

Scope of Work – Technical Criteria

POOL FILTRATION & WATER TREATMENT



Stage 1 Works

Cabonne Council

DATE: 24/04/2024

Design & Construct Brief Issue

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1 INTRODUCTION

Background

Cabonne Council has seven (7) across the Local Government Area. These are currently operated and maintained internally by Cabonne Council.

The seven pools are a highly valued by the communities they serve. All seven pools were built over 50 years ago with a commonality of design and engineering across the older infrastructure.

Due to the age of the plant rooms and water treatment systems there are some reliability and non-compliance issues. Cabonne Council is committed to maintaining these valued community assets.

For this reason, Cabonne Council successfully applied for a NSW Government Grant through the Resources for Regions – Round Nine (9) – Program.

The primary focus of the Cabonne grant is the Pool Plant Rooms these upgrades will provide energy efficiency, circulation, filtration and chlorination improvements whilst reducing risk and enabling operational / maintenance benefits.

Cabonne's Pools are of an older configuration with the circulation and filtration rates below recommended. Upgrades to plant rooms will be facilitated through system designs that utilise common plant, filters, Cl analysers, pumps and products that are commonly used within the pool industry.

Council is looking to engage a suitably qualified contractor with the capacity and capability to undertake the completion of the design and construction of the various plant rooms as defined in stage one (1) of this document. The technical scoping criteria are detailed within this document, the Pool Contractor is responsible for the final detailed design, project co-ordination, installation, and commissioning.

The project will be delivered in two (2) stages – these will be within the off-seasons of 2024 and 2025 respectively. As there seven (7) Cabonne Pools the work scope has been split into 2 (two) groups.

2024 – Stage One

- Molong
- Cumnock
- Yeoval
- Canowindra

2025 – Stage Two

- Manildra
- Cudal
- Eugowra

The purpose of this design brief is to document a Design & Construct scope covering Pool Water Treatment (PWT) for Stage 1 PWT Works. These works are based on a fixed price contract sum for the following pool sites: -

1. Canowindra Pools
2. Molong Pools
3. Cumnock Pools
4. Yeoval Pools

Council has consider the key outcomes for consideration of the project and described as the critical success factors. The contractor is to consider these in every aspect of the project.

Critical Success Factors:

- Pool turnover rate
- Water quality in accordance with the guidelines, refer to performance criteria
- Completion prior to 24/25 pool season commencement
- No WH&S incidents
- Pool Plant Operation – ease / uniformity across similar sites
- Pool Plant – key operating equipment – mechanical/electrical integrity

1.1 General

All work including the quality and standard of all workmanship, materials and systems shall be in full compliance with all relevant Australian Standards and Statutory Regulations.

Contract 1674466 – Cabonne Pools Scope of Work Technical Criteria - RevC

Stage 1 works are to design and construct upgraded pool filtration systems to the 4 pools outlined below. This does not include any major structural changes to the existing pools to incorporate the required reticulation and additional inlets to the pools OR separation of the pool systems. Stage 1 Works shall be accordance with 2013 NSW Health Advisory Document Section 7.2.8 “Upgrading existing outdoor pools”

1. Canowindra Pools - shall maintain the existing filtration system with upgraded pumps and associated reticulation within the pool plant room.
2. Molong Pools - shall have filtration plant capacity to meet the existing 33m pool system in accordance with “NSW Public Swimming Pool and Spa Pool Advisory Document”. This capacity shall serve both existing pools.
3. Cumnock Pools - shall have filtration plant capacity to meet the existing 25m pool system in accordance with “NSW Public Swimming Pool and Spa Pool Advisory Document”. This capacity shall serve both existing pools.
4. Yeoval Pools - shall have filtration plant capacity to meet the existing 25m pool system in accordance with “NSW Public Swimming Pool and Spa Pool Advisory Document”. This capacity shall serve both existing pools.

Separation of pool systems for Items 2,3 & 4 above shall not be in Stage 1 Works.

Stage 1 works shall be designed to allow future work upgrades in creating a dedicated filtration and water treatment system to the toddler pools. This includes allowance to the new pool control panels in Stage 1 for spare space for electrical components and sufficient capacity in the pool panel PLC for analogue terminations and remote monitoring to a dedicated toddler pool system.

Commissioning shall be at maximum allowable flow rates via the existing reticulation systems to the pools.

Where the design brief nominates a higher quality or standard of workmanship and or materials than the relevant Standards or Regulations; the contractor shall allow compliance with the higher or greater standard of workmanship or material. Any anomalies or discrepancies between the design brief, Advisory Documents and Australian Standards shall also allow compliance with the higher or greater standard of workmanship or material shown.

Requirements with respect to program, all required insurances, payments, submissions, procedures, quality assurance, defects liability, warranty and other contract conditions in addition to the requirements of this design brief shall be as detailed in the contract conditions.

1.2 Tender Submission

Tender submissions must include a conforming tender to this design brief. Alternative offers may only be accepted on the provision of a conforming tender submission and clearly identify alternatives showing advantages and benefits to the client inclusive of operational costs and life of the proposed plant.

Tender submissions must also include confirmation of: -

1. Plant capacities for the pool system(s)
2. Filter pump curve data and number of filter pumps per system inclusive of overload parameters.
3. Make and models of all equipment noted within this design brief.
4. Alternatives must include technical data and supporting information confirming the benefits.

The client and or their agents will not provide an oral interpretation of the tender documents. Any requests for an interpretation shall be made in writing to the Client and shall be processed in accordance with the Conditions of Tendering. Canvassing of the client, or any of its staff or its consultants may result in disqualification of the tender.

1.3 Specialist Contractor Experience

Specialist commercial pool filtration and water treatment contractors with capable and proven experience of 10 years or greater for works similar to this tender scope.

Due to the importance of the pool water treatment scope to the aquatic facilities, the successful tenderer selected is not necessarily determined on price only. Level of experience, available resources during the contract including servicing capability of post completion works throughout defects liability period (DLP) are also factors considered.

1.4 Definitions

For the purposes of this design brief and the associated drawings, the following definitions shall apply.

"approved" and "approval"	shall mean approval in writing by the aquatic consultant or approved representative.
"authority" and "utility"	shall mean local, state or commonwealth authorities, companies or bodies having jurisdiction over the work specified.
"client"	shall mean Cabonne Council.
"head contractor"	shall mean contractor responsible for the site and to the client.
"contract"	shall mean all work in connection with this design brief, contract engagement between the contractor and head contractor
"contractor"	shall mean the specialist contractor engaged for the Pool Water Treatment works and "head contractor" if responsible for the site and to the client.
"drawings"	shall mean all drawings provided for the project.
"aquatic consultant"	shall mean Cabonne Council or approved representative.
"pool water treatment" or "PWT"	shall mean all work in connection to pool water treatment services as detailed on the design brief and drawings.
"project"	shall mean Stage 1 PWT Works
"provide"	shall mean supply, install, test, commission and warrant the item or work specified.

1.5 Performance Guarantee

The contractor shall provide a performance guarantee to the Client in accordance with this design brief. The tenderer must accept this requirement under the contract. The performance guarantee is to ensure all PWT works under the contract meet the objectives of this design brief and are fit for purpose.

1.6 Practical Completion – Completion of the Whole of the Works.

Practical completion for the works can be requested following completion of works and documentation has been provided and approved including, but not limited to the following:

- Commissioning of the pool water treatment plant
- Operating and Maintenance Manuals
- All maintenance equipment
- Electrical certification
- As built drawings and circuit diagrams
- Initial Staff training
- Equipment and installation warranties
- Lab results of water sample demonstrating performance objectives.
- All submissions to the respective approval of the Contract Administrator and relevant authorities.

The Contractor is to make good and areas of the site that have been impacted by construction activities.

2 SCOPE OF WORKS – TECHNICAL CRITERIA

The scope of works technical criteria is provided for Stage 1 includes the supply, installation, testing, commissioning, handover and guarantee of the following items.

2.1 Design Responsibilities

The pool water treatment element and performance criteria of the swimming pool works is covered in the Design Brief document. The Contractor is responsible for finalising the design component, coordination of the works required for installation and to ensure operation of the final system installation, complies with the technical performance criteria and all applicable standards and best practices. The Pool Water Treatment Contractor must warrant the system installation ensuring that it meets the performance requirements and is fit for purpose.

Contractor will be responsible for ensuring the completed designs fully comply with the performance criteria described within the documentation. Contractors will be required to attend site to become familiar with the site constraints at each site.

The Contractor is to consider Section 5.6 – Work Health and Safety Management: Design in Preliminaries document. Specifically *“Ensure, in carrying out the design that, so far as is reasonably practicable, the Works and Temporary Work, including all structures and plant, are designed to be without risks to anyone who constructs, uses, maintains, or demolishes the Works and Temporary Work.”*

The design is to be approved by the Councils representative prior to commencement of work. The design documentation is to include:

Plant layout drawing identifying location of all main components and equipment of the plant room. The drawings should include a plan view and sectional views that show key operational areas.

A site plan showing pipeline routes, size and type of pipe, power and dosing schematic is to be included.

Performance outcomes of the selected equipment to demonstrate the equipment satisfies the criteria. The design is to have consideration of operation and maintenance areas as well as safety in design characteristics.

Contractor is to undertake calculation of the Total Dynamic Head (TDH) of the pump to achieve the flow rate performance as described in the performance design specification.

Contractor is to engage a licensed electrician for compliance with the Electrical Standards and the design requirements.

2.1.1 Shop drawings

The nominated Contractor shall provide shop drawings as detailed within this specification following award of tender for review and approval by the Project Superintendent’s representative to ensure that the nominated design and equipment selections are fit for purpose.

2.1.2 Quality Management

Refer to Preliminaries Section 4.1. The contractor will be required to submit with their quality management plan a detailed inspection and test plan that outlines key activities

2.2 Pool Filtration and Water Treatment

1) Canowindra Pools

- a) New Pool Control Panel
 - i) Interlocked with all associated equipment
 - ii) Flow safety devices (Kelco paddle switch)
 - iii) Flow Rate Sensor (Burkert 8045)
 - iv) Touch display unit
 - v) Winterisation / Overnight mode switch override
 - vi) Graphic display remotely accessible via VPN
 - vii) Hourly logging of chlorine and pH levels for remote monitoring
- b) New pumps, pump strainers, pump plinths & Variable Speed Drives
- c) Service Existing Filters
- d) New Dry Feeder Systems
- e) New Dry Acid dosing systems
- f) New water make up system
- g) Level Sensors
- h) Chemical Control Dosing – Reuse existing Chemtrol Units OR
Supply and install new Prominent diaLog 700 Pool Package, Chemtrol or approved equal
 - i) Automated
 - (1) Chlorine feed via free Chlorine sensor
 - (2) Sodium Bisulphate (Dry Acid) via pH sensor
 - (3) 4-20mA signal to Pool Control Panel for status and logging i)
- Commissioning manual draft provided 4 weeks prior commencement
- j) Operating manuals draft provided 4 weeks prior to commissioning
- k) Painting and labelling of exposed pipe work.
- l) Labelling of valves
- m) Removal of redundant equipment and materials
- n) Plant room floor to be patched and epoxy coated
- o) Remove all redundant components from site to a waste depot.

2) Molong Pools

- a) New Pool Control Panel
 - i) Interlocked with all associated equipment
 - ii) Flow safety devices (Kelco paddle switch)
 - iii) Flow Rate Sensor (Burkert 8045)
 - iv) Touch display unit
 - v) Winterisation / Overnight mode switch override
 - vi) Graphic display remotely accessible via VPN
 - vii) Hourly logging of chlorine and pH levels for remote monitoring
- b) New pipe work reticulation within pool plant to suit new flows
- c) New pumps, pump strainers, pump plinths & Variable Speed Drives
- d) New Filters
- e) Service existing Gas Chlorine System and apply latest safety standards
- f) New Dry Sodium Bicarbonate dosing 250L tank system c/w motorised stirrer
- g) New water make up system
- h) Level Sensors
- i) Chemical Control Dosing – Reuse Existing Prominent Unit OR
Supply and install new Prominent diaLog 700 Pool Package, Chemtrol or approved equal
 - i) Automated
 - (1) Chlorine feed via free Chlorine sensor
 - (2) Sodium Bicarbonate Solution via pH sensor

- i) 4-20mA signal to Pool Control Panel for status and logging
- j) Commissioning manual draft provided 4 weeks prior commencement
- k) Operating manuals draft provided 4 weeks prior to commissioning
- l) Painting and labelling of exposed pipe work.
- m) Labelling of valves
- n) Removal of redundant equipment and materials
- o) Plant room floor to be patched and epoxy coated
- p) Establish new plant room floor and enclosure for new filters (maintain all other equipment within existing plant room.
- q) Remove all redundant gravity filter components from site to a waste depot and make good.

3) Cumnock Pools

- a) New Pool Control Panel
 - i) Interlocked with all associated equipment
 - ii) Flow safety devices (Kelco paddle switch)
 - iii) Flow Rate Sensor (Burkert 8045)
 - iv) Touch display unit
 - v) Winterisation / Overnight mode switch override
 - vi) Graphic display remotely accessible via VPN
 - vii) Hourly logging of chlorine and pH levels for remote monitoring
- b) New pipe work reticulation within pool plant to suit new flows
- c) New pumps, pump strainers, pump plinths & Variable Speed Drives
- d) New Filters
- e) Service existing Gas Chlorine System and apply latest safety standards
- f) New Dry Sodium Bicarbonate dosing 250L tank system c/w motorised stirrer
- g) New water make up system
- h) Level Sensors
- i) Chemical Control Dosing – Reuse Existing Prominent Unit OR
Supply and install new Prominent diaLog 700 Pool Package, Chemtrol or approved equal
 - i) Automated
 - (1) Chlorine feed via free Chlorine sensor
 - (2) Sodium Bicarbonate Solution via pH sensor
 - (3) 4-20mA signal to Pool Control Panel for status and logging
- j) Commissioning manual draft provided 4 weeks prior commencement
- k) Operating manuals draft provided 4 weeks prior to commissioning
- l) Painting and labelling of exposed pipe work.
- m) Labelling of valves
- n) Removal of redundant equipment and materials
- o) Plant room floor to be patched and epoxy coated
- p) Establish new plant room floor and enclosure for new filters (maintain all other equipment within existing plant room.
- q) Supply and install new wet deck grating system for flow increases. Includes retiling on pool and concourse side of the wet deck grate similar to Molong site.
- r) Demolish and remove from site redundant gravity filter components including concrete filter shell and make good.
- s) Utilise existing gravity sand filter cells as a back wash tank. Supply and install back wash pump to existing sewer location at a rate not more than 2L/s. Remove all internal materials from site and make good internal surfaces.

4) Yeoval Pools

- a) New Pool Control Panel
 - i) Interlocked with all associated equipment
 - ii) Flow safety devices (Kelco paddle switch)
 - iii) Flow Rate Sensor (Burkert 8045)
 - iv) Touch display unit
 - v) Winterisation / Overnight mode switch override
 - vi) Graphic display remotely accessible via VPN
 - vii) Hourly logging of chlorine and pH levels for remote monitoring
- b) New pipe work reticulation within pool plant to suit new flows
- c) New pumps, pump strainers, pump plinths & Variable Speed Drives
- d) New Filters
- e) Service existing Gas Chlorine System and apply latest safety standards
- f) New Dry Sodium Bicarbonate dosing 250L tank system c/w motorised stirrer
- g) New water make up system
- h) Level Sensors
- i) Chemical Control Dosing – Reuse Existing Prominent Unit OR
 - Supply and install new Prominent diaLog 700 Pool Package, Chemtrol or approved equal
 - i) Automated
 - (1) Chlorine feed via free Chlorine sensor
 - (2) Sodium Bicarbonate Solution via pH sensor
 - (3) 4-20mA signal to Pool Control Panel for status and logging
- j) Commissioning manual draft provided 4 weeks prior commencement
- k) Operating manuals draft provided 4 weeks prior to commissioning
- l) Painting and labelling of exposed pipe work.
- m) Labelling of valves
- n) Removal of redundant equipment and materials
- o) Plant room floor to be patched and epoxy coated
- p) Establish new plant room floor and enclosure for new filters (maintain all other equipment within existing plant room.
- q) Supply and install new wet deck grating system for flow increases. Includes retiling on pool and concourse side of the wet deck grate similar to Molong site.
- r) Demolish and remove from site redundant gravity filter components including concrete filter shell and make good. Disposed of at licensed landfill.
- s) Utilise existing gravity sand filter cells as a back wash tank including landscape pump for cycling back wash water. Irrigation pump to have strainer lid for manual dosing of sodium thiosulphate to dechlorinate water. Supply & install valves and pipe work to also allow emptying of tank for irrigation purposes. 50NB male camlock to be installed for connection.

2.3 Associated Works by Others

2.3.1 By the Client

- a. Workcover Applications and other Authority approval for the delivery and storage of pool chemicals if applicable.
- b. The supply of all operational chemicals (via specific supply Agreements established with relevant chemical suppliers) prior to the intended plant commissioning date.
- c. Trade Waste Agreement for the periodic disposal of collected sludge contained within the backwash detention tank.
- d. Periodic microbiological testing of pool water via an independent NATA approved laboratory (on at least two occasions during the first 12 months operation).
- e. Any service Agreements that may be necessary (after the defects maintenance period) for the preventative maintenance of essential plant and equipment.
- f. Sim cards for remote access to pool panel PLC

3 PWT PARAMETERS

3.1 Operational Parameters

Brief of required facilities and operational parameters are summarised as follows: -

Tenderers are to note this detail is provided for information purposes only. Tenders are to undertake their own assessment of the equipment required to achieve the performance criteria as highlighted below in yellow.

As an example, Southern Cross Star-Line pumps are the selected model, however the Tenderer is to confirm the performance, including calculation of the Total Design Head (TDH) and therefore size the pump that best meets criteria shown. TDU shall not exceed 20m.

Table 1 – Operational Parameters

3.1.1 Canowindra Pools

Description	Outdoor 25m Pool	Outdoor Program & Splash Pad
Pool Surface Area (m ²)	325	78
Pool Tank Volume (m ³)	480	78
Process Treatment	Calcium Hypochlorite / Dry Acid	Calcium Hypochlorite / Dry Acid
Recirculation Rate (m ³ /hr)	170 (47 l/s)	85 (24 l/s)
Nominal Turnover Rate (hrs)	2.9	0.87
Auto Control		
pH Set Point	7.6	7.6
Chlorine Set Point (mg/L)	3.5	3.5
Manual Dosing		
Alkalinity (mg/L)	80-110	80-110
Calcium Hardness (mg/L)	180-250	180-250
Cyanuric Acid (mg/L)	20-30	20-30
Water Balance Index	0.0 – 0.2	0.0 – 0.2
Existing Filter Make	Neptune Benson	Neptune Benson
Existing Filter Model	SP-33-48-732	SP-27-48-487
Filtration Rate (m ³ /hr/m ²)	3.20	2.39
Pumps	Pentair Southern Cross “Star-Line” Stainless Steel 4 Pole	Pentair Southern Cross “Star-Line” Stainless Steel 4 Pole
Pump Pressure at Design Flow (m)	16	16
Nominated Model	150x125-250 11kW	125x80-200 7.5
No Off	1	1
Filter Pump VSD	Zener 8000	Zener 8000

Nominated Figures – Required filtration plant capacity parameters under Stage 1 Commission system to maximum capable flow for each pool.

3.1.2 Molong Pools

Description	Outdoor 33m Pool	Outdoor Toddler Pool (Future Only)
Pool Surface Area (m ²)	462	40
Pool Tank Volume (m ³)	614	12
Process Treatment	Chlorine Gas / Sodium Bicarbonate	Chlorine Gas / Sodium Bicarbonate
Recirculation Rate (m ³ /hr)	236 (66 l/s)	16 (4.4 l/s)
Nominal Turnover Rate (hrs)	2.6	0.74
Auto Control		
pH Set Point	7.6	7.6
Chlorine Set Point (mg/L)	3.5	3.5
Manual Dosing		
Alkalinity (mg/L)	80-110	80-110
Calcium Hardness (mg/L)	180-250	180-250
Cyanuric Acid (mg/L)	20-30	20-30
Water Balance Index	0.0 – 0.2	0.0 – 0.2
	Stage 1 Works	Part of 33m System
Sand Filter (m2)	2.4	Part of 33m System
No Off	4	Part of 33m System
Back Wash Volume (m3) / Filter	<7	Part of 33m System
Filtration Rate (m3/hr/m2)	25.1	Part of 33m System
Pumps	Pentair Southern Cross “Star-Line” Stainless Steel 4 Pole	Part of 33m System
Pump Pressure at Design Flow (m)	15	Part of 33m System
Nominated Model	125x100-250 7.5kW	Part of 33m System
No Off	2	Part of 33m System
Filter Pump VSD	Zener 8000	Part of 33m System

Nominated Figures – Required filtration plant capacity parameters under Stage 1
Commission system to maximum capable flow to both pools

3.1.3 Cumnock Pools

Description	Outdoor 25m Pool	Outdoor Toddler Pool (Future Only)
Pool Surface Area (m ²)	225	45
Pool Tank Volume (m ³)	326	21
Process Treatment	Chlorine Gas / Sodium Bicarbonate	Chlorine Gas / Sodium Bicarbonate
Recirculation Rate (m ³ /hr)	116 (32 l/s)	20 (5.6 l/s)
Nominal Turnover Rate (hrs)	2.8	1.0
Auto Control		
pH Set Point	7.6	7.6
Chlorine Set Point (mg/L)	3.5	3.5
Manual Dosing		
Alkalinity (mg/L)	80-110	80-110
Calcium Hardness (mg/L)	180-250	180-250
Cyanuric Acid (mg/L)	20-30	20-30
Water Balance Index	0.0 – 0.2	0.0 – 0.2
	Stage 1 Works	Part of 25m System
Sand Filter (m2)	1.5	Part of 25m System
No Off	3	Part of 25m System
Back wash Volume (m3)/Filter	<4	Part of 25m System
Filtration Rate (m3/hr/m2)	25.8	Part of 25m System
Pumps	Pentair Southern Cross “Star-Line” Stainless Steel 4 Pole	Part of 25m System
Pump Pressure at Design Flow (m)	15	Part of 25m System
Nominated Model	100x65-200 4.0kW	Part of 25m System
No Off	2	Part of 25m System
Filter Pump VSD	Zener 8000	Part of 25m System

Nominated Figures – Required filtration plant capacity parameters under Stage 1
Commission system to maximum capable flow to both pools

3.1.4 Yeoval Pools

Description	Outdoor 25m Pool	Outdoor Toddler Pool (Future Only)
Pool Surface Area (m ²)	225	35
Pool Tank Volume (m ³)	270	13
Process Treatment	Chlorine Gas / Sodium Bicarbonate	Chlorine Gas / Sodium Bicarbonate
Recirculation Rate (m ³ /hr)	116 (32 l/s)	15 (4.2 l/s)
Nominal Turnover Rate (hrs)	2.8	0.88
Auto Control		
pH Set Point	7.6	7.6
Chlorine Set Point (mg/L)	3.5	3.5
Manual Dosing		
Alkalinity (mg/L)	80-110	80-110
Calcium Hardness (mg/L)	180-250	180-250
Cyanuric Acid (mg/L)	20-30	20-30
Water Balance Index	0.0 – 0.2	0.0 – 0.2
	Stage 1 Works	Part of 25m System
Sand Filter (m2)	1.5	Part of 25m System
No Off	3	Part of 25m System
Back wash Volume (m3)	<4	Part of 25m System
Filtration Rate (m3/hr/m2)	25.8	Part of 25m System
Pumps	Pentair Southern Cross “Star-Line” Stainless Steel 4 Pole	Part of 25m System
Pump Pressure at Design Flow (m)	15	Part of 25m System
Nominated Model	100x65-200 4.0kW	Part of 25m System
No Off	2	Part of 25m System
Filter Pump VSD	Zener 8000	Part of 25m System

Nominated Figures – Required filtration plant capacity parameters under Stage 1
Commission system to maximum capable flow to both pools

3.2 Flow Design Criteria

The basic design criteria are as follows:

Flow Rates

The design flow rates for the pools indicated above represent the average flows between clean and dirty cycles of the filters.

New sand filters to be supplied and installed shall have a maximum filtering rate of: 26 m³/ hour/ m² and quantities of filters for each system shall be designated as in the tables above.

Flow rates across each pool are to be balanced to achieve required flows to each pool if both pools are interconnected.

3.3 Pool Water Velocities

The design shall allow for the following maximum pipe work water velocities within the new works: -

- Pool Pump Suction – not greater than 1.3 m/s
- Pool Pump Discharge – not greater than 3.0 m/s
- Pool Plant Header Pipe Work – not greater than 2.4 m/s
- Concrete Encased Pool Filtered Water Headers – not greater than 2.4 m/s
- Pool Filtered Water – not greater than 2.8 m/s
- Gravity Feed Soiled Water (1:00 Fall) – not greater than 0.75 m/s
- Small Bore Water Feature (50NB or less) – not greater than 2.4 m/s AND 10m/100m Hydraulic Gradient

Any pipework with velocities above 1.5 m/s is to have sufficient thrust and pipe supports.

Note: Canowindra Pool not applicable as plant room pipe work is to remain with only pump & strainer upgrade applied.

3.4 Australian Standards & Guidelines

SHPN (EH) 130037

NSW Public Swimming Pool and Spa Pool Advisory

Document Public Health Regulation 2012 - Schedule 1

AS1023	Low Voltage Switchgear and Control gear - Protection of Electric Motors.
AS1029	Low Voltage Contactors.
AS1202	AC Motor Starters.
AS1318	Colour And Identification.
AS1345	Identification of Piping, Conduits.
AS1359	AC Motors - General Requirements.
AS1379	Design brief and Supply Concrete.
AS1428	Design for Access and Mobility.

Contract 1674466 – Cabonne Pools Scope of Work Technical Criteria - RevC

AS1431 Elements.	Low Voltage Switchgear and Control gear - Control Circuit Devices and Switching
AS1926	Swimming Pool Safety
AS1939	Protection of Control Boards.
AS2032	Installation of PVC pipe systems
AS2129	Flanges for Pipes, Valves and Fittings.
AS2184	Low Voltage Switchgear and Control gear - Moulded Case CircuitBreakers.
AS2610.1	Spa Pools - Public Spas.
AS2818	Guide to Swimming Pool Safety.
AS3000	SAA Wiring Rules.
AS3100	Approval and Test Design brief - General Requirements for ElectricalEquipment.
AS3112	Approval and Test Design brief - Plugs and Socket-Outlets.
AS3136 Swimming Pools.	Approval and Test Design brief - Electrical Equipment for Spa-Baths and Spa and
AS3147	PVC Insulated Cables for Working Voltages Up To 0.6 KV.
AS3191	Electric Flexible Cords.
AS3198	Electric Cables - XPLE Insulated Cables - For Working Voltages 0.6/LKV.
AS3439.1	Low Voltage Switchgear and Control gear Assemblies.
AS3500	National Plumbing and Drainage Code.
AS3600	Concrete Structures.
AS3661	Slip Resistance of Pedestrian Surfaces.
AS3735	Concrete Structures for Retaining Liquids.
AS3780	The Storage and Handling of Corrosive Substances.
AS3833	The Storage and Handling of Mixed Classes Dangerous Goods inPackages and Intermediate Bulk Containers.
AS4276	Water Microbiology Series.
AS5104	General Principles on The Reliability of Structures.
AS60227.5	Polyvinyl Chloride Insulated Cables of Rated Voltages Up to And Including 450/750 V - Flexible Cables (Cords).
BCA	Building Code of Australia.
EPA	Environmental Protection Authority Requirements.
HB241	Water Management for Public Swimming Pools and Spas.
SR148	Plumbing Regulations.

3.5 Contractor's Submissions

Review of contractor's technical data & drawing submissions shall not be considered as a design check, nor will it relieve the contractor of any responsibility to ensure that the works are constructed in accordance with this design brief. Acceptance of the contractor's technical data and drawing submissions does not imply acceptance of any variation from the contract.

3.5.1 Workshop Drawings

Workshop drawings shall be submitted by the contractor within the requirements of the construction programme.

Workshop drawings are to conclude with the final issue of "For Construction" prior to any commencement of works. Submission shall also include a functionality description of the PWT system.

Submitted drawings must show system schematics, pool layout, plant layout, details, sections and interfaces with related services and or structures. Drawings are to be provided in electronic format including pdf copies. Revit 2022 shall be used to provide a model of the PWT scope.

As a minimum requirement, the contractor's working drawings shall include the following: -

- Process Schematic
- Plant room layout and plant sections not smaller than 1:25
- Piping layout and sections not smaller than 1:50
- Electrical switchboard, wiring & control diagrams

Allowance shall be made by the contractor under the construction programme for a period of ten working days for review of each submission.

3.5.2 Technical Data

Technical data submission for all equipment shall be provided for review by the Client prior to any procurement of any equipment.

3.5.2.1 Pumps

Submission of filter pump technical data shall be provided in the tender submission.

4 PIPE WORK, VALVES & FITTINGS

Unplasticised PolyVinyl Chloride (UPVC) pipework and fittings shall be used and comply with the requirements of AS/NZS 1477 “PVC pipes and fittings for pressure applications”.

Joints unless otherwise specified shall be of the socket formed solvent cement welded type. Flanged joints shall be used for connecting all items of equipment and shall be of the loose ring type complete with EPDM gaskets and galvanized backing rings.

Bends and fittings shall be of the short radius moulded type unless otherwise specified. Couplings shall be provided to allow for thermal expansion and contraction.

4.1 Pipe Work

All pipe work shall be installed in accordance with AS/NZS 3500, AS/NZS 2032. Pool water treatment pipework materials shall be as listed in the schedule below.

Pool Water Treatment System	Pipework Material
SOILED WATER 150NB and Less	Class 12 UPVC Pressure Pipe
SOILED WATER 200NB and Greater	Class 9 UPVC Pressure Pipe
FILTERED WATER 150NB and Less	Class 12 UPVC Pressure Pipe
FILTERED WATER 200NB and Greater	Class 9 UPVC Pressure Pipe
BACKWASH 80NB and Less	Class 12 UPVC Pressure Pipe
BACKWASH 100NB and Greater	Class 9 UPVC Pressure Pipe
DRY FEEDER	Class 12 UPVC Pressure Pipe

All piping systems shall be complete with fixings, valves, fittings, vents, drains, expansion facilities, anchors, supports and other items necessary for the satisfactory operation of the systems as intended.

Prior to and during installation, all pipework shall be thoroughly cleaned with open ends sealed to prevent the ingress of dust, water and general building debris.

Responsibility shall be accepted by the contractor for all damage that arises because of debris entering pipework and equipment. Any damage caused because of debris entering pipework and equipment shall be repaired at the contractor's expense.

All pipework shall be installed to meet structural and architectural requirements to achieve a neat appearance with adequate provision for concrete shrinkage, expansion, contraction, grading, alignment, and access for maintenance with not less than 50mm clearance between the external surfaces of pipes (including insulation where applicable) and all adjacent services and building structures.

4.1.1 Pipe Work - In Ground

4.1.1.1 Trench Bottoms

Trench bottoms shall be examined for irregularities and any hard projections shall be

removed. 4.1.1.2 Pipe Support and Bedding Material

All bedding material shall be crusher dust or granular sand containing little or no fines shall

be used. Variations in the hard bed shall not exceed 10% of the bedding depth.

Minimum bedding and overlay depth and side support for bedding underlay shall be in accordance

with WSA 03-2011-3.1 and is as follows: -

- Bedding: 100mm
- Overlay: 150mm
- Side support: 150mm (each side of pipe)

The side support materials must be carefully placed around the haunches of the pipes to ensure that the pipes are evenly supported.

Unless otherwise specified, the pipe side support and pipe overlay material used should be identical with the pipe bedding material.

The pipe overlay material should be levelled and tamped in layers to a minimum height of 150 mm above the crown of the pipe.

Detector tapes, or marker strips, should be laid on top of the overlay once a layer of 150mm backfill soil has been compacted.

4.1.1.3 Back Filling

All material for backfilling shall be free from debris and compacted in maximum 300mm layers.

4.1.2 Pipe Work Cast in Pool Shell Concrete

All pipework cast into pool concrete structures shall be supported and braced within the structure. Rubber Ring Joints (RRJ) shall only be used for construction joints with armourflex surround 500mm long from the joint.

All pipework shall be hydraulically pressure tested to 100kPa prior to and during concrete placement. The test shall be maintained until the concrete is fully cured and may be left under pressure until continuation of the pipe run is to be installed.

4.1.3 Pipe Work Fixing Systems

All pipework fixings shall be applied to accommodate thermal expansion and the combined loads of the pipework, pipe contents, valves and fittings.

Minimum 5mm thick UPVC packers shall be provided below all fixing floor plates and where any fixing is in contact with the floor slab to avoid contact with surface water. All fixing cut ends shall be cold galvanized and be provided with proprietary end caps.

Pool plant pipe work is to be supported from the plant room floor and shall be provided with a rubber isolation strap between the upvc pipe wall and the metal pipe fixing and or saddle. Saddles or straps shall be minimum 25mm wide.

Submerged pipework in balance tanks shall be fixed with 316L stainless steel fixings.

316L stainless steel pipe work supports above balance tank water operating level are to be epoxy coated with minimum application of 2 coats.

Direct contact of dissimilar metals shall be avoided. Flanges and connecting bolts shall be compatible with the connecting pipework material.

4.1.4 Pipe Support Spacing

Maximum Spacing of Supports for all Classes of PVC Pressure Pipe for Water

Size DN	Maximum Support Spacing	
	Horizontal (m)	Vertical (m)
15	0.60	1.2
20	0.70	1.4
25	0.75	1.5
32	0.85	1.7
40	0.90	1.8
50	1.05	2.1
65	1.20	2.4
80	1.35	2.7
100	1.50	3.0
125	1.70	3.4
150	2.00	4.0
175	2.20	4.4
200	2.30	4.6
225	2.50	5.0
250	2.60	5.2
300	3.00	6.0

4.1.5 Pipe Penetrations

All pipework penetrations through the pool structure shall have puddle flanges and be sealed with Hydrotite or equivalent either side of the puddle flange within wall thickness and to provide a watertight seal to the approval of the aquatic consultant. Flexible connections shall be installed for in ground pipe work entering the structural tanks. Flexible connection metal components are to be coated twice with bitumen and wrapped in Denso tape as indicated on PWT drawings.

4.2 Valves, Fittings & Gauges

All valves and accessories shall be installed in positions easily accessible for operation and maintenance. Valves shall be located as close as possible to points of support and labelled. Ferrous metal valves shall not be used for pool water.

Valves <80mm shall have compression union, threaded or SWJ connections in joining pipework materials. Valves >065mm shall have Table E flanged connections in accordance with AS2129.

4.2.1 Manual Ball Valves – Plastic Pipe Work for 50NB or Less

Manual operating ball valves shall be UPVC true union type with barrel union SWJ connections, PTFE seats, EPDM o-rings and double o-ring stem seals. Valve ends shall be compatible with the pipework material.

Ball valves used for chemical dosing shall have Viton seals.

Compact type ball valves (direct glued without unions) will not be accepted.

4.2.2 Manual Butterfly Valves – Plastic Pipe Work for 65NB or Greater

Manual operating butterfly valves shall be UPVC wafer type with allowance for AS2129 table E standard bolt hole pattern, EPDM liner, stainless steel disc and stem with notch plate for lever handle type.

4.2.3 Manual Diaphragm Valves

Manual operating diaphragm valves shall be true union type with EPDM diaphragm, NBR sealing ring, opening limiter and position indicator.

4.2.4 Solenoid Valves

Solenoid valves shall be normally closed ABS bodied, water hammer resistant, zero differential pressure acting with NBR diaphragm and seal. Actuating coil shall be 24VAC.

4.2.5 Gauges

All gauges shall be stainless steel, bottom entry glycerin filled with minimum Ø80mm face and metric measurement in kilopascals (kPa) for pressure and degrees Celsius (°C) for temperature. The gauge range shall be selected to provide a needle range across the gauge representing 125% of the operating parameters. All pressure gauges shall be provided with isolation valves to permit removal without interruption to the connecting system. All temperature gauges shall be provided with thermowells to permit removal without interruption to the connecting system.

5 EQUIPMENT

5.1 Filters

- have a proven in-service record in Australia,
- be manufactured from reliable materials,
- meet the specified design requirements,
- be fitted with components that can be readily obtained within Australia
- air relief and venting system
- inlet and outlet pressure gauge points

5.1.1 Medium Rate Sand Filters

Sand filters shall be Chadson model MHS, Waterco SMD or approved equal. Multiport valves will not be accepted. Filter test pressure ratings shall be equal or higher than 350kPa.

5.1.1.1 Operating Requirements

The filter circulation and piping systems ensure that the filter bed is always under positive pressure. A filtered water loop above the top of the filter bed must be provided where necessary to meet this requirement, complete with automatic air valve and manual valved bleed, hard piped to waste.

5.1.1.2 Backwashing

The rate of backwashing must provide sufficient bed expansion to achieve high efficiency during backwash. Backwashing shall be plumbed for shunt operation.

5.2 Foot Valves

Foot valves shall be 316 stainless steel and fixed to the sump base. Foot valves shall include screen inlets with a minimum operable surface area of no less than 4 diameters. Maximum free area is not to exceed 50%. Chadson Engineering foot valves are to be one nominal diameter size larger than pipe work line size.

Supplier details: Rodney Industries (07) 3624 0300 / Chadson Engineering [\(08\) 9344 3611](tel:0893443611).

5.3 Pump Strainers

Pump strainers shall be Fulfab 20-03 or approved equal. Pump strainers are to have the following:

1. Flanges vanstoned to inlet/outlet nozzles, flanges shall be AS-2129 Table D
2. Finish; Stainless Steel, as welded, acid passivated, natural finish with galvanised inlet flanges.
3. Filter shell manufactured from Grade 316 Stainless
4. Standard screen details based on perforated Stainless-Steel sheet with 03.25 holes on 4.52 ctrs (46% open area)
5. A spare basket is to be provided per model size used.
6. Inlet and Outlet sizing are based on soiled water suction velocities under Section 4.

Supplier details: Chadson Engineering [\(08\) 9344 3611](tel:0893443611).

5.4 Pumps

5.4.1 General

Provide centrifugal, single stage, back pull-out electrically driven motor pumps for all main circulating pumps. All pumps must be of common manufacture and designed for easy removal of all wearing parts for inspection and maintenance.

5.4.1.1 The pump casing must be zinc free bronze or 316 stainless steel, of uniform composition and thickness to withstand effectively all pressures that may be produced due to normal working pressures or pressure surges. Eye bolts and lugs must be provided for lifting purposes.

5.4.1.2 The impeller must be statically and dynamically balanced on the shaft and accurately machined and fitted to reduce friction and leakage loss to a minimum. Each pump must be selected with maximum impeller diameter.

5.4.1.3 The impeller must be made from phosphor bronze and must comply with BS 1400 and must be zinc-free to grade PB 3-C or other suitable material. The shaft must be stainless steel.

5.4.1.4 Pump must be fitted with mechanical seals and all pumps must be suitable for service in heated chlorinated pool water.

Pump sets must be horizontal motor pump type complete with corrosion proofed galvanized support frames mounted on concrete plinths.

5.4.1.5 Plinths must be supplied under all pumps and must be complete with 25mm radius chamfer edges.

Feature pump shall be of Pentair Southern Cross ISO Starline or approved equal with equalising/flushing connection to zone between impeller and back plate.

5.4.2 Back Wash Pumps

Submersible back wash pump shall be Grundfos “AP” 316 stainless steel model or similar suitable for discharge to sewer at 2 L/s.

5.4.3 Working Conditions

Ensure that all pumps offered are compatible with the system characteristics. The pumps must have adequate suction lift and must operate entirely free of cavitation under all operating conditions. Pumps shall be installed from approved technical data curves provided at tender.

5.4.4 Noise and Vibration

Noise generated by pool pumping equipment shall be minimised. Supply and install all vibration isolation and noise attenuation required to meet site requirements and to achieve an acceptable working environment for pool operators, as recommended by AS 2107. Waffle pads are the preferred method.

5.4.5 Access Platforms / Walkways / Ladders

Installation of all plant requiring regular operator input shall be readily operable from plant room floor level. Platforms, elevated walkways, ladders and the like will not be permissible.

5.5 VARIABLE SPEED DRIVES

5.5.1 General

The variable speed drives are required to operate on dedicated 30ma RCD protected circuits (one circuit per drive) in a plant room environment. Ambient conditions at Stage 1 PWT Works require VSD capacities to be upgraded one size up from pump motor size. E.g. 15kW pump = 18.5kW rated VSD

VSD units shall comprise of the following:

1. EMC Filters:

The equipment offered is RFI and EMC filtered and is C Tick compliant in accordance with product specific EMC standard AS61800 part 3, 2005.

2. Harmonic Filters:

The equipment offered incorporates substantial DC Bus Choke harmonic reduction filters and is compliant with AS/NZS 61000.3.12.2006 'EMC part 3.12: limits for harmonic currents produced by equipment connected to public low voltage systems'.

Enclosures:

All controllers are housed in minimum IP54 enclosures

Cable Installation:

To ensure installed EMC compliance the motor wiring and earth conductor will be enclosed together within a continuous EMC compliant metallic sheath such as braided EMC compliant cable which has a full 360° metallic gland termination solidly earthed to bare metal at both the motor and the inverter chassis

5.5.2 Operation

The variable speed drive to each pump shall be commissioned to run at a set speed. Commissioned flow rates shall be median between clean and dirty state of filters.

Pump flows shall be commissioned against a certified pump curves during a clean filter state and back pressured to simulate a dirty state of 40kPa additional pressure under maximum operation.

The loading valves are to be set and inhibit adjustment post hand over as the VSDs have been commissioned to the Loading Valve Set Position.

5.6 Chlorine

5.6.1 DRY - Canowindra

Calcium Hypochlorite Feeders shall be serviced and recommissioned for operation by a qualified technician. Old Granudos units are no longer in service with new Prominent ProCals units to be provided.

5.6.2 Gas – Molong, Cumnock & Yeoval

Gas chlorine system shall be serviced and recommissioned for operation by a qualified technician. This includes review of any safety requirements and upgrades required under current regulations.

Gaseous chlorine is controlled and adjusted via rotameter.

5.7 DRY ACID MIXING TANK

Sodium Bisulphate Mixing Tank with motorized stirrer shall be provided. Tank volume shall be minimum of 250 litres capacity and manufactured from stabilised PE. 240V slow speed stirrer shall be mounted on top of tank.

5.8 CHEMICAL DOSING

5.8.1 General

Existing chemical controllers shall be serviced and recommissioned for operation by a qualified technician.

The automated water chemistry system shall be fully electronic with constant LCD display in pH units for pH and both total and free Chlorine shall be in parts per million (ppm).

The probes shall be housed in a proprietary sample cell complete with flow indication and shall be continuously provided with pool water from the recirculation pumps discharge pipework. Each filter/pump system shall have sample lines, isolation and check valve on pump discharge pipe work for operation. The sample line connection at the sample cell shall be provided with a drain valve.

One manufacturer shall supply every item of the water chemistry packages including the method of control. Only proprietary integrated control shall be used. Software driven water chemistry control as a part of the PLC control system will not be accepted.

The water chemistry system shall incorporate high and low limit alarms and sample flow monitoring. The water chemistry system shall be disabled if either the high or low limit alarms are activated or if the sample flow is isolated.

5.8.2 Parameters

System control parameters shall include the following:

pH	0 - 14 pH
Cl (free)	0 – 10 ppm
Cl (total)	0 – 10 ppm

Control	Proportional band
Limits	High and low limit relays

Chemical controller shall be Prominent diaLog7000 Pool Package or Chemtrol approved equal. Additional electronic cards may be installed to existing controllers not able to provide signals to the pool panel PLC.

- Chemical control system to include: -
- pH, free chlorine and total chlorine
 - Probe holder & flow switch assembly
 - Inline filter assembly
 - 25m roll of sample line tube
 - 4-20mA signals for Chlorine and pH levels to the pool panel PLC
 - Chemical Alarm to the pool panel PLC

5.9 Pool Make Up System

The balance tank must be supplied make up water via a non-return valve from within the pool plant room. Connect the system to the cold water supply valve provided by others.

The make-up system must comprise a 'discharge' component and a 'level-sensing' component. The 'discharge' side must include an automatically controlled solenoid valve on the make-up supply and a 'quick-fill' manual bypass valve, both of which must supply to the balance tank.

The 'level-sensing' side must include static pressure level sensing device located over a separate standpipe located within the balance tank.

Level sensors must be to IP68 to withstand immersion. All sensors must be securely mounted. Access to the sensor will be via an access “hatch” in the concourse above.

Solenoid valves must be of suitable manufacture and the make-up line must be fitted with a Sioux Chief water hammer arrestor, sized to suit system characteristics.

6 ELECTRICAL WORKS

6.1 Standards

AS/NZS 3000:2018 and amendments – wiring rules
AS/NZS 61439.1:2016 - low-voltage switchgear and control gear assemblies
AS/NZS 3111:2009 Amd 2:2015 – miniature overcurrent circuit breakers
AS 2184 – moulded case circuit breakers
AS/NZS 3947.4.2-1997 – low voltage switchgear and control gear – contactors and motor starters

Supply and install a complete electrical system for the pool water treatment system and water features. Contractor is to assess any electrical upgrades required to the site and provide a PC sum for any works deemed necessary.

6.1.1 Existing Electrical Services to the Site

6.1.1.1 CANOWINDRA

Mains supply is full 80A 3 phase supply.
Switchboard location – Mounted on Pump shed.
Existing supply into pump shed is full 3 phase submain to an internal sub board. Protected by 100a Circuit breaker.

6.1.1.2 MOLONG

Mains supply is full 80A 3 phase supply.
Switchboard location – Mounted on Pump shed.
Existing supply into pump shed is 20A 3 phase submain to an internal sub board.
Existing circuit is protected by ceramic fuses.
Suggestion only to upgrade circuit protection to circuit breaker.

6.1.1.3 CUMNOCK

Mains supply is full 80A 3 phase supply.
Switchboard location – Mounted on Pump shed.
Existing supply into pump shed is 32A 3 phase submain to an internal sub board.

6.1.1.4 YEOVAL

Mains supply is full 80A 3 phase supply.
Switchboard location – Mounted on Kiosk
Existing supply into pump shed is 32A 3 phase submain to an internal sub board.

6.2 Works Description

Include the final design of switchboard, control panels and control circuits as well as supply of all labour, the supply and installation of all materials, services and equipment necessary for the provision of electrical control and protection systems.

Council (The Principal) will free issue the following equipment that is to be provided by The Principals preferred PLC contractor. The following equipment will be supplied to the contractor for installation at each site:

- 1 x SCADAPack 474 Smart RTU
- 1 x Harmony ST6, 12 inch Touch Panel Screen
- 1 x Ultra eSAM Router kit with GPS B28

The Principals PLC contractor will program and factory test the equipment prior to sending to site.
The contractor will make provision for assistance in commissioning of the Control equipment.

The Contractor is responsible for the development of a full functional description (FD) in consultation with Councils representative. The FD will be required to be submitted with the design documentation that will be approved by Councils representative prior to proceeding – Hold Point.

The Contractor is to include all site wiring between the equipment and the control panel terminal block. The provision of installation of the free-issued equipment will include connectivity to the relevant circuits of the terminal block and tested for functionality during commissioning.

It is assumed the Contractor will determine the best method for integration of the control section within a single board (Sub board) or separated control panel.

The following aspects are to be included in the Contractors submission.

- a. Provision of 20% spare space capacity within the sub board and control panel for future up-grades
- b. Field equipment as specified elsewhere, including: No-flow switches, level sensors in the balance tank and level switches in the backwash tank.
- c. Cable supports and enclosures, including cable trays, conduits, draw wires and the like.
- d. Cabling and conduits (with draw wires) between the sub board and the pool plant which includes, amongst other things, main pumps, chlorine, acid dosing systems level and alarm sensors and solenoid valve in pool water make-up line. Cabling and conduits to the balance tank and to the backwash tank.
- e. Equipotential bonding system for the pool plant and connection of bonding cable from pool side.
- f. Design, installation and commissioning of all necessary plant and associated system controls.

6.3 Regulations and Workmanship

Carry out all work in accordance with this Specification and to the requirements of AS/NZS3000:2018 and amendments and the Supply Company.

Arrange all tests of electrical equipment by the Supply Authority inspectors. Pay all Supply Authority costs associated with the inspections.

Carry-out essential modifications which may be required by the Supply Authority's

inspectors. **6.4 Electricity Supply**

The electrical supply is to be a 3 phase 415/240 volt 50 Hz MEN system. Confirm the fault level applicable at the sub board prior to commencing manufacture of the sub-board.

6.5 Cabling

6.5.1 Final Sub-Circuits

Supply and install all final sub-circuit cables and conduits associated with the water treatment plant and associated enhanced treatment systems.

Provide orange circular PVC insulated, PVC sheathed 0.6/1 kV Grade cables with V-75 thermal rating insulation, and stranded copper conductors not less than 2.5 mm² cross-section.

Provide following colour codes or as otherwise required by the Supply Authority:

- Two core and earth insulation - red, black and green/yellow or brown, blue and green/yellow.
- Three core and earth insulation - red, white, blue and green/yellow.
- Four core and earth insulation - red, white, blue, black and green/yellow.

Size cables to meet the current rating and volt-drop requirements of AS/NZS3000:2018 and amendments.

6.5.2 Control Cables

Supply and install control cables as required for the satisfactory operation of the water treatment plant.

Control cables must be multi-core screened 0.75 sq mm, PVC sheathed. Each core must have white insulation and must be identified by black numerals repeated throughout the length of the cable.

Control cables must include at least two (2) spare cores.

6.6 Earthing

The sub board must be connected to the installation main earth via the earth continuity conductors included in the sub-mains cable or by separate earthing conductors as appropriate.

Earth all 415/240 V motors using the earth continuity conductor in the motor cable.

Individually connect all earthing conductors to the earth bar in the sub-board. Tee- offs or joints of any description in earthing conductors will not be permitted.

Provide Residual Current Device (RCD) protection to all motors of drives in contact with pool

water. **6.7 Equipotential Bonding**

Supply and install equipotential bonding system for all equipment within the pool plant areas in accordance with the requirements of AS 3000. This will include but must not be limited to the bonding of all pumps together with all metal equipment in contact with the pool water.

6.8 Field Equipment

6.8.1 General

Supply and install all necessary field-mounted equipment as required to provide control and protection generally shown on the flow schematics.

Where the requirements of an item of equipment specified or shown in the drawings is not detailed below, seek the approval for a particular brand or type selected for the application.

6.8.2 Level Control System for Balance Tank

The pool water make-up level control and alarm system in the balance tank level indication system will comprise a static pressure sensor with associated fixings and control cabling to the level controller. Operating height range shall be a minimum 60% of the level sensor pressure range.

All level sensors must be suitable for continuous operation in balance tank environments.

Provide level sensor with a multi-core cable to facilitate its termination directly to the switchboard terminals without the need for an intermediate junction box. Provide fixing and cleaning equipment as recommended by the manufacturer. All exposed metal components are to be 316 stainless steel or other material that is not subject to corrosion or contamination under service conditions.

The switching systems must operate from a 24 Volt 50 Hz supply and are to be located and installed within the respective sub-board, in accordance with the manufacturer's requirements and/or recommendations.

Provide the following level sensors for level control and alarms in:

- Backwash tank (float type)
- Balance tanks (static pressure)

6.8.3 Motor Isolators

Supply and install motor isolators in accordance with Supply Company requirements. Provide IP54 high impact polycarbonate switch enclosures.

6.9 Cable Installation Methods

Cable installation methods are to comply with the requirements of AS/NZS 3000:2018 and amendments. Avoid damage to the insulation and sheathing.

No splices will be permitted.

Terminate all multi-strand conductors using crimp lugs or crimp pins as appropriate.

Install all cabling external to the water treatment sub-boards in surface mounted conduit or on non-corrodible cable trays.

Determine the correct conduit and cable tray sizes and ensure that all conduits and/or cable trays are installed in correct locations.

Run conduits in straight lines parallel or perpendicular to the floor and fit with long radius or sweep bends. Run cable trays in a neat and regular manner free from any unnecessary changes of direction.

6.10 Sealing

Effectively seal all openings made for entry of electrical conduits and the like into buildings, trenches and cable ways, with a waterproof grout.

Effectively seal all cable duct openings above ground level with weak mix concrete or other suitable means.

Ensure that all spare conduits and ducts and conduits entering or leaving water containing tanks or enclosures are effectively plugged and sealed.

6.11 Identification

6.11.1 Electrical Equipment

Identify all electrical equipment, instruments, field devices and motors with suitable labels. Labels on the sub-board must be traffolyte, screw fixed.

Fix all labels adjacent to (preferably above, but not directly on) the particular item of equipment to which they apply, with the wording horizontal.

Where the possibility exists of switchgear or other items of equipment being unintentionally interchanged, mount labels both on the item and on the adjacent fixed support.

Provide "traffolyte" labels as follows:

- Identification labels and name-plates; black lettering on white background.
- Warning labels or labels associated with emergency conditions (e.g. "danger", "emergency stop" and the like); white lettering on red background.

All wording on labels is to be in capital block letters.

6.11.2 Wiring and Cabling

Identify all cables (at the time of glanding-off) by means of stainless-steel tags or strips numbered in an approved manner.

Identify power connections at each termination with the appropriate phase colour (including neutrals).

Identify all ends of wires and cable cores (excepting phase conductors), including neutrals at each termination with marker ferrules numbered in accordance with the accepted wiring diagrams. Such markers must not be capable of being accidentally removed during routine maintenance.

6.12 Pool Switchboard (Control Panel/Sub Board))

6.12.1 Control Voltages

Operate all control circuits via 24V AC unless stated otherwise). Power failure relay to turn off all equipment.

6.12.2 Manufacture

Deliver the sub-board to site completely pre-wired complete with all switchboard components and including all equipment necessary for the satisfactory operation of the installation and switch gear for the mechanical equipment in the plant room.

Provide with a minimum of 20% spare space.

6.12.3 Arrangement

Provide free standing sub-board conforming with AS/NZS 61439.1:2016, Form 1, with a fixed inner chassis on which all control fuses, circuit breakers, relays, timers, starters etc. are neatly arranged. Indicators, instruments, switches, push buttons, circuit breakers and designated timers are to be flush mounted on, or arranged to project through, the cubicle door.

Live terminals or wiring are not to be accessible to the operator with the door closed.

Mount door-mounted equipment between 750 mm and 1750 mm above finished floor level with the board in its final position.

Segregate 240V equipment from extra-low voltage equipment. House extra- low voltage relays or timers that switch 240V circuits in the 240V zone.

Arrange equipment in groups for each motor within each zone.

Provide top entry for all cabling to the sub-board unless designated otherwise.

6.12.4 Cabinet

Cabinet shall be Eldon type (Light Grey – RAL7035) or Rittal type (Light Grey) with IP54 protection. Due to ambient conditions at the Grafton Aquatic Centre, provisions shall be made for ventilation or an air-conditioned unit for thermal control of switchboard internals.

Provide appropriate flush mounted door hinges allowing a minimum door swing of 165 degrees. Secure all doors providing access to 240/415V equipment and wiring using a "tool- access" format.

Incorporate three-point fastening for doors larger than 700mm in height.
Allow adequate capacity for future upgrade (separate pool systems) for Molong, Cumnock & Yeoval.

6.12.5 Wiring

Use PVC wiring ducts for all switchboard internal wiring. Colour code wiring as below:

- | | | |
|------------------------------|---|-------------------------|
| □ Power wiring | - | applicable phase colour |
| □ All neutrals | - | black |
| □ Earth Conductors | - | green/yellow |
| □ LV Control wiring actives | - | brown |
| □ ELV Control wiring actives | - | grey |

Use 0.6/1 kV grade, V75 thermal rating, PVC insulated stranded copper conductors, minimum conductor size 2.5 mm² for power wiring.

Use 0.6/1 kV grade, V75 thermal rating, PVC insulated stranded copper conductor, minimum conductor size 1.5mm² for control wiring.

Install all wiring in PVC wiring ducts having a minimum spare capacity of 30%.

Wire equipment mounted on doors with PVC insulated flexible conductors.

Use crimp pins or lugs on all terminations with no more than two (2) conductors at any single terminal.

Ensure that:

- No strands are cut during cable stripping and crimping; and
- No uninsulated conductor is exposed where the wire enters lugs.

Install rail-mounted, double-sided, tunnel-type terminal strips of Klippon type minimum size SAK4 manufactured from polyamide or suitable alternative in the boards with separate terminals for each incoming and outgoing control wiring and for each incoming and outgoing conductor. Separate ELV and LV terminals with barriers.

Size terminal strips to allow for minimum 20% spare capacity. Use brass cable glands for all cables terminated in the sub-board.

6.12.6 Neutral Links and Earth Bars

Provide separate neutral links and earth bars of either brass or copper adjacent to the incoming and outgoing terminal strips with sufficient suitably - sized terminals for all internal and external earth or neutral connections plus a minimum of ten (10) percent spare terminals. Provide a separate terminal for each connection.

Connect all instrument cases, gland plates, transformer frames, panel doors (which include door mounted), equipment chassis and other exposed metal parts to the earth bars using PVC insulated copper earth wire of minimum size 2.5 mm².

The neutral links and earth bars will be connected to the main neutral links and main earth bars via neutral and earthing conductors in the water treatment plant sub-mains cable.

6.12.7 Sub-Board Equipment

6.12.8 Main Switch and Isolator

Fit a three-pole main isolator to interrupt the incoming supply, rated to break the full load of the board and positioned within 1750 mm of floor level.

The main isolator is to be a MCCB – auto type circuit breaker, Load-Break-Switch or equivalent.

6.12.9 Fuse Links and Fittings

Provide enclosed HRC type fuses complying with AS2005.

6.12.10 Circuit Breakers

Provide circuit breakers of the thermal-magnetic or thermal - hydraulic type complying with AS 3111 and/or AS 2184, temperature-compensated for an ambient temperature range of 0° - 45°C. Toggles are to have trip-free action with positive indication of the "tripped" position.

Contacts must be of non-welding silver alloy and provide effective arc - control means, and all metal parts must be treated to ensure corrosion resistance throughout the life of the breaker.

Circuit breakers are to be suitable for both horizontal and vertical mounting. Dimensions, fixing and wiring arrangements are to permit three single-pole breakers to be readily exchanged for one three-pole breaker and vice versa. Multi-pole breakers have a common tripping mechanism arranged to trip all poles simultaneously for a fault on any pole.

Select ratings in accordance with the manufacturer's recommendations for the actual load with due allowance for motor starting conditions.

Symmetrical fault-current-breaking capacities are to equal or exceed the following minimum values:

1. for sub-main isolators 18 kA (to be confirmed on site)
2. for final sub-circuit breakers 14 kA (to be confirmed on site)

6.12.11 Motor Starters

Provide motor starters complying with AS/NZS 3947.4.2-1997 and classified as follows:

- Duty: Suitable for both Intermittent 12 starts per hour and Uninterrupted.
- Utilisation category: AC3
- Mechanical endurance: not less than 3 million cycles

In addition, provide starters for drives rated at greater than 7.5kW and up to 18.5kW that comply with the following requirements:

6.12.12 Motor Thermal Protection Relays

Protect motors against small, sustained overloads by means of thermal overload relays with elements connected in all three phases. These relays must compensate for changes in ambient temperature and be capable at a single thermal setting of disconnecting the motor from the supply at any load condition above 50% of full load whenever single phasing occurs.

Thermal overload relays must be adjustable and suited to the full load current of the motor that they are to protect. Confirm motor full load current prior to installation and the final setting prior to commissioning. Thermal overload relays are to be manual reset type and are to be provided with a test facility. Thermal overload relays are to be of same manufacture as the contactors provided under Motor Contactors above.

6.12.13 *Indicator Lights*

Provide indicator colours within the TDU schematic generally as follows,

- RED – Stopped,
- GREEN- Run
- AMBER or ORANGE – Fault

6.12.14 *Control Transformer*

Provide control transformer continuously rated for 150%t of the maximum load VA taken from the secondary winding. Primary and secondary windings must be electrically separated and a metallic screen between primary and secondary windings provided.

6.12.15 *Timers*

Provide electronic adjustable timers via the TDU.

6.12.16 *Relays*

Provide single pole relays with not less than 2 contacts rated at not less than 10 amps - 240 V.

6.12.17 *Selector Switches*

Provide graphical switches within the TDU of all electrical equipment.

6.12.18 *Central Processing Unit (CPU).*

All outputs are to be disabled on power failure, and all process equipment stopped. On restoration of power, a normal sequential plant start-up is to be carried out automatically.

The PLC unit is to be equipped with an erasable, non-volatile, user programmable memory. Program memory is to be fully maintained during power failures for a minimum of forty-eight (48) hours.

A minimum of 20% extra memory is to be provided over and above that required to commission the control system.

Provide systems capable of checking that the content of the memory corresponds to the content of the storage device on completion of loading.

6.12.19 *Inputs/Outputs*

- Discrete Inputs/Outputs

Provide galvanic isolation between field and processor circuitry, and provide effective surge/impulse, noise and transient voltage rejection and indication of the status of all inputs and outputs.

Input modules must operate from voltage free field contacts and be provided a field sensing voltage of 24 V DC maximum.

Discrete outputs consisting of separate voltage free relay contacts and rated for a minimum of 100 mA @ 24 V DC.

Provide analogue inputs and outputs (where required) of the 4-20 mA type current sourced or current sinking units, fully short circuit protected.

Provide accommodation in the input/output racks (above the final commissioned input/ output usage of the system as commissioned) for addition of up to 20% discrete I/O.

6.12.20 *Programming*

Prepare all programs in Australia with all associated documentation.

Submit programme documentation as detailed below for review before implementation and factory testing commences. Provide modified documentation as required to provide a record of the "as commissioned" programme.

Minimum program documentation requirements include:

- A complete listing with comment and mnemonic labels for all inputs, outputs and internal outputs.
- Input/output allocation tables, with the same mnemonics as used in the program listing.
- Block logic and sequence diagrams.

6.12.21 *Controls*

Provide indication of all alarm and fault conditions with alarm resetting procedure for motor thermal overload achieved by resetting the respective overload relay and pressing the "Reset" button. Refer following Clause for touch screen requirements

Base all control circuits on the "fail-safe" principle. In particular:

Failure of relay or contactor coils, failure of contacts to close, or open circuit wiring must not, under any circumstances, lead to damage of other equipment or to unsafe operation of the plant.

As far as possible, protection and alarm circuits are to be energised under normal conditions and are to be de-energised on fault.

Provide volt-free contacts on a separate terminal strip for future transmission of alarm status to building control system. Refer "Controls" section for details.

6.12.22 *Programmable Logic Controller (PLC)*

Supply and install a programmable logic controller (PLC) in the sub-board to control all pumps, chemical dosing systems and auto valves.

6.13 Touch Screen / HMI (Human Machine Interface)

6.13.1 Site Specific Requirements

The system must consist of a Touchscreen Display Unit (TDU) located on the sub-board. Centre of TDU must not be greater than 1500mm high from the floor with minimum size 10" screen.

The TDU must control the water treatment plant routines. The TDU must provide master control over the entire system. Other systems may be monitored for operational status. TDU must monitor the alarms generated by the system. The intent of the system is to control and monitor the water treatment process via the TDU. This must include such items as:

- pH monitor
- Free Chlorine value monitor
- Filter No.1 Pump Fault Status
- Filter No.2 Pump Fault Status (for 2 pump systems)
- Flow Rate Status
- Balance Tank High Level Alarm
- Balance Tank Low Level Alarm
- Back Wash Tank High Level Alarm
- Back Wash Tank Low Level Status (OK to Back Wash)
- Chemical Control Alarm - General
- General Fault (items other than chemical control)
- Winterisation Mode
- Emergency Stop Activation
- RCDs and RCBOs
- Flow switches
- Solenoid control
- Timeclock functions
- 415 VAC and 24 VAC availability/failure
- Hourly logging of chlorine and pH levels covering 12 months

6.13.2 Functional Intent of Control Philosophy:

The system function intent is to include the following: -

Chemical Controller: This unit is to stand alone in controlling dosing systems of acid and chlorine based on set points within the chemical controller. This function is via the 4-20mA output from the chemical controller. The chemical controller is to provide feedback to the PLC with both analogue and digital signals.

Canowindra is dry chlorine dosed via Pro Cal system and is controlled through chlorine analyser Molong, Cumnock & Yeoval is gaseous chlorine dosed via rotameter intent is to retain current system with provision in future to automate. Contractors are requested to provide a price for Automation of these systems as an Option.

PLC / HMI to enable winterisation mode. This is to control pump speed and ramp down to a settable point.

System shut down in the event of no-flow. Other alarms as required as noted in section 6.17.

Where balance tanks are installed monitor levels and enable alarm set points.

A full functional description is to be developed in consultation with Councils representative and provided with the design documentation that will be approved by Councils representative prior to proceeding – Hold Point.

The TDU must communicate to the controlling PLC via RS232/485 or Ethernet protocols. The TDU must be capable of high-speed communication without interfering in process time. Monitoring must be available to multiple users concurrently.

Graphical representation of the system processes must be available on the screen. Control switches must be overlaid on the screen. Machine status must be represented by dynamic bitmaps. These must change colour from red (off state) to green (on state). The bitmaps must be indicative of the machine ie pump bitmap to represent a pump.

The Home Page must have: -

- Current time and date indicated. Time and date must be able to be altered by the user.
- Winterisation / Overnight mode switch override
- Status mode for
 - Water system levels
 - Chemical levels
 - Pumps
 - “OK to Backwash” for back wash tank

Engineering parameters that require alteration must be password protected. (setpoints, timers etc)

6.13.3 Technical Requirements:

- a. The TDU must be 24 Volts DC.
- b. Communications must be via RS232/485 or Ethernet
- c. Alarm page which only shows current alarms and must not be shown when they are reset
- d. Alarms must be time and date stamped
- e. The TDU must be rated IP66 (face only)
- f. The TDU must screen save to a blank screen and must be reactivated by a key touch
- g. Power, communications and fault status of the TDU must be indicated by local LED indicators
- h. Programming must be via a standard serial, Ethernet or USB connection to standard configurable PC
- i. The TDU must have standard cables and drivers for the PLC in use
- j. The TDU must be a backlit LCD screen. The TDU must incorporate a DSTN Passive Matrix 256 colour VGA 640 x 480 pixel LCD module (minimum)

6.13.4 Ancillary Items

- a. Emergency Stop must be hard wired to disconnect output devices
- b. Field equipment must have a local electrical isolator.
- c. The system must provide flow interlocks to peripheral equipment such as chemical dosing.

6.13.5 Electric Motors

Provide electric motors that meet IE3 efficiency standards, designed, manufactured and tested in accordance with the requirements of AS1359. Provide mounting and coupling details to suit the driven device. All motors shall each be provided with Residual Current Device (RCD) protection to AS 3000.

6.13.6 Output Rating

Provide motors having a maximum continuous rating (MCR) at least 10% in excess of the maximum input power required by the driven unit over the whole range of the driven unit's operating characteristic (i.e. a Service Factor of 1.10). The motors must be capable of supplying their continuous rated output at any voltage in the range plus 5.0% to minus 10% of rated voltage and for any frequency in the range 50 Hz plus or minus 2.0%.

6.13.7 Speed

The rated speed of all motors is to suit the requirements of the driven units and is not to exceed 1450 rpm unless otherwise specified.

6.13.8 Starting

Provide motors suitable for starting under full load conditions when coupled to the driven unit. The method of starting is specified elsewhere.

Ensure smooth, positive starting and acceleration in conjunction with the specified starting method used under all conditions of operation.

6.13.9 Connections

Provide a separate terminal for both ends of each winding.

6.13.10 Insulation and Temperature Rise

Provide an insulation class (other than for submersible motors) of not less than Class 130 (Class F) in accordance with AS 2768. The insulation class of submersible motors is not less than Class 155 (Class B) in accordance with AS2768.

The temperature rise of the motor windings (by resistance method) is to be not greater than that applicable to the insulation Class in accordance with AS 1359, Part 32.

6.13.11 Earthing

Provide an earthing stud within the power supply terminal box.

6.14 Controls

6.14.1 Operation

Initiation of various plant functions must include automatic function loops, as follows: -

Contractor is to be aware of the functionality of the equipment and its integration. The contractor is required to make provision for all necessary field wiring back to control panel termination block.

6.14.2 Water Quality Control

Chlorine dosing must be automatically controlled via the chemical controller.

pH control dosing must be injected into the pool filtered water line and must be automatically controlled via the pH sensor and controller.

6.14.3 Winterisation / Night Mode

System shall allow to minimise electrical use during Winterisation or Overnight Mode by reducing the flow rate to the system.

6.14.4 Flow Safety

Flow safety switches shall be supplied and installed to all pumps. Activation of flow switch shall allow for 30 second operation prior to isolating relevant pump system. Flow safety switches shall be Kelco type FB-25 or approved equal.

6.14.5 Pool Water Make-Up System

Level sensing devices in the pool system must initiate pool make-up and provide both high-level and low-level alarm indication and system shut-down in the event of extra low level in the system. The make-up supply must consist of two circuits, level controlled and manual quick-fill bypass.

6.14.6 Level Controls

Balance Tank

Level sensor within the balance tank – Messages on touch screen

high level alarm, low level alarm, low level shut-down”.

Backwash Tank

Low and High Float Sensor - Messages on touch screen

Lo-level – “tank ready for backwash” Hi-level – “do not backwash”

6.15 System Interlocks

6.15.1 Chemical Dosing

The chemical dosing system must shut down in the event of total plant shutdown. If a 'no-flow' condition occurs in the pool water circulation system, the chemical dosing and heating system must shut down (also refer Flow Schematics).

6.15.2 Partial or Total Shut-Down

6.15.2.1 General

The pool water treatment system must be fail-safe in operation after partial or total plant flow failure, i.e. the plant must 'default' to filtering mode following power failure.

6.15.2.2 No-Flow

Failure to establish flow in any pump line must shut down the respective pump (and all associated sub-circuits) until such time as full pump flow has been re-established.

6.15.2.3 Pump Strainer Cleaning - Manual Initiation

Selected pool circulating pump is shut-down at the sub board to permit strainer cleaning. Ancillary systems remain in operation.

Isolating valve on pool side of strainer closed. Cleaning completed. Isolating valve reopened

Selected isolator is switched on, pump is started and main flow re-established.

6.16 Backwash

6.16.1 Operation

6.16.1.1 Canowindra

Back wash procedure with wastewater entering to sewer discharge point.

6.16.1.2 Molong, Cumnock & Yeoval

Following a back wash procedure resulting in wastewater entering the back wash tank, back wash pump shall discharge at 1 L/s to a sewer discharge point.

6.16.2 Pump

Pump shall be Grundfos AP submersible type or similar.

6.16.3 Levels

High- and low-level float sensor is to be supplied and installed and provide indication to the pool control panel TDU (Touch Display Unit).

6.17 Remote Monitoring

Provide option for graphic display remotely accessible via VPN, modem and sim card (provided by Council). Remote Graphic display should provide the following information: -

	DESCRIPTION
*	pH monitor
*	Free Chlorine value monitor
*	Temperature
*	Filter No.1 Pump Fault Status
*	Filter No.2 Pump Fault Status
*	Flow Rate Status
*	Balance Tank High Level Alarm
*	Balance Tank Low Level Alarm
*	Back Wash Tank High Level Alarm
*	Back Wash Tank Low Level Status (OK to Back Wash)
*	Chemical Control Alarm - General
*	General Fault (items other than chemical control)
*	Winterisation Mode

This option provides the operator to remotely review condition of pool water and attend to the issue.

Option also provides the operator to adjust the Winterisation times to suit season and holiday periods.

Filter pressure monitoring allows technician to evaluate when filters require back washing.

Chemical levels also provide indication if there is an issue with the plant or consumable chemicals are required.

Allowance shall also be made for future upgrade to additional filtration systems to the toddlers pools for Molong, Cumnock & Yeoval.

Filtration plant is to operate 24/7 to maintain condition of pool water.

7 MAINTENANCE & SAFETY EQUIPMENT

7.1 Safety Equipment

The contractor shall supply the following: -

- Safety hazard signs for chemical tanks.
- Disposable Face Masks
- Safety gloves and safety visor.
- PVC safety apron
- First Aid kit for each pool plant room.
- Laminated MSDS sheets for all pool chemicals used

8 CONTRACT REQUIREMENTS

8.1 Insurances

Insurances shall be provided in accordance with Clients contract

8.2 Work, Health & Safety

In carrying out the work, the contractor and or their employees and Sub Contractors, shall comply with all requirements under relevant Acts, Regulations, Ordinances and other special requirements of proper Authorities concerning the safe transport, delivery, storage and use of materials, plant, equipment and work processes.

Where any current Australian Standard published by the Standards Association of Australia is appropriate to transport, storage and use or safety precautions, the provisions of that Standard shall be observed except where it conflicts with a statutory or special requirement of a proper more relevant Authority in which case the latter is to apply.

All materials and equipment supplied, and all work methods selected by the Contractor shall comply with the Occupational Health and Safety requirements of NSW and other relevant Authorities having jurisdiction over the specified works.

8.3 Proposed Programme

Contractors are required to submit a preliminary program covering`, procurement and construction of the works and demonstrate their ability to complete the specified works within a proposed time frame.

Programme shall clearly indicate the critical path (complete with all necessary hold points) the extent of all preparatory work & planning, implementation, testing and commissioning.

Extension of time will not be granted due to delays in obtaining necessary materials, labour, tradesmen and the services of sub-contractors or delays due to faulty or unacceptable work.

8.4 Discrepancies & Omissions

Tender drawings shall not be used for construction purposes. It is the responsibility of the contractor to address any constraints and to verify all site dimensions and levels necessary for correct operation of the system.

Revisions or corrections issued during the Tender period will be made only by notice of Addenda. Any revisions or corrections issued during the Tender period shall be covered by each Tenderer and they shall become part of the contract documents.

Drawings provided under the tender documentation demonstrate the intended location of reticulation, major plant and equipment. Omissions from the drawings, such as valves, flexible couplings, supports or for any items deemed essential for fit for purpose operation of the system, shall be supplied and installed as part of the contract without cost variation.

Tender design drawings are not fully detailed and are not to be used as construction documents.

8.5 Operating Manuals & As Builts

8.5.1 Draft Operating Manual

The draft manual shall be forwarded to the head contractor four weeks prior to commissioning of pool systems for approval.

Operating Manual shall include: -

- Instructions of equipment schedules and all operating procedures for pool plant operation.
- Electronic files with an indexing system.
- Equipment schedule
- Manufacturer's literature with an indexing system.
- Schedule of manufacturer's contact details
- Section for manufacturer's warranties
- Chemical water balance table and explanation of chemical dosing to achieve water balance.
- Start-up and shut-down procedures
- Trouble shooting guide
- As built drawings
- Service contact details

8.5.2 Approved Operating Manual

Submit copy of the completed Operating & Maintenance Manuals to the head contractor prior to hand over.

8.6 Commissioning Manuals

Commissioning of the pool water treatment plant shall be undertaken by a technician with practical experience and have a comprehensive knowledge of pool filtration systems.

The contractor is to demonstrate evidence of the water quality performance by submitting a sample of the treated water to a NATA approved Lab. Results are to include:

- E.Coli 0 CFU/100mL
- Pseudomonas Aeruginosa 0 CFU/100mL
- Heterotrophic Colony Count (HCC) Less than 100CFU/mL

Values highlighted above will be the performance parameter for the water quality performance criteria.

Tenderer is to provide optimization of the equipment to meet the hydraulic capacity constraints of the existing reticulation system.

8.6.1 Draft Commissioning Manual

The draft manual shall be forwarded to the head contractor four weeks prior to commissioning of pool systems for approval.

Commissioning Manual shall include: -

- Test sheets with sufficient space available technician's comments and observations.
- Each pool system to have pre-fill and pre-start check lists. Adequate space for photos in the comment section to be allowed for.
- Chemical water balance charts for each pool system
- Chemical readings schedule and associated dosing towards chemical balance.
- Pump schedule and associated pump technical data
- Check lists on all equipment
- Check list of all control functions including TDU system
- Client Sign Off Training List

8.6.2 Approved Commissioning Manual

Submit copies of completed commissioning manual within operating manual to the head contractor prior to hand over.

8.7 Warranties

The contractor shall provide a 12-month warranty period. Defects within the Defects Liability period shall be corrected by the contractor. All site attendances to defects shall be logged and forwarded to the head contractor.

Contractor shall provide all Manufacturer's Warranty details within the operating manuals. Contractor shall be responsible to correct any defects for a period of twelve months commencing from the date of practical completion.

8.8 Chemical Supplies

Three (3) months' supply of specialty or commissioning chemicals as noted below shall be supplied by the contractor at hand over (does not include dry chlorine, acids pH control & dry feeder maintenance): -

- t) Calcium chloride
- u) Sodium bicarbonate

8.9 12 Months Maintenance - DLP

The contractor shall provide twelve (12) monthly preventative maintenance visits during the defect liability period. Service reports shall be forwarded to the head contractor upon completion of each visit.

Service report shall include comments section and attend to associated issues raised by the operator.