Specification

Technical Specification - Network Rechlorination Plant

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Revision details

Version No.	Clause	Description of revision
2	All	Format update, inclusion of appendices into main document, update of references throughout, Introduction, Copyright, General Terms and Definitions added, changed 'shall' and 'should' to 'must' where relevant. 'Principal' replaced with 'Sydney Water'. Minor editorial changes, general removal of duplication with other specifications, removal of reference to "Supplement to WSA 201 (ACP0166)", Clause 1.1 change definition of transportable RCP to 27kL and below per building and permanent to greater than 27kL per building, Clause 2.1 outer pipe material for dosing lines changed from PE/UPVC to DWV, Clause 2.5 Pipework labelling and colouring requirements a), b) and c) amended, the lagging requirement for above ground pipes less than 50mm identified as for potable water, lagging requirements added, additional detail for full bore type valves, additional dot point added for screw type connections, site RPZ requirements for reservoirs added second last dot point, RPZ requirement description added to last dot point, Clause 2.8.1 addition of provision requirements for HMI, Clause 2.8.3 removal of thermostat and heater requirement from third paragraph, amendment of thermostat and heater requirement in fourth paragraph, Clause 2.10 amend 3G requirement to 4G/5G, Clause 2.13 amend first paragraph to "make provisions" for security and access control system rather than supply, "data gathering panel" added to first dot point, addition of three dot points, "reed" added to fifth dot point, Clause 2.18 "combined transfer/mixing pump" added to Transfer and Chemical Batching System, Clause 3.3 the grade of 1 in 75 removed, Section 3.4 part 1) amended, Clause 3.5 lagging materials requirement added to second dot point, site RPZ requirements added third dot point, "minimum 15mm diameter" hose real replaces "UV resistant" in fourth dot point, Clause 4 added requirement for all exposed metallic surfaces to receive WSA 201 protective coating, Clause 4.1 first paragraph - removal of window requirement in dividing wall, and specification of exposure class as 'Moderate' in accordance with WSA 201, amendment of fourth paragraph including removal of first sentence and addition of more detail of locking mechanism, amend fifth paragraph regarding lifting points for removable roof, removal of last sentence, Clause 4.2 'SwiftLift' anchors specified for lifting lugs, Clause 4.4.1 'Pink F5 key' specified as the site fence gate lock compatibility requirement, Clause 4.3 the grade of 1 in 75 removed, 50mm overflow pipe added to last sentence, Clause 4.4 first paragraph uPVC replaces PVC, "solvent welded connection" and "stand-alone valve pit" (replacing new sump requirements) added, last paragraph removed and added to last paragraph of Clause 4.3, Clause 4.7 second paragraph amended re ventilation fans, third paragraph deleted, door vents added for transportable units in fourth paragraph, delete last sentence, Clause 4.8 first, third, fourth dot points amended, last two dot points deleted, Clause 4.9 closable gate removed, Clause 5 first paragraph "window" and "smaller" tank removed, last sentence amended re storage volume calculation, Clause 5.1 tank material uPVC removed, second paragraph replaced, Clause 5.2 high density polyethylene foam sheet added, Clause 5.4 "upward" replaced with "downward" in first dot point, sixth dot point amended re discharge outlet, stub flange connection method added second last dot point, Clause 5.5 "indicator" changed to "transducer", high level and low level switch requirements amended, last sentence deleted, Clause 5.5 high contract LED display included, Clause 5.7 second last sentence amended to include digital display at unloading point and last sentence deleted, Clause 5.7.1 second and fourth dot points replaced, Clause 6.1.1 "self-priming" replaced with "flooded suction", Clause 6.1.2 first paragraph "duty/standby" replace by "duty/assist" and "self-priming" removed, second paragraph replaced, third paragraph amended, Clause 6.1.3 dosing pumps pressure requirement amended to 7 bar, automatic gas vent requirement removed, Clause 6.1.4 third paragraph in 'Carrier Water Line' re flow switch amended, last paragraph in 'Dosing Line' deleted, Clause 6.1.5 first paragraph dosing cabinet requirements amended, all valve handles

Version No.	Clause	Description of revision
		requirement to be lockable deleted, last paragraph replaced, Clause 6.6 valve close on power failure details amended, Clause 6.8 note added to last sentence, Clause 6.9 flow switch requirement amended, flushing water timing requirement amended, Clause 6.9.1 wash down hose deleted,
1	All	First Issue

Introduction

This Specification is for the design, supply and construction, of Network Rechlorination Plants for Sydney Water assets.

Sydney Water makes no warranties, express or implied, that compliance with the contents of this Specification shall be sufficient to ensure safe systems or work or operation.

It is the user's sole responsibility to ensure that the copy of the Specification is the current version as in use by Sydney Water.

Sydney Water accepts no liability whatsoever in relation to the use of this Specification by any party, and Sydney Water excludes any liability which arises in any manner by the use of this Specification.

For the purpose of this Specification "Sydney Water" is the nominated person or organisation that has written authority to act on Sydney Water's behalf.

This document is uncontrolled once printed or downloaded.

Copyright

General Terms & Definitions

Term	Definition
AS	Australian Standard
AS/NZS	Australian and New Zealand Standard
ATWL	Above Top Water Level
CHAIR	Construction Hazard Assessment Implication Review
DTC	Deemed to Comply (drawing list)
DWV	Drain, Waste and Vent pipe
FAT	Factory Acceptance Testing
FMECA	Failure Mode, Effects and Critical Analysis
FRP	Fibre Reinforced Plastic
HAZCHEM	Hazardous Chemical
HAZMAT	Hazardous Material
HAZOP	Hazard and Operability Study
HSP	Health and Safety Procedure
HMI	Human Machine Interface

Term	Definition
I&C	Instrumentation and Control
IICATS	Integrated Instrumentation, Control, Automation, and Telemetry Systems
I/O	Input/Output
MAICS	Maximo Asset Information Collection Software
MAXIMO	Sydney Water's Maintenance Management System
NPER	National Professional Engineers Registration
NTC	National Transport Commission
OHS	Occupational Health and Safety
OTS	Operational Technology Service
P&ID	Process & Instrumentation Diagram
PE	Polyethylene
PLC	Programmable Logic Controller
PN	Pressure Nominal, Pressure Rating
PVC	Polyvinyl Chloride
RCP	Rechlorination Plant
RPZ	Reduced Pressure Zone
RTU	Remote Telemetry Units
SAT	Site Acceptance Test
SDS	Safety Data Sheet
SOC	System Operations Centre
UV	Ultraviolet
VSD	Variable Speed Drive
WAC	Work As Constructed

1. General

1.1 Scope

This document specifies the detailed design and construction requirements for a standard Sodium Hypochlorite (NaOCl) Rechlorination Plant (RCP). The primary function of the RCP is to accurately dose Sodium Hypochlorite to maintain the chlorine residual in the water supply. This Specification pertains specifically to Rechlorination Plants that are co-sited with other assets on the supply network. Installations within treatment plants and filtration plants are not covered by this document.

This Specification does not apply to temporary dosing units but may form the basis for the supply and performance requirements for temporary units. Temporary RCPs may only be used where approved by Sydney Water.

The document is to be used for the design, construction, installation and commissioning of both, transportable and permanently installed RCPs. The selection of type (transportable or permanent) must be agreed with Sydney Water. In general, the units must comply with the following:

Transportable RCP – *Total effective storage* is 27kL and below per building consisting of a two-tank system, a storage tank (neat sodium hypochlorite) and a dosing tank (diluted sodium hypochlorite).

Permanent RCP – Installations whereby total effective storage at the plant is greater than 27kL per building. Where the technical requirements for the design and construction of the plant varies for a particular section, these variations must be clearly stated in this Specification. Otherwise, the Contractor is to comply with all sections for both transportable and permanent plant types.

1.2 Style of this Specification

This document is written in the directive style. Where an obligation is given and it is not stated who is to undertake these obligations, they are to be undertaken by the Contractor. Therefore, guidance on the allocation of tasks or separation of a contract into sub packages or work orders is not included in this Specification. The Specification shall outline the final requirements of the units however not dictate who must undertake these works.

Where a submission, request, or proposal is required, and it is not stated who the recipient should be, it is to be provided to Sydney Water for approval.

Any discrepancies between this Specification and other standards and/or regulatory requirements must be clarified with Sydney Water.

1.3 New designs and innovations

This document provides an indicative solution for the Works. The Contractor may wish to develop the indicative solution shown or produce their own design that will fully comply with the requirements of this Specification.

Any alternative materials, designs, methods of assembly, and processes that do not comply with the requirements of this Specification, or are not mentioned in it, but give equivalent performance outcomes to those specified, are not necessarily prohibited, and will be considered by Sydney Water. Written approval from Sydney Water must be sought with the design submission, prior to the commencement of construction.

1.4 Responsibilities

Responsibilities relating to the contractual terms and conditions, including financial matters and site issues are covered in the relevant contract documents. Specific responsibilities are noted in this document, but they do not necessarily describe all the activities required for the Works.

For the purpose of developer funded works, the words “Principal” and “Contractor” in this Document shall be replaced with the words “Sydney Water” and “Developer” respectively.

1.4.1 Contractor

The Contractor must be fully responsible for the detailed design and construction being fully compliant with the requirements of this Specification, and provide a complete, functional RCP that meets all the relevant Australian Standards, Codes of Practice, industry standards, and all statutory requirements. The complete system must include but is not limited to, all structures, pipework, fittings, valves, pumps, instruments and controls, from the point of bulk delivery to the point of chemical dosing into the process streams.

The Contractor should be aware that this Specification is for a standard RCP. As sites vary each site must be assessed on an individual basis for site specific risks.

In addition, the Contractor must provide the following:

- Design drawings and review of the RCP standard design.
- The Contractor must submit RCP design drawings for Sydney Water’s review at concept, 50% detailed design and 90% detailed design stages.
- A lifting plan for the installation and removal of the RCP.
- Review Sydney Water supplied HAZOP report.
- Carry out a total of two Construction Hazard Assessment Implication Review (CHAIR 1 & 2) workshops. CHAIR 1 must be undertaken at the concept design stage, and CHAIR 2 at the detailed design stage. The CHAIR workshops must be in accordance with Sydney Water’s Safety in Design Procedure (D0000653) and the CHAIR guidelines prepared by Work Cover NSW.
- Review the Sydney Water supplied CHAIR 3 report (refer Appendix C)
- Review the Sydney Water supplied Failure Mode, Effects and Critical Analysis (FMECA) workshop report.
- Commissioning plans (refer Sydney Water’s Specification – Commissioning (D0001440)).
- FAT testing (wet FAT/Pre SAT) in the factory prior to delivery to site.
- Update of Sydney Water information systems including:
  - Sydney Water’s Maintenance Management System (MAXIMO) asset listing to be completed and sent to Asset Information (Data Creation), who will allocate asset numbers and notify the HYDRA Register & the Operational Technology Service (OTS). Refer to Section 2.15.
- O&M Manuals, Work As Constructed (WAC) drawings and other documentation necessary for the optimal operation and maintenance of the RCP, as detailed in Sydney Water’s Specification - Commissioning (D0001440) and Sydney Water supplied O&M manual shell document (Refer Appendix E).

- All documentation submitted to Sydney Water must be formatted such that it complies with Sydney Water's quality documentation requirements. Typically, electronic versions in PDF, Word and DWG formats need to be provided as well as two hard copies.
- Additional specific equipment as may be necessary for the operation, maintenance and cleaning of the Sodium Hypochlorite system being provided, or as specified by Sydney Water or recommended by the chemical supplier and regulatory bodies.
- Storage tanks, process pipes, drain and overflow pipes, fittings, valves, equipment and instruments constructed of materials compatible with Sodium Hypochlorite stored and conveyed. All materials of construction must be non-corroding for Sodium Hypochlorite.
- Stairs, ladders and walkways, where appropriate, to allow ease of access to all storage tanks and equipment for maintenance purposes. All such stairs, ladders and walkways must be constructed of appropriate corrosion resistant materials.
- Provide adequate access for maintenance purposes.
- Necessary facilities to ensure all spills and leakages are contained.
- Safety facilities, such as safety showers, eyewash stations, fire extinguishers and so on.
- Tags, labels, signs, and other markings, for all these systems which clearly indicate the individual system, chemical contents, hazards, warnings, and any other pertinent information in accordance with the requirements of the relevant standards, Codes of Practice and statutory authorities.
- Safety Data Sheets (SDS) for Sodium Hypochlorite.
- Any additional items/equipment requested by Sydney Water

1.4.2 Principal (Sydney Water)

The Principal (Sydney Water), through its appointed representative/consultant, will provide input for the development of the detailed design required in this Specification. The input includes, but is not limited to:

- This Specification.
- Items in this Specification that will be done by others.
- Deemed To Comply (DTC) drawings including Layouts and Process and Instrument Diagrams (PIDs);
- HAZOP documentation - refer SW Delivery Portal
- CHAIR 3 report. refer Appendix C
- Failure Mode, Effects and Critical Analysis (FMECA) workshop report. refer SWDelivery Portal
- Standard general arrangements of the RCP; refer DTC drawings (listed in Appendix A).
- Safety Data Sheets (SDS) for Sodium Hypochlorite.
- Sample template for Operation and maintenance manuals – refer Appendix E
- Contact details of Sydney Water security systems contractor.
- General scope of civil works required at site for access and egress of service and delivery vehicles.
- Provide the information in the following table:

Parameter	Quantity/Requirements	Units
Type of dosing system	Flow paced/ Set Dosing Rate within a chlorine residual window using Chlorine Residual Feedback	-
Type and properties of dosing chemical	Sodium Hypochlorite 12.5%	Available Chlorine
Chemical supplier name and contact details		-
Location of the RCP	(Insert street address, asset number etc.)	-
Mobility requirement of the RCP Building;	TRANSPORTABLE / PERMANENT	-
Concentration of Supplied Chemical	12.5%	Available chlorine
Concentration of batched chemical for dosing		Available chlorine
Rate of chemical dosing minimum		Litres/hour
Rate of chemical dosing maximum		Litres/hour
Dilution/carrier water flow rate	X:1 with maximum chemical dosage rate	Litres/hour
Delivery Bund Sump Pump (if required)		Metres head
Pressure of available water supply for process water		Metres head
Pressure of available water supply for safety shower and eyewash;		Metres head
Delivery tanker size;		Kilolitres Length / Vehicle Type
Maximum temperature of the delivered chemical;		°C
Minimum chemical tank storage size;		kilolitres
Minimum Dosing Tank storage size		kilolitres
Location of the Chlorine Residual Analyser used to control dosing.		
Minimum target performance parameters, (for example, free chlorine/total chlorine residuals, before and after dosing).		-
Protective coating system to be applied (external)	PUR-B or PSL for Anti-Graffiti ACL for Aesthetic PUR-A for Coastal Environment	-
Protective coating system to be applied (bund floor and wall)	NOV (Novolac Epoxy)	

1.5 Contents of this document

Section 2 contains requirements for the standard design of the RCP.

Sections 3 to 6 contain requirements for the design of specific components of the standard Rechlorination system, namely the Chemical Unloading Bay, the RCP Building, the Chemical Storage and Dosing tank, and the Rechlorination system.

Sections 7 and 8 contain requirements for the submission of the design, and for the testing and commissioning of the RCP respectively.

1.6 Reference documents

The following documents are to be referenced with this Specification

AS	**Australian Standard**
AS 1319	Safety signs for the occupational environment
AS 1345	Identifications of the contents of pipes, conduits and ducts
AS 2129	Flanges for pipes, valves and fittings
AS 3500	National plumbing and drainage code
AS 3735	Concrete structures retaining liquids
AS 3780	Storage and handling of corrosive substances
AS 3996	Access covers and grates
AS 4130	Polyethylene (PE) pipes for pressure applications
AS 4775	Emergency Eyewash and Shower Equipment
AS/NZS	**Australian Standard/New Zealand Standard**
AS/NZS 3000	Electrical Installations (Australian/New Zealand Wiring Rules)
AS/NZS 4766	Polyethylene storage tanks for water and chemicals
ANSI	**American National Standards Institute**
ANSI Z358.1	Compliance requirements- Emergency shower and eye wash stations
EN	**European Standard**
EN 60529	Degrees of protection provided by enclosures (IP Code)

Austroads Design Vehicles and Turning Path Templates AP-G34-13 (3rd Edition).

Australian Design Requirements ADR 43/04 2006.

National Transportation Commission (NTC) – Australian Dangerous Goods Code (latest edition)

SafeWork NSW – Storage and Handling of Dangerous Goods: Code of Practice, 2005

Work Health and Safety Act 2011

Work Health and Safety Regulation 2017

NSW Protection of the Environment Operations Act, 1997, and its amendments

Orica (Ixom) Bulk Delivery Requirements

Orica (Ixom) Bulk Installation Guidelines

Orica (Ixom) On-Site Inspection Guidelines

Sydney Water's Instrumentation and Control Standards TOG_TS01

Sydney Water's Water Distribution Related Instrumentation and Control Standards TOG_TS02

Water Services Association (WSA) Manual for Selection and Application of Protective Coatings, WSA 201

Sydney Water's Procedure for Disinfecting New Mains, WPIMS5027

Sydney Water's Technical Specification – Civil CPDMS0023

Sydney Water's Technical Specification – Mechanical, BMIS0209

Sydney Water's Technical Specification – Electrical CPDMS0022

Sydney Water's Technical Specification – Commissioning D0001440

Sydney Water Electric Intruder Detection Specification EIDS

Sydney Water's Asset Data Management & Commissioning SAP

Sydney Water Safety in Design Procedure D0000653:

Sydney Water Business Management Information System (BMIS)

CHAIR guidelines prepared by WorkCover NSW

2. General requirements

2.1 Containment methodology

The RCP will include the development of a complete containment methodology for the chemical, from the delivery bay to and including the storage tank(s) to the dosing location(s), inclusive of the dosing point(s). The containment must direct any leakage or spillage to a safe location where it must be managed appropriately. This methodology is to include appropriate locations for visual identification of leaks and leak detection at any low points.

The containment methodology is to be discussed and accepted by Sydney Water prior to implementation. The method must include proprietary product pipe in pipe, single run PE dosing lines inside DWV pipe, leak detection pits or a combination of the above. Any other containment systems which are viable for the chemical and Site Acceptance Testing requirements will also be considered. The containment methodology is the responsibility of the contractor responsible for the construction of the plant as well as the civil contractor running dosing lines, unloading points, pump out locations and any other chemical pipework or pits.

Bunding must be provided for the delivery bay and chemical tanks to contain any chemical spillages as described in the following clauses.

2.2 Minimum criteria

This Specification represents the minimum requirements for the Rechlorination Plant.

The RCP must be designed to:

- Provide a minimum service life of:
  - 50 years for structural elements
  - 20 years for tanks and pipework
  - 10 years for mechanical, pumping, electronic and control equipment
- Achieve a level of treatment according to the minimum requirements outlined in Section 1.4.2 of this Specification, over the designed service life;
- Comply with all relevant regulatory requirements, Standards, and Codes of Practice, including, but not limited to:
  - Work Health and Safety Act 2011
  - Work Health and Safety Regulation 2017
  - SafeWork NSW – Storage and Handling of Dangerous Goods Code of Practice 2005
  - National Transportation Commission (NTC) – Australian Dangerous Goods Code Edition 7.4 (2016)
  - AS 3780 – The Storage and Handling of Corrosive Substances
  - NSW Protection of the Environment Operations Act, 1997, and its amendments
  - All other referenced documents in this specification
- Not cause interruption to the normal operation of the Sydney Water water supply system
- Have complete chemical receiving, storage, transfer, and dosing systems, and the necessary safety facilities
- Be capable of automatic operation via Sydney Water's Telemetry System (IICATS)
- Be capable of local manual operation

- Be capable of adjustment of the treatment level during operation
- Be safe to operate, maintain and decommission
- Contain all spills of the chemical being used and have a bund capacity of 9,000 litres or a minimum 110% of the chemical storage and dosing volumes, whichever is greater
- Give effective process control under both routine and non-routine operations
- Be self-contained, to allow transport and relocation
- Allow for nominal 30 days storage of Neat Sodium Hypochlorite (12.5%)
- Provide a dosing tank for the batching, storage, and dosing of diluted Sodium Hypochlorite. Transfer of the chemical to be undertaken on approximately 10-day intervals; and
- To be capable of delivering to and dosing from both storage tanks
- Have online Chlorine Residual Analyser monitoring installed downstream of the chemical dosing point, at a location nominated by Sydney Water, which is linked to the Sydney Water IICATS network.

2.3 Site conditions

The site is normally subjected to temperate climate conditions, with an ambient temperature range of (minus) -6°C to 50°C, and humidity of up to 100%.

Additional consideration must be given for sites that are subjected to strong wind and saltwater spray/mist, for example, marine conditions. All equipment must be designed to accommodate and operate satisfactorily within these weather conditions.

Consideration must be given to Sydney Water's requirements for building over or close to Sydney Water sewer, water or stormwater assets.

2.4 Materials

2.4.1 General

All materials selected or adopted in the design must be suitable for installation in the proposed environment, including contact with Sodium Hypochlorite and high humidity conditions. They must be corrosion resistant and selected to match the relevant specified design life. Where required, materials must be coated in accordance with the latest edition of Water Services Association Manual for Selection and Application of Protective Coatings, WSA201.

2.4.2 Corrosion resistance

The internal parts in contact with the chemical substances are required to be corrosion resistant against Sodium Hypochlorite.

All bolts, nuts, and washers must be made from stainless steel grade 316, or equivalent, which is deemed to be suitable for the application.

2.4.3 Adhesive, sealants and gaskets

All adhesives and sealants must be resistant to oil and water, non-supportive of microbial growth, and dimensionally stable. They must also be resistant to chemical attack by Sodium Hypochlorite.

All gaskets must be made from Viton rubber materials. Refer Appendix F 'Sydney Water Guide to Proven Products'.

2.5 Pipework and fittings

Materials for pipe work and fittings must be uPVC or cPVC ASTM Schedule 80 or Polyethylene PE to AS4130. All pipework within the chemical area (including the delivery bay area) of the Rechlorination Plant must be uPVC/cPVC Schedule 80 only. Refer Appendix F.

Pipework for the dosing line to the dosing point must be either:

- uPVC/cPVC George Fischer double containment system (Double-See™), or equivalent approved by Sydney Water
- PE100 polyethylene PN16 dosing pipe with PE100 polyethylene PN16 containment pipe, or
- PE100 polyethylene PN16 dosing pipe with DWV containment pipe

All pipes, including those in pipe trays and trenches, must be painted in accordance with WSA201-Application of Protective Coatings.

A solvent welding course is to be completed by the piping installation team to satisfy Sydney Water's and pipework supplier's requirements.

The minimum pressure rating class of all pipes and fittings must be PN 16. All pipework selected must be designed specifically for use in the chemical industry and resistant to chemical attack.

All pipework, fittings and equipment installed and fabricated will be in accordance with the following:

- Sydney Water Technical Specification - Mechanical and the Sydney Water Procedure 724 - Solvent Cement Welding.
- Method of jointing polyethylene pipe work must be electrofusion jointing. The manufacturer's recommendations must be followed with the correct specialised tools when installing pipes and fittings (no compression fittings to be used).
- All personnel undertaking pipework installation to be competent and have undertaken PVC installation training (Sydney Water and supplier's), polyethylene electro-fusion jointing training and Sydney Water chemical dosing training.
- Pipe work jointing and installation must be carried out in accordance with the manufacturer's specification and requirements, inclusive of pipe cutters, chamfering and de-burring tools.
- All pipework is to be painted (ACL system) or coloured and labelled as per Sydney Water Technical Specification - Mechanical and point a) below:

  a) Pipework located within the RCP building only requires correct coloured labelling (i.e. colouring/painting of pipework is not required).

- Potable water pipes less than 50 mm in diameter, located above ground outside of the RCP structure must be suitably lagged. Pipe trays located outside must be supplied and installed with suitable covers. All lagging materials must be rigid, weather resistant, non-combustible type and accepted by Sydney Water prior to procurement. It must be rockwool type or equivalent with aluminium or stainless steel sheet outer cladding to protect from water ingress and damage. Aluminium foil tape type lagging covers are not acceptable.
- Buried non-metallic pipes must have continuous metal tape placed in the trench above the pipe to allow detection.

- All chemical dosing lines external to the RCP (above ground or buried) must be double contained arrangement. In addition to this, all chemical dosing and/or water lines passing through the RCP electrical controls room must also be double contained arrangement. Where lines are installed in the RCP electrical controls room, they must be shielded with PE covers to prevent leakage spray reaching electrical cubicles and to direct any leakage onto the floor. A drain must be installed to the outside.
- The arrangement of all pipes must allow a leak to be readily identified and contained and facilitate repair or replacement of the inner pipe. The arrangement of the pipework must allow a leak to drain into the RCP bund or the dosing point.
- All drainage should be vermin proof.
- Underground dosing lines must be designed so that the pipework can be replaced without the need for excavation.
- All ball valves must be full-bore type. Ball valves must be true union type with FKM (viton) o'rings. All ball valves exposed to Sodium Hypochlorite must be vented to prevent the build up of gas within the ball when isolated. The ball must vent upstream of flow direction when isolated. Vented ball valves must be indelibly labelled as such. For throttling purposes, a diaphragm valve suitable to the specific application must be used. These, along with other non-standard pipework fittings must be double union type to minimise damage during repair and maintenance. Appropriate space is to be left around unions to enable dismantling. Utilise spacers under pipe clips where attaching directly to flat surfaces.
- Where equipment is only available with a screwed process connection (i.e. chemical gauge guards & pulsation dampeners), a threaded socket adapter must be permanently solvent welded to the equipment to prevent leakage from the threaded connection.
- Valves, piping and fittings should be from the same supplier for a specific dosing system and where possible, for any existing chemical dosing system on site. All valves of the same size, duty and type supplied under the contract must be identical.
- Joints must be either solvent welded (glued), electro fused, or flanged. Screwed connections are not permitted.
- Only approved pipe glues (Weldon 724) and solvents (coloured primer) that are designed for use with the specific chemicals and piping systems are to be used. Minimum curing times for primers and glues, as specified by the manufacturer, are to be strictly adhered to.
- Potable water must be provided for the eyewash and safety shower at all sites. All potable water lines coming from Sydney Water mains must be provided with Reduced Pressure Zone (RPZ) valves to prevent carrier water flowing back into the mains. RPZ device must be installed downstream of the supply feeding the potable water supply on site to prevent pressure loss to safety showers and eye washes. Note site RPZ not required for reservoir sites. Only require RPZs upstream of non-potable water connections at reservoir sites.
- An RPZ must be provided to separate the Potable and Non-Potable water. This is to ensure backflow from the Carrier water within the RCP cannot enter the safety shower & eyewash. All RPZ devices are to be installed by a licensed plumber and appropriately tested in accordance with the requirements of AS3500. Where required, booster pumps or pressure reducing valves must be installed based on the incoming water pressure and the pressure at the dosing point.

A generic RCP Site Layout General Arrangement for the Potable Water Supply is provided in the DTC drawings as listed in Appendix A of this Specification.

A list of proven products is included for reference in Appendix F. Products may be added to this list with the approval of Sydney Water.

2.5.1 Pipework supports

All pipework supports located inside dosing rooms or bunds must be suitable for contact with Sodium Hypochlorite. Proprietary systems such as Georg Fischer must be used where available. Metal support systems such as 'Unistrut' or metal brackets and clips must not be used inside dosing rooms or bunds but can be used externally where double containment pipe is being supported.

2.6 Civil works

The design and construction of the civil works must be in accordance with the requirements contained in Sydney Water's Technical Specification - Civil, unless specified otherwise in this document. Where necessary, relevant Dangerous Goods Regulations must be complied with.

As a minimum for the transportable RCP, the foundation pad must have a sub-base of 200 mm thick cement stabilised DGB20 road base (3% minimum cement content), any soft spots in the founding material must be compacted to 98% of maximum dry density prior to laying sub-base. The top of the foundation pad must be 50mm above the surrounding ground level and must extend 150mm past the building perimeter. The RCP base must be placed on 50mm of packing sand and a 0.25mm waterproof membrane double lapped and taped at joints. The waterproof membrane must be increased to 2 layers for saline conditions. A 50mm layer of sand is required under the RCP to ensure the load is evenly distributed on the foundation pad. A geotechnical engineer or engineering geologist is to confirm the allowable bearing capacity of the foundation soil is sufficient for the requirements specified by the RCP supplier. If the foundation is not sufficient then the geotechnical engineer is to provide direction on ground improvement works required at site. The geotechnical engineer is to be engaged by the contractor undertaking the Civil works.

Where insufficient or unsuitable access to site is provided then a detailed design is to be undertaken in accordance with Sydney Water Technical Specifications.

2.7 Mechanical works

The design and construction of the mechanical works shall be in accordance with the requirements contained in Sydney Water's Technical Specification – Mechanical (BMIS0209), unless otherwise specified in this document.

2.8 Electrical works

2.8.1 Scope of work

The electrical scope of work of this contract is for the design, manufacture, supply, delivery, installation, testing and commissioning of all electrical equipment. This includes the incoming power supply system, communication, control, instrumentation, and all necessary accessories and associated equipment, for the proper functioning of the dosing system to be installed at the site.

This includes, but must not be limited to the following:

- Where the RCP is a standalone plant install the power supply cables from the point of common coupling, and 3-phase power supply from the Electricity Authority supply to the RCP connection point of the dosing system, including metering, termination, lightning and surge protections. Where the RCP is installed within a reservoir/water pumping station site the power supply must be provided from the

pumping station electrical switchboard via a separate circuit breaker. The electrical loading must incorporate an extra allowance of 30% for future loads.

- Installation of a covered, non-metallic cable tray around the complete inside perimeter wall of the dosing room. The cable tray must have segregated sections for power and controls cable.
- Provision of IICATS interfacing signals
- Provision of all cabling and wiring between the RCP and the Sydney Water supplied IICATS RTU (Remote Telemetry Unit) including surge protection units
- Provision of a touch screen Human Machine Interface (HMI) and cabling to connect to the Sydney Water supplied IICATS RTU. Programming of the specified HMI will be provided by SW as part of the supply arrangement.
- Provision of internal and external lighting
- Provision and installation of all equipment, materials, accessories, cabling, conduits, power poles/posts, connections and housings to enable the system to be fully operational
- All necessary electrics are earthed to comply relevant aspects of AS/NZS 3000
- Where non-standard RCP designs are used (in terms of DTC drawings and P&IDs) then the application specific settings in the standard Plain English Functional Description (PEFD) proforma must be changed by the process designer and the Functional Design Specifications (FDS) must be customised by OTS.
- Site testing and commissioning; and
- Provision of Work As Constructed (WAC) drawings.

2.8.2 Standards

The design and construction of the electrical works must be in accordance with the requirements contained in Sydney Water's Technical Specification – Electrical (CPDMS0022), unless specified otherwise in this document. The RTU panel is to comply with I&C Standard.

2.8.3 Electrical equipment

All equipment must be new and suitable for its purpose, comply with Australian Standards and be rated for continuous in service condition within a switchboard. All electrical equipment supplied should be available from suppliers within Australia.

All items of equipment must be designed, manufactured, and installed to perform their required functions reliably and efficiently. The Contractor must take into consideration the conditions and functions of the equipment when designing the systems, and selecting equipment, to ensure the system could be operated safely and efficiently. Particular attention must be given to equipment installed in an adverse environment and/or exposed to weather.

Temperature rise within electrical enclosures and cubicles must not exceed the maximum temperature specified for components inside those enclosures. Adequate ventilation must be provided in the enclosures and cubicles. Switchboard ventilation fans should be considered for installations using dosing pumps with Variable Speed Drives.

Each compartment of the control panel must be provided with a thermostat and heater to protect against condensation inside the electrical and controls enclosures and cubicles.

Live equipment and terminals must be located behind removable covers or doors and shrouded to prevent accidental contact when the control panel's front doors are open, including equipment mounted on doors.

The switchboard must have touch protection included in the design.

Where more than one item of equipment is supplied and installed to perform a particular function, all such items of equipment must be identical and completely interchangeable.

The site is subject to power failure. The equipment must be designed for automatic restart when the power returns.

The Contractor must develop electrical circuits and submit the electrical circuit diagrams to Sydney Water for review prior to manufacture. Circuit design must be in accordance with DTC electrical drawings provided at time of tender. This will be a hold point.

2.8.4 Battery backup

The controls and RTU must be provided with 2 off 24V battery backup units, one for the RTU modem and instruments and the other for the motorized and solenoid valves. The battery supplied for the RTU must be sized according to the requirements in TOG_TS01. The battery for the valve power supply must be sized to provide 2 complete operations for the maximum number of open motorized valves. The batteries must be suitable for a life of at least 3 years continuous use with checks at 12 monthly intervals.

2.9 Instrumentation

All instrumentation including level transmitters, flow transmitter, flow switches and level switches must comply with the TOG_TS01. If there is any discrepancy between this document and the TOG_TS01, it must be raised to Sydney Water at the Design phase, to allow him / her to make an appropriate ruling on the matter. The Contractor must resolve any issues of concern with Sydney Water and obtain written approval prior to proceeding with ordering and manufacture.

2.10 Telemetry & control

The RCP is to be supplied as a package by the equipment supplier with all necessary control and instrumentation. The RCP must be designed for connection into Sydney Water's Telemetry System. Telecommunications must be provided as per TOG_TS01.

Specific requirements of telemetry and control for water disinfection by a RCP are detailed in Sydney Water's Water Distribution Related Instrumentation and Control Standards TOG_TS02. Unless directed otherwise, the digital and analogue inputs and outputs must be provided as specified in TOG_TS02. If there is any discrepancy between this document and the TOG_TS02, it must be raised to Sydney Water prior to design commission to allow him/her to make an appropriate ruling on the matter.

Telecommunications must be provided by a 4G/5G link to the mobile network. The Contractor must supply a suitable 4G/5G aerial mounted on the RCP building and cabled to the RTU panel. A surge protector should also be installed.

The selection and installation of field mounted electrical equipment within the chemical storage and dosing area of the RCP building must have a minimum IP54 rating and comply with the requirements of AS/NZS 3000 Section 6: Damp Situations.

2.10.1 Rechlorination plant (RCP) controller

The primary control of the RCP must be provided by a local RTU. The controlling RTU must be to TOG_TS01.

The RCP must be installed with monitoring and control equipment to Sydney Water Standards, which must enable it to integrate into Sydney Water's IICATS.

2.10.2 Remote telemetry units (RTU)

Control and monitoring of the RCP must be provided through the RTU which will be connected to the IICATS network. The RTU and IICATS network will provide the means for supervisory control and monitoring from remote workstation. Supervisory control must permit overriding control from the SOC.

A stand-alone RTU must be provided in the RCP control panel to control and monitor the plant. In this case:

- The RTU must be installed in a segmented section of the control panel or in a separate fully accessible adjacent panel.
- The RTU power supply must be provided by Dyne Industries with 8 hours battery back-up and sized as per TOG_TS01.
- Digital and analogue I/O must be connected to the RTU in accordance with TOG_TS01. Hardwired signals must be terminated through the knife switch terminals in the RTU panel. External inputs to the RTU (chlorine analyser, etc.) must be connected through surge diverters.
- The supplier must interconnect all telemetry components, including connection of the RTU equipment. (Refer TOG_TS01 for details).
- The RTUs and Modem, as well as configuration of this equipment, will be free-issued by Sydney Water. The contractor will be responsible to provide the external aerial for the site (COL7195/7199 with SMA Male Connector) mounted on j bracket external to the building, as per the I&C Standard.

2.10.3 Human machine interface (HMI)

A HMI must be installed in the RTU cubicle door to enable local operator control of the RCP. The HMI must be a Schneider Electric HMIGTO6310 12' Colour Touch Panel. The supplier must connect the HMI to the RTU power supply and RTUs.

2.11 Internal cable tray

There must be a non-metallic cable tray around the complete inside perimeter wall of the dosing room and into the electrical controls room. The cable tray must have plastic divider segregated sections for power and controls cables. The power cable section will be 2/3 of the space and the controls cable section will be about 1/3 of the space. The cable tray must be spaced off the wall using a spacer so that control cables will fit between the wall and cable tray where relevant. Power cables must come out of the bottom of the cable tray and controls cables must come out of the top or back of the cable tray. The cable tray must be sealed with a removable compound where it penetrates through the wall between the dosing room and electrical controls room.

2.12 Services

Services to the RCP must include potable water supply, electrical power, telephone connection (if required), and drainage. These services are to be identified as to their location relative to the dosing unit.

2.13 Security and access control

The Rechlorination Plant must make provisions for a security and access control system in accordance with Sydney Water Technical Standard SWC EIDS-2. The security and access control to be provided and installed by Sydney Water's approved supplier). The Contractor must liaise with and make provision for the security system.

This includes, but must not be limited to the following:

- Security system controller or data gathering panel
- Penetrations
- GPO for data panel
- Access to nearest telecommunications pit
- Passive infra-red sensors, door limit reed switches
- At least one card reader
- Communications link to the Sydney Water security system network.

All doors must be keyed for Sydney Water security key 5 (pink PCY key).

2.14 Facility and equipment identification and labelling

All equipment must have a unique identification number in accordance with ACP0055 Asset Numbering Standard Operating Procedure. Sydney Water designates unique identification numbers for all its asset and associated equipment and Sydney Water will assign these.

The facility and equipment identification and labelling must be in accordance with Sydney Water's Specification SDIMS0026 Facilities Site Signage Specification and D0001440 Commissioning.

A standard Sydney Water facility asset sign must be mounted on the outside of the RCP building.

2.15 Entering asset details into Maximo, IICATS & Hydra

The Contractor must provide information for the update of Sydney Water information systems including:

- Sydney Water's Maintenance Management System (MAXIMO) asset listing to be completed & sent to Asset Information (Data Creation), who allocate asset numbers & notify the HYDRA Register & OTS.

Use the "Location Number Request Form for New/Existing Assets" form MEPR0063 (refer Appendix B) to add new assets and have asset numbers assigned to them by Asset Information Data Creation group. MEPR0063 form is available from the Asset Information page on iConnect.

Request new asset numbers from Asset Information (Data Creation), then forward with P&IDs to OTS for IICATS updates.

Sydney Water shall ensure that HYDRA GIS is updated to include the location of the RCP and chemical dosing line, from the RCP to the dosing location. The dosing line shall be shown in HYDRA as a pressure main with pipe size, pipe type, etc. noted. The chemical dosing line must have the term CHEMICAL DOSING LINE entered into the 'General Information' field in HYDRA.

2.16 Signage

Signage must be erected as required in accordance with Facilities Site Signage Specification. These include, but are not limited to the following:

- Sydney Water Facilities' site signage Specification - Document Number: SDIMS0026
- For sites with capacity greater than 1 kL, a Hazardous Chemical (HAZCHEM) warning placard with UN number and chemical class to be placed on the main site entrances or on the RCP building as well as the storage (and dosing??) tanks, when a hazardous chemical is stored on site.
- Information panels as per current edition of the Australian Dangerous Goods Regulation must be placed in prominent and visible locations. As a minimum, there must be one each on the chemical storage and dosing tanks, and another on the inside of the door to the bunded area.
- Confined Space Entry Permit placard to be placed on the storage and dosing tank.
- Capacity of the storage and dosing tank stated on the tanks.
- A sign that identifies the chemical, specifies tank asset number, full tank capacity and safe tank fill volume must be placed adjacent to the fill point.
- Safety signage as per DTC Drawings must be placed at the front of the RCP building or inside the door.
- If required by National Construction Code (>100 square metres) luminous emergency EXIT sign placed inside above the exit door.

Other relevant OHS signs must be installed in accordance with AS 1319. The signs may include, but are not limited to, safety shower, eye wash station, and non-potable water tap.

2.17 Fencing (if required)

To prevent access from the general public and protect against vandalism, a man proof, fence must be supplied and installed with a gate at the perimeter of the RCP area. It must be located so as not to interfere or restrict operational and maintenance activities, including chemical tanker delivery. Any fencing must allow the largest chemical delivery tanker servicing the site to park completely off the road to allow access gates to be opened and closed safely. Sydney Water will specify when fencing is required.

Fencing must be designed in accordance with Sydney Water's Deemed to Comply (DTC) drawings – Facility Fencing. Where this fencing is not suitable due to gate span or other parameters the Contractor must be responsible for providing a separate fence design to Sydney Water for approval during the design phase of the contract.

2.18 Elements of RCP

A RCP must consist of the following elements:

- Chemical tanker delivery bay
- RCP building, which contains two rooms: one for the electrical control panel and IICATS RTU, and the other a self-bunded room for the chemical storage and dosing tanks, dosing pumps and pipe work
- Electrical control panel with RTU and HMI
- Chemical storage and dosing tanks
- Transfer and Chemical Batching System

  - Make-up Water Pumps (If pressure not sufficient at site)
  - Transfer Pumps or combined transfer/mixing pump
  - Pipes
  - Valves
  - Instrumentation
- Dosing system
  - Pumps
  - Pipes
  - Valves
  - Instrumentation
- Safety and wash down equipment

Specific requirements for each chemical dosing system and components of the RCP are detailed in the following sections of this Specification.

A set of RCP Process and Instrumentation Diagrams (P&ID), and general arrangement drawings and sketches are available as listed in Appendix A of this specification. The proposed design must be conceptually similar to them, unless instructed otherwise by Sydney Water.

2.19 Maintenance access

The layout of the equipment inside the RCP building must be submitted to Sydney Water for approval prior to construction. This is to ensure that access hatches, level indicators, pumps and so on, can be easily reached by personnel for maintenance and operation. For standard general arrangements of the RCP, Refer DTC drawings.

3. Chemical delivery bay

A chemical delivery bay and associated roadworks or re-grading must be designed and constructed to provide safe arrival, parking, off-loading, turning around (if necessary), and departure of bulk chemical tanker trucks. Refer to DTC drawings as listed in Appendix A.

3.1 Location

The delivery bay must be located adjacent to the RCP building. Unless otherwise specified, the RCP building must be located on the left side of the tanker.

The unloading point must allow the chemical delivery tanker to be fully inside the delivery bay when unloading. The unloading hose connection point is typically located inside the RCP building and must be no more than 6m from the tanker connection point, as per the Dangerous Goods Code of Practice.

3.2 Access

The chemical delivery tanker must be able to access the site safely without traffic controllers. It must be safe for the truck to turn off the roadway into the property and for the driver to stop the truck and open the gate. Depending on traffic conditions in the area, slip lane(s) may be required.

The delivery bay and its access shall be large enough to accommodate a tanker to be reversed into the bund and exit the site in a forward direction. Alternatively, the access must allow the tanker to drive through and exit the site in a forward direction. The design is to avoid the possibility of the delivery truck having to pass back through a bund in which a spill has occurred.

3.3 Delivery bay bund

The delivery bay must be a concrete slab with a bund wall, to provide containment for any spill or leaks. Relevant aspects of AS 3780 must be complied with where corrosive chemicals are used.

The bund must be designed as a water retaining structure in accordance with AS 3735. It must have a capacity of 9,000 litres or 110% capacity of the largest tanker vehicle compartment, whichever is greater.

The bunded area must be designed so that any liquid spills or leakage flows grade towards the sump drain, such that no pools of chemical will accumulate on either side of the bund. The bund walls must also be painted yellow to increase visibility and reduce the risk of tripping onsite. The step between the delivery bay bund low level and RCP footpath is to be a maximum of 225mm as per AS1657 step size criteria unless approved by Sydney Water.

Any roll-over kerbs in the roadway at either end of the tanker delivery bay bund must be designed to allow normal passenger vehicles (Class B99) to enter and exit without scraping the bottom of the vehicle as per the clearance requirements of ADR43/03 unless other vehicle agreed or specified by Sydney Water.

The area between the tanker bay bund and the RCP building must be concreted, and any spills in this area must be contained and drain into the delivery bay bund.

The delivery bay and RCP arrangement must ensure any stormwater from the surrounding roadway and ground must be channelled away, and not flow into the delivery bay bund. Any expansion joints in the concrete path between building and delivery bay must be mastic filled to prevent chemical seepage in between joints.

3.4 Sump and discharge line

A sump pit to collect liquid from the bunded area must be provided. It must have minimum dimensions of 600 x 600 x 600 mm to ensure sufficient capture of rainwater or hose down water without filling the bund sump.

The sump may be either be:

1) fitted with a sump pump pumping via a hard plumbed hose to either a stormwater/sewer (if available) or via a camlock coupling for truck pump out. The bund sump needs to be substantially larger than the minimum dimensions indicated above to house the submersible pump with an independent low-level cut-out float regulator and to ensure efficient operation of the submersible pump and prevent pump short cycling. High-level alarms must be provided in the event of heavy downpours or pump failure, or
2) a camlock pump out point fitted with a suction pipe ending in a camlock for a sucker truck to remove the contents.
3) A diagram of the arrangement described is presented in DTC drawings.

The submersible pump must be corrosion proof and must be fitted with a titanium impeller (e.g. Tsurumi or equivalent). The submersible pump must be elevated from the floor of the sump to prevent clogging by dirt and debris. It must be furnished with an accessible discharge union coupling, to enable removal for cleaning and servicing without the need for confined space entry permit.

Automatic control of the sump pump must not be permitted in any circumstance for Sodium Hypochlorite. The pump may only be started from a push button station. Level sensors must be installed within the sump pit for low level cut out, and high level alarm. The high level alarm signal must be routed to IICATS.

The sump pit must be located where it is not subjected to vehicle loading at one of the sides (outside) of the delivery bay bund. It must be fitted with a grate/cover made from lightweight materials, in accordance with AS 3996 (Class A), weighing no more than 16 kg. The weight limit must be labelled where appropriate. Where the unit's location is subject to falling debris from trees in the area, perforated sump covers with 12mm diameter holes must be used as opposed to grated covers to prevent blocking of drainage system.

3.4.1 Camlock pump out point

A camlock pump out point must be installed to allow pump out from the sump pit and bund area. The location of the camlock pump out point must be adjacent to the sump. The pump out point must be installed on an up-stand off the pumped discharge line from the sump pump, or on its own upstand if no sump pump is required on the site. Isolation valves must be installed to allow pump out from the sump pit pump or camlock connection.

3.5 Safety equipment

The following safety equipment must be provided:

- A safety shower and eyewash station, which complies with AS 4775, located within 2 to 7m of the chemical unloading connection point. This is typically mounted to the inside of the right hand door of the transportable RCP building. An additional eyewash station must be located within the RCP dosing room near the exit, on the furthest wall away from the dosing system and tank. Safety shower and eyewash facilities must be tested and tagged in accordance with AS 4775. Also refer to Appendix G.

- Long water lines to the safety shower and eye wash station (above ground and external to RCP building) that are exposed to sunlight must be lagged, as water may be heated up by the sun and therefore unsuitable for use. All lagging materials must be rigid, weather resistant, non-combustible type and accepted by Sydney Water prior to procurement. It must be rockwool type or equivalent with aluminium or stainless steel sheet outer cladding to protect from water ingress and damage. Aluminium foil tape type lagging covers are not acceptable
- If adequate supply pressure for the safety shower and eyewash is not available, a booster pump must be installed. The contractor must determine the capacity of the booster pump including pipeline, RPZ and valve losses. Note that if supply water is from a reservoir, then RPZ is not required upstream of safety shower and eyewash, but if supply is from Sydney Water mains, then an RPZ is required.
- A minimum 15mm diameter hose reel permanently attached to a water tap and capable of reaching all parts of the RCP, including the unloading area. The hose reel is to be fitted with a 20mm female camlock fitting making it suitable for use as a flushing mechanism.
- Sufficient lighting to enable safe work beyond daylight conditions, particularly for the chemical delivery activities.
- An ABE fire extinguisher for use in electrical fires must be provided.

When the delivery bay is not adjacent to the RCP building (that is, in a remote location), an additional safety shower is required within 2 to 7 meters of the tanker connection point.

All equipment provided must be located such that the potential for vandalism is minimised.

3.6 Tanker power connection outlets

Two permanently mounted electrical power outlets are required for unloading of the dosing chemical. These power outlets are 415 V (20 amps) and 240 V (15 amps) and are interlocked with the storage tank level transmitter (90%) and high-level switch (95%), to prevent operation of the tanker unloading pump on high-level. That is, automatic cut out of the outlets during filling when the tank level reaches high-level (90%).

They must be located within 7.5 m of the unloading hose connection point, and inside the RCP building and guarded from splashback at the fill point. For further detail on the switch arrangement, refer to TOG_TS02.

3.7 Fill point

The fill point must be designed and installed so that the delivery driver can unload to either the storage tank or the dosing tank. The valve connecting to the dosing tank must be “Locked Closed” and only filled to under direction from Sydney Water.

At the tanker filling point, a 50mm tanker fill pipe with a 50mm suitable male camlock fitting angled downwards at 45^{o}, with removable cover, must be supplied and installed. From this fill line a branch, with valve and extension piece pointing vertically down, must be supplied and installed for hose draining purposes. Refer to typical Sodium Hydrochloride dosing unit DTC drawing set.

The camlock coupling point must be positioned at least 600mm and no more than 900mm above the ground and firmly supported above and below the wye fitting. Transfer pipes should rise vertically from the tee and slope downward (1 in 100) at the top of the tank(s) to minimise drainage losses. The tank inlet branch should be above the level of the overflow pipe. The fill point must be fully contained inside a bund to prevent release of chemicals in the event of leaks at the connection point. The fill point is to be fitted with a digital display and associated equipment in accordance with this Specification.

A second tanker fill point must be provided with valves and drain line but with a screwed plug fitted instead of a camlock. This line will connect to the dosing tank but be used only in an emergency to feed direct to the dosing tank. An individual fill point is required for each tank if there are multiple tanks in series.

A placard containing information on chemical, tank descriptor (storage or dosing), tank capacity and safe fill volume must be placed clearly on each line at the loading point as shown in DTC drawings and as per SDIMS0026 Customer Delivery Safety Signage Specification.

4. Rechlorination plant building

A reinforced concrete, two-room building must be designed to accommodate the chemical storage and dosing tanks, bund, dosing equipment and control panel, along with the necessary control functions, alarms and telemetry links.

The building must be designed to be weatherproof and prohibit unauthorised entry. Its construction must be vandal-proof and painted in accordance with the WSA Manual for Selection and Application of Protective Coatings, WSA 201, including all exposed metallic surfaces (doors and doorframes, chinaman's hats). Sydney Water must advise whether the protective coating must be Aesthetic (ACL coating System), Anti-Graffiti (PUR-B or PSL coating System) or coastal environment (PUR-A coating system) The colour of the plant must be as advised by Sydney Water.

4.1 Building layout and dimension

The building must consist of two separately accessible rooms; a bunded dosing room for chemical storage and dosing equipment, that is capable of containing any chemical leaks or spills. The second room is an electrical controls room for electrical controls, telemetry, and document storage. The rooms must be divided by a wall. Separate doors must provide external access into the two rooms. The doors must be steel fabrication and corrosion protected in accordance with WSA 201 (exposure class 'Moderate').

The dimension of the building must be designed to allow adequate space to work in, and regular operation and maintenance of the tank(s) and equipment to be carried out, without removal of the roof. As a minimum, the ceiling height must be greater than 2.2 m from the ground or 1 m from the highest tank whichever is the greatest.

Normal working areas must have immediate access to the point of safe egress. The width for emergency access and egress must be no less than 1 m, unless specified otherwise.

The doors must have a mechanism to lock them in the open position whilst the site is attended, and lockable shut when not attended. The doors must be fitted with single cylinder 'deadlatch' mechanisms suitable for SW bi-lock external barrels such as 'Lockwood 002 single cylinder lever style deadlatch' or similar. The doors must be replaceable without damaging the concrete substrate of the unit. Refer DTC drawing for more information.

A removable modular roof to accommodate the replacement of the storage and dosing tanks must be provided with removable galvanised steel eyebolt lifting points grouted up to prevent corrosion and indelibly marked to enable location for future roof removal.. All electrical wiring connected to equipment on the roof, such as ventilation fans must have dismantling joints or sockets to unplug and disconnect prior to removal of the roof.

4.2 Mobility

Unless specified otherwise, the building must be designed to be transportable, without having to dismantle and reinstall the chemical storage tank(s), pipework, pumps, control system and all other equipment. 'SwiftLift' anchors must be provided and located at the base of the building. Lifting lugs must be grouted over after installation and locator markings made at the lifting point locations.

The design life of the lifting lugs must exceed the design life of the building. Structural certification from a structural engineer with National Professional Engineers Registration (NPER) with the Institution of Engineers Australia must be provided to certify the lifting of the building. The lifting procedure must be stated in the O&M manual and the detailed drawings.

A stainless steel plate must be mechanically fastened to the building, stating lifting certification date, construction materials, dry weight, maximum loaded lifting weight, and maximum load for each individual lifting lug must be provided.

Structural drawings shall be submitted to Sydney Water for written approval prior to construction. This must include, but is not limited to:

- Concrete drawings with all dimensions specified (clearly showing the location of the lifting lugs)
- Concrete reinforcement drawings (plan view and sections)
- Notes pages, which captures:
  - Concrete grade
  - Finishes
  - Reinforcement grade and cover reinforcement
  - Sub-grade preparation with notes (detailing allowable baring capacity and so on)
  - Design life of building and lifting lugs
  - Design capacity of lifting lugs and lifting procedure, clearly identifying which lifting lugs to be used for transport, and loads imposed by lifting lugs
- Building certification of design and fabrication referenced for each individual drawing.

4.2.1 Permanent plant specific requirements

Where storage requirements do not facilitate the use of indoor tanks and an external tank is required for dosing then a separate bunded area must be provided. The bunded external tank area must be designed for chemical storage capable of containing any chemical leaks or spills and must be designed as a water retaining structure in accordance with Section 3 of this document.

The separate dosing tank bunded area must be covered with a carport type steel structure to provide sufficient weather protection for intermittent works within the bund and to ensure rainwater does not collect in the bunded area. The roof is to have sufficient storm water drainage and downpipes. The roof connections are to be bolted to minimise the works involved in removing the roof if a tank replacement is required. The roof must be designed to withstand all forces associated with dead, imposed and wind loading as specified in AS1170.0, AS1170.1 and AS1170.2. The design must be site specific to evaluate wind direction, topographic and shielding factors. The walls shall be clad to a height 1m below the roof line on all four sides.

Around the perimeter of the bund fence in compliance with the DTC 5000 series is to be provided to increase site security of the outdoor asset as specified by Sydney Water. The gate must be fitted with a lock compatible with a Pink F5 key.

4.2.2 Lifting plan

As part of the design the Contractor must provide a lifting plan for the RCP unit for installation and removal. The plan must show the location of the crane and its outriggers and include the mass of the crane and the maximum force at each outrigger point. The lifting plan must be site specific and include the make and model of the crane used in the design. The lifting plan must include details of the lifting points and their maximum loads.

The lifting plan must be reviewed by a geotechnical engineer engaged by the contractor who will undertake any testing and calculations necessary to confirm suitable bearing capacity of the earth at the outrigger location. A Geotechnical engineer must confirm the temporary works required to achieve required bearing capacity at outrigger location and any works for locating the crane at the lifting point.

4.3 Bund floor and wall

Any chemical storage area in the RCP building must be bunded in accordance with the requirements detailed below. The bund must be designed as a water retaining structure in accordance with AS 3735. It must have the capacity of at least 110% of the total capacity of the tank(s) located within the bund compartment.

The bund wall height must be a minimum of 400 mm. The need for high bund walls needs to be balanced against the more difficult access and emergency egress and the overall size of the building. For wall height greater than 400 mm, access stairs are required in and out of the building. Where access steps/stairs are required, they must be provided on the inside and outside of the bund wall to provide safe access and egress, in accordance with AS1657 and DTC drawings.

A high level alarm (connected to IICATS) must be installed in the bund, to alert the operator that a spill may have occurred. The alarm set point must be agreed with Sydney Water and cause an automatic shutdown of the RCP.

The bunded area must be designed so that any liquid spills or leakage flows towards the sump pit such that no pools of water/chemical will accumulate on the bund floor.

The bund wall and floor must be coated with NOV coating systems in accordance with the Manual for Selection and Application of Protective Coatings, WSA 201.

All pipework must be run around the perimeter of the dosing room to minimise trip hazards, and as far away from electrical wiring as practicable. With exception to the bund drainage pipe and 50mm overflow pipe, all pipes must pass through the building wall above the top of bund wall. Where there is water supply within the RCP bunded area, a 50 mm overflow pipe must be provided above the 110% bund directing the flow away from electricals, operator accesses and where possible, to the delivery bay/intermediate sump. This can be provided through the wall of the RCP. The design must include ready isolation of the water supply without the need to enter the bund.

4.4 RCP internal sump and discharge line

To allow for the management of any chemical spills occurring in the internal bunded area, it must drain to a low point recessed into the floor of the building. A DN50 uPVC pipe must be installed through a penetration at the low point of the building. The penetration for this pipe through the RCP floor must consist of a uPVC socket cast into the floor with a puddle flange glued to it (as shown in the drawing DTC-7009) such that chemicals will not come in contact with the concrete. The uPVC pipe with solvent welded connections must connect to either the delivery bund sump or a stand-alone valve pit if the delivery bund sump is not at an appropriate location. A manual isolation valve must be provided on this line. Refer Section 3.4 of this Specification for sump and discharge details.

If a gravity arrangement is not feasible, then a manually started self-priming pump must be permanently installed to empty the sump (refer Section 3.4).

A recessed low point inside the chemical room of the building is to be located adjacent to the door to facilitate maintenance.

4.5 Electrical controls room

The electrical controls room must have an external entrance door opening outwards. The chemical delivery lines and water supply lines must pass through a hole in the floor of the electrical controls room. The pipework must rise above bund height and then enter the bunded dosing room. The pipework in the controls room must be shielded with PE panels, designed to prevent impact damage to the pipes and prevent any leakage or spray from the pipes reaching the electrical and controls cubicles. Any leakage must be diverted onto the floor of the room. The floor must be sloped so that any leakage flows towards and out of the door and into the delivery bund.

The Contractor must provide a table and chair in the control room.

4.6 Electrical

All electrical equipment in the chemical room, including wiring, must be installed above the full chemical bund level. All electrical equipment must be capable of working when the bund is full of liquid. As both water and the dosing