conduits	1	Sum	5,000.00	5,000		5,000
5.1.10	Netball Lighting				Excl		0
5.1.11	SMSB works				Excl		0
<b>1</b>	<b><u>External Services</u></b>						<b><u>239,280</u></b>
<b>5</b>	<b>EXTERNAL SERVICES</b>						<b>239,280</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 211020_Schematic Design Cost plan
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**6 DESIGN CONTINGENCY**

**6.1 Design Contingency**

6.1.1	Allowance for Design Contingency	4.0	%	2,357,338.90	94,300		94,300
<b>1</b>	<b>Design Contingency</b>						<b>94,300</b>
<b>6</b>	<b>DESIGN CONTINGENCY</b>						<b>94,300</b>

<b>Project:</b> Site Architecture Studio	<b>Details:</b> 211020_Schematic Design Cost plan
<b>Building:</b> Muchea Recreation Centre	

Autocode	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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**7 CONSTRUCTION CONTINGENCY**

**7.1 Construction Contingency**

7.1.1	Allowance for Design Contingency	5	%	2,357,338.90	117,900		117,900
<b>1</b>	<b>Construction Contingency</b>						<b>117,900</b>
<b>7</b>	<b>CONSTRUCTION CONTINGENCY</b>						<b>117,900</b>

**Project:** Site Architecture Studio  
**Building:** Muchea Recreation Centre

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Attachment 1  
Attachment 4

Autoco de	Description	Quantity	Unit	Rate	Subtotal	Factor	Total
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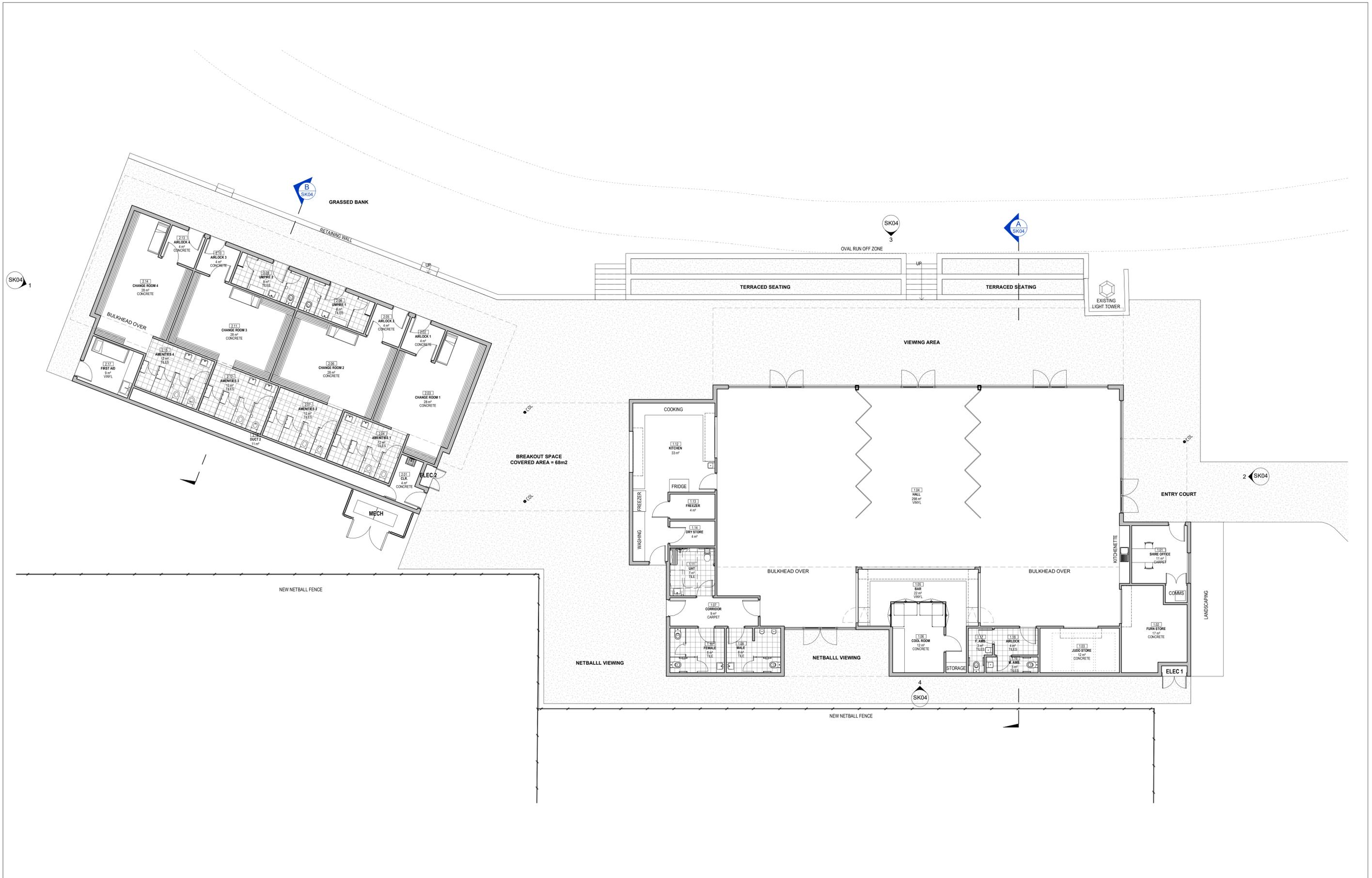
**8 PROFESSIONAL FEES**

**8.1 Professional fees**

8.1.1	Allowance for Professional fees based on Site email dated 18/10/21	1	Sum	200,000.00	200,000		200,000
<u>1</u>	<u>Professional fees</u>						<u>200,000</u>
<b>8</b>	<b>PROFESSIONAL FEES</b>						<b>2,769,261</b>

CEO03 - 05/22  
CEO04 - 02/22





SK02 FLOOR PLAN  
Scale 1 : 100

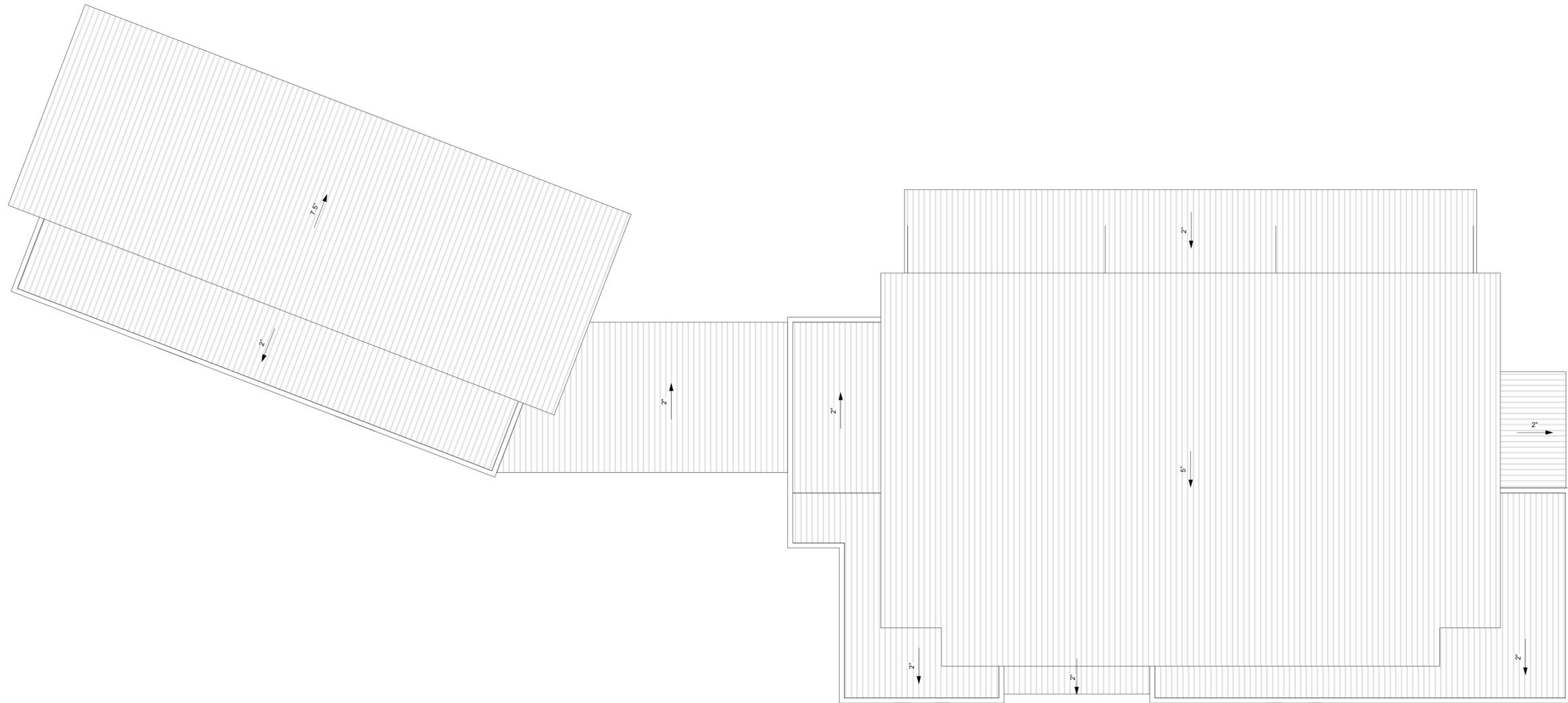


MUCHEA RECREATION CENTRE

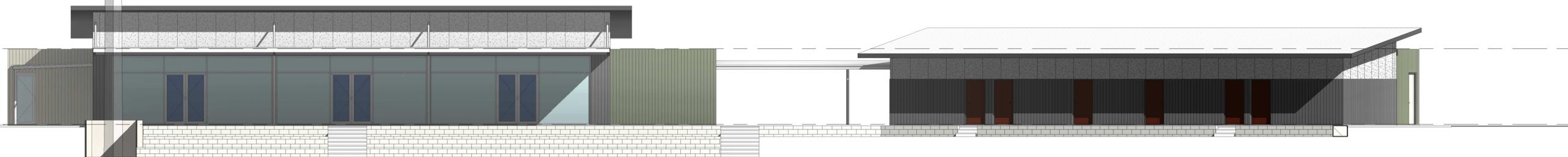
Shire of Chittering

Project number 22105  
OCTOBER 2021



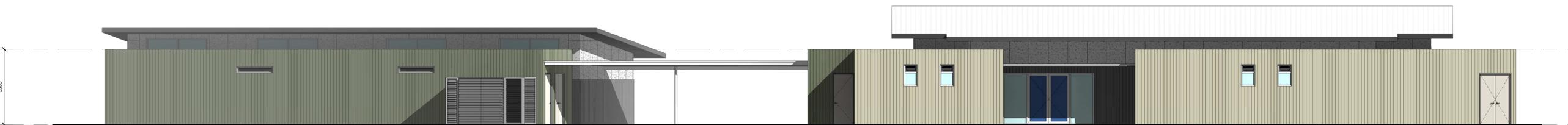


57.460 FCL ▾ PARAPET  
3500  
53.960 FFL ▾ GROUND FLOOR



**EAST ELEVATION**  
1 : 100

57.460 FCL ▾ PARAPET  
3500  
53.960 FFL ▾ GROUND FLOOR



**WEST ELEVATION**  
1 : 100

57.460 FCL ▾ PARAPET  
3500  
53.960 FFL ▾ GROUND FLOOR

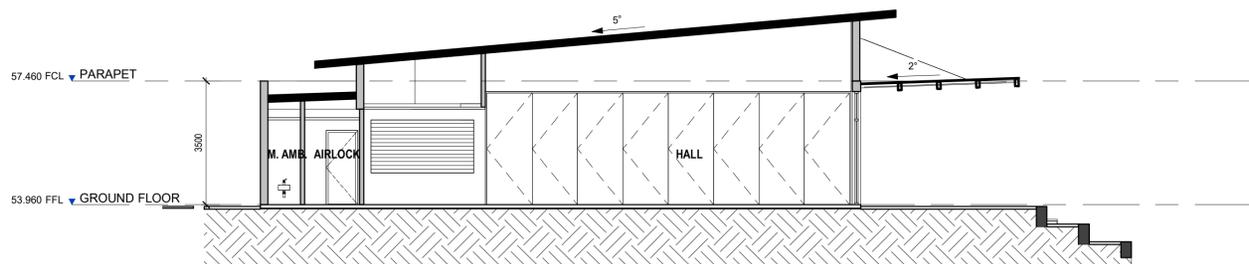


**NORTH ELEVATION**  
1 : 100

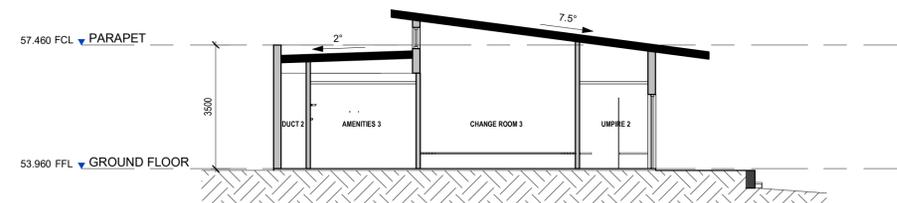
57.460 FCL ▾ PARAPET  
3500  
53.960 FFL ▾ GROUND FLOOR



**SOUTH ELEVATION**  
1 : 100



**SECTION A - BUILDING 1**  
1 : 100



**SECTION B - BUILDING 2**  
1 : 100

**CEO04 – 12/21 Muchea Recreation Centre – Project Update**

<b>Applicant</b>	SOC
<b>File ref</b>	GRT.CSRFF.Muchea Hall
<b>Author</b>	Community Development Coordinator
<b>Authorising Officer</b>	CEO
<b>Disclosure of interest</b>	Neither the Author nor Authorising Officer have any Impartiality, Financial or Proximity Interests that requires disclosure or relevant details
<b>Voting requirements</b>	<b>Absolute Majority</b>
<b>Attachments</b>	<ol style="list-style-type: none"> <li>1. Muchea Recreation Centre SD Cost Report. QS estimate</li> <li>2. Budget exclusions</li> <li>3. In kind funding</li> <li>4. Floor plans and elevations</li> <li>5. Muchea Changerooms only Cost Estimate &amp; Site plan.</li> <li>6. Muchea Function and Changerooms on Hall Site Cost Estimate &amp; site plan.</li> <li>7. Muchea Total Project (Reference Group Design) cost estimate &amp; site plans.</li> <li>8. Project Tracker – MRC.</li> <li>9. Muchea Cost Estimates. Option 1 &amp; 3</li> </ol>

	<b>Authority / Discretion</b>	<b>Definition</b>
<input type="checkbox"/>	Advocacy	<i>When Council advocates on its own behalf or on behalf of its community to another level of government/body/agency.</i>
<input checked="" type="checkbox"/>	Executive	<b><i>The substantial direction setting and oversight role of Council. e.g. adopting plans and reports, accepting tenders, directing operations, setting and amending budgets.</i></b>
<input type="checkbox"/>	Legislative	<i>When Council initiates or adopts a policy position, or a local law.</i>
<input type="checkbox"/>	Quasi-Judicial	<i>When Council determines an application/matter that directly affects a person's rights and interests. The judicial character arises from the obligation to abide by the principles of natural justice. Examples of Quasi-Judicial authority include development applications, building permits, applications for other permits/licences (e.g. under Health Act, Dog Act or Local Laws) and other decisions that may be appealable to the State Administrative Tribunal.</i>
<input type="checkbox"/>	Information	<i>Includes items for information purposes only and do not require a decision of Council (to 'note' only).</i>

**Executive Summary**

Council is requested to make a decision to provide further direction to officers on how to proceed with the Muchea Recreation Centre project in light of recent discussion by Council.

**Background**

The Muchea Recreation Centre Reference Group resolved at the 25 October 2021 meeting that the Muchea Recreation Centre Project would be placed on hold to enable Shire staff to seek direction from Council with regard to the budget of the project, in light of potential funding shortfalls and sharply increasing costs of construction across Western Australia.

It was suggested that Council would need to consider the following three options:

1. Resolve not to proceed with the project;
2. Re-design the project to reduce the scale of the project, to reduce the cost to within budget; or
3. Approve a contingency amount to be drawn down on, likely to be in the order of 30% of the total project cost.

The following items were to be updated and submitted to the November Ordinary Council Meeting:

- The Project Manager to provide Council with an up to date total project budget outlining inclusions/exclusions, list and cost breakdown of all other materials and services to be provided by the Shire of Chittering as part of the project, any proposed future staging and an up to date funding strategy including clubs contributions and potential staging:
  - Stage 1: Construction of the Muchea Recreation Centre
  - Stage 2: Demolition of Muchea Town Hall
  - Stage 3: Upgrade of the Muchea Netball Courts
- Additionally, the Shire Project Manager was to document the contracting strategy including in-kind costs as this will be required for the tendering process.

At this meeting it was acknowledged that any delays will impact on the capacity of Site Architecture Studio to meet agreed timeframes.

Due to the time required to prepare this information, the above items were not available for the November Ordinary Council Meeting and have subsequently been tabled for the December 2021 Ordinary Council Meeting. See attachments 1 – 7.

It was requested that a session for Council be held that would cover the background of the project, progress to date, and a potential path forward. As part of the discussion that was to take place, it was requested of staff to prepare costings of the following three options:

1. Option 1: Retain the current design concept, demolish the existing hall and develop a new layout over the sight of the existing hall.
2. Option 2: Retain the existing club rooms (hall), build the proposed change rooms only, and delay construction of the new club rooms to a later date:
3. Option 3: Proceed to tender based on the designs developed in conjunction with the Muchea Recreation Centre Reference Group.

A Council Workshop for the project was held on Thursday, 2 December 2021. The intention of this session was to brief new Councillors on the background of the project, progression of the project to date and for Council to consider the financial implications of any decisions pertaining to this project as determined by Council Resolution at the December Ordinary Council Meeting. While no decisions were made at the workshop, there appeared to be a mixture of support for all three options, however, a majority appeared to indicate a desire to proceed with trying to complete the project in full.

### **Consultation/Communication Implications**

#### Local

The following Muchea Recreation Centre Reference Group Meetings have been held with minutes tabled at Council.

- 22 July 2021
- 17 August 2021
- 30 August 2021
- 13 September 2021
- 28 September 2021

- 25 October 2021

A project page is available on the Shire Website with all relevant publically available documents uploaded to this page.

State

Not applicable

**Legislative Implications**

State

Nil

Local

Nil

**Policy Implications**

State

Nil

Local

Nil

**Financial Implications**

Nil – the additional costs will be covered under an already established budget for the project, however future decisions as a result of the direction set may have a financial implication.

**Strategic Implications**

Local

- Strategic Community Plan 2017-2027

Focus area: Our community

Objective: S1.1 An active and supportive community

Strategy: S1.1.2 Develop and enhance existing recreation and social facilities for local communities

Objective: S1.2 Strong sense of community

Strategy: S1.2.3 Activate our local centres and towns

Focus area: Our Build Environment

Objective: S3.1 Development of local hubs

Strategy: S3.1.1 Plan for new and enhanced community facilities

Objective: S3.3 Improved infrastructure and amenities

Strategy: S3.3.1 Improved asset management across all asset classes

Focus Area Strong Leadership

Objective: S5.3 Accountable Governance

Strategy: S5.3.1 Good governance which supports efficient and effective service delivery

State

Nil

**Site Inspection**

Not applicable

**Risk Assessment / Implications**

Potential risk implications for Council to consider as part of this agenda item are outlined below:

*Reputational Risk*

The intention of the Muchea Recreation Centre Reference Group was to provide valuable input to inform site placement and floor plan based on their knowledge of the facility's construction and operational activities. To this end significant time has been invested by the Project Manager and Architect to understand and design in user needs and requirements. For Council to override the preferences of a community based reference group, a reputational risk exists. Council remains the overriding decision making body, however, even despite the best of reasons, this may only mitigate the risk to a certain extent.

**Officer Comment/Details**

A point of contention that has arisen out of the course of the development of this project has been the standard of netball courts and the need to have four courts should the Muchea Netball Club grow to a position where they have the ability to, and desirability to return to the South Midlands Netball Association. The last time that the Muchea Netball courts have been used for this purpose was for a single round in 2018. Over the past few years, there have been several representations made to the Shire regarding the inability for netball clubs to grow in a Shire that has a small population, the netball courts not being of a sufficient standard and the netball courts being of a sufficient standard. Currently the facility is only used as a training venue and has not required four courts of a competition standard. It should be noted that this has not stopped Council from continuing to support the need for four courts.

The current netball courts have been problematic for several years with issues due to underground water, aging surface, poor lighting and limited viewing options due to the proximity of the boundary fencing to the court area. The opportunity to redevelop the remaining three courts and along with the installation of a new 4<sup>th</sup> court to meet local competition standard could attract funding under the Community Sporting and Recreation Facilities Fund Small Grants Program for projects up to \$300,000 or the Annual Grants Program for projects up to \$500,000, where up to one third of the total project cost can be awarded.

Site Architecture Studio, at the 17 August 2021 Muchea Recreation Centre Reference Group Meeting, outlined that a site feature survey had been undertaken. This survey informs the room available to build the facility and the relationship of the facility to users. It also enabled the architects to consider how the community can take best advantage of the facility. The survey enabled site to look critically at the location and the proposed building. Site Architecture provided 2 alternative site solutions to the placement and design of the building for consideration of the group of which Option 1 above was presented along with Option 3. Option 3 as presented by Site Architect was the preferred option of MRC for the site position for the new building.

Shire Officers have recently been advised by the Department of Local Government Sport & Cultural Industries of the Minamata Convention on Mercury, ratified by Australia on 7 December 2021. The Convention aims to eliminate the source of mercury pollution by prohibiting the manufacture and trade of certain lamps containing mercury. Australia is expected to implement this by March 2022. This may have implications for the existing Netball Court lighting and necessitate a replacement of these which has not been included in existing plans and will mean that any lighting works required by building a new court will be required in the coming years anyway. There will be opportunity for the Shire to seek funding under the Club Night Lights Program for sports floodlighting infrastructure of up to one third of the total estimated project cost (excluding GST) up to a maximum grant of \$1 million.

At the Council briefing session held on 2 December 2021 Council discussed the implications of resource and

material shortages and the potential for cost escalation. Highlighting that there is considerable risk that the Total Project Cost will exceed Budget.

Council discussed that the total redevelopment cost including all other items and services are not yet known. With the Shire's total contribution potentially exceeding \$1.846M for the total site redevelopment, Council must acknowledge and approve the total redevelopment cost, including all exclusions.

Amongst all of the discussion and costings, a consideration has not been made toward the opportunity cost of staff time. That the cost does not change, the staff time for this project could be utilised for other projects and services that Council wish to provide, so further efforts to further define costs may reduce other projects and services provided to the community.

Three of the options that have been discussed are:

**Option 1 - Demolish the existing hall, retain the current change rooms design and develop a new layout over the sight of the existing hall.**

Whilst this has an obvious short term impact on the majority of users within the facility, 'for the greater good' this approach may lead to an improved layout, retention of existing netball facilities, slightly lower capital cost and overall long term benefit to the community.

Whilst there will be savings in retaining the original netball court, the court is reaching end of life. The subsequent upgrade to the existing court and development of a new architectural design to fit into the space currently occupied by the existing hall will add further cost. Refer to costings as supplied by Project Manager in Attachment 9.

While there is a slight saving, in pursuing this option, it will be a less attractive option for the users of the facility as it will provide inferior usage and viewing for football and cricket and less connection with netball for the coming fifty year lifespan of the facility.

**Option 2 - Retain the existing club rooms (hall), build the proposed change rooms only, and delay construction of the new club rooms to a later date.**

Council discussion outlined that this fulfills the immediate user requirements for new change rooms at reduced site development cost, and may lessen the impact on Netball.

In the short term it would alleviate Council of the exposure to rising construction prices however it then exposes Council to construction price variations over the longer term, increasing the risk. This option would also leave Council with the maintenance and upgrade of an aged facility that has reached its end of life projections and requires considerable upgrade to meet existing user requirements, particularly the ablutions and kitchen facilities.

Financing costs in the future are also unknown, while currently financing is the cheapest it has been for the past sixty years and sits lower than historical averages. The ability of the Shire to lock in interest rates below the Consumer Price Index targets set for the Reserve Bank make financing projects at this time very attractive.

**Option 3 – proceed to tender based on the designs developed in conjunction with the Muchea Recreation Centre Reference Group.**

Council discussed that this option retains the existing hall for the duration of the build, enabling existing hall user needs to be met, however has a short term impact on the Netball Courts with the need to utilise

the space of one of the existing courts for optimal building placement.

While this plan may be slightly more expensive, potentially only \$1,000 per year for the life of a 20 year loan that has a 0% real interest rate, it does provide a better long term solution for the site.

While it does create a problem of having a netball facility that cannot host rounds of the South Midlands Netball Association, though this may not be different to the current situation. This could be rectified by as early as 2023, and due to the building schedule, at most only a couple of months of the season may be missed. This hardship would be less than that of missing the full season of one of the sports should the hall be required to be demolished first. The hardship would also only eventuate should the Mucnea Netball Club move to the South Midlands Competition in 2021, an option that they could forego for one year to minimise the hardship on the club.

Having spent considerable time working on this project and the problems of the project, further delays to the project may not in the end make large difference to the overall cost, especially when taken into account over the long term, and the true costs will not be known until a tender is received. This is some of the reasons why the officer recommendation is to proceed to tender utilising a design that places the clubrooms over the site of a current netball court.

It is noted that in follow up discussions with Council, opinions may differ and the Council preference may be to seek further costings. If this is the case, then the decision for Council to make may be:

That Council:

1. Instruct the CEO to develop designs for option 1 & 3 with detailed costings for both of these designs.
2. Instruct the CEO to procure professional services to provide detailed costings of all of the project exclusions.
3. Support "in principle" a stage 3 plan that will incorporate the redevelopment of the Mucnea Netball Courts to provide 4 courts that are consistent with competition standards as specified by Netball Australia
4. Direct the CEO to undertake an audit of the existing courts at Mucnea hall to inform a detailed report and subsequent budget for the stage 3 plan.

#### OFFICER RECOMMENDATION

That Council:

1. Approve the Chief Executive Officer to proceed to tender for the construction of the Mucnea Recreation Centre Project based on the designs developed in conjunction with the Mucnea Recreation Centre Reference Group;
2. Instruct the Chief Executive Officer to procure professional services to provide detailed cost estimates for the project, including all of the assignment exclusions. To be completed by the Council Meeting that at which Council is to receive the tender;
3. Support "in principle" the third stage of a plan that will incorporate the redevelopment of the Mucnea Netball Courts to provide four (4) courts that are consistent with competition standards as specified by Netball Australia; and
4. Direct the Chief Executive Officer to undertake an audit of the existing courts at Mucnea Hall to inform a report and budget for Stage Three of the plan that is to be included in Council's consideration of the 2022/2023 Annual Budget.

**ALTERNATIVE MOTION / COUNCIL RESOLUTION 111221****Moved Cr King, seconded Cr Hughes****That Council:**

1. Instruct the CEO to procure professional services to provide detailed cost estimates for each of the three options listed in item 2 below, including all of the assignment exclusions and services proposed to be supplied the Shire, associated infrastructure, services and utilities;
2. Confirm the three options to be costed are:
  - a) Option 1 – Retain the Muchea Hall, build the proposed new club room over the existing netball court, build the new change room, build a new fourth netball court (in a 2 x 2 configuration) with lighting, refurbish the existing three netball courts with upgraded lighting as required, replace the existing machinery storage shed, then demolish the Muchea hall and redevelop the area;
  - b) Option 2 – Demolish the Muchea Hall upfront, retain the current change rooms design and develop a new layout over the site of the existing hall, refurbish the netball court surfaces and upgrade lighting, and replace the existing machinery storage shed
  - c) Option 3 - Retain the Muchea Hall and allow for essential refurbishment only, build the new Change Rooms only, decommission the existing change rooms, and refurbish the existing four netball court surfaces and upgrade lighting.
3. Instruct the CEO to provide a report on the sources of secured project funding, including the Shire's contribution, community contribution from grants, donations and in-kind sources;
4. Authorise the Architects professional services fee to be funded from the undrawn budget allocation for professional services; or if not sufficient, authorises additional allocation from the current budget;
5. Instruct the CEO to table a report at the February 2022 Ordinary Council Meeting or at a Special Council Meeting if the information is available earlier.

**CARRIED BY ABSOLUTE MAJORITY 4 / 3**

TIME: 7.52pm

***For: Cr King, Cr Hughes, Cr Dewar, Cr Curtis******Against: Cr Ross, Cr Angus, Cr Campbell***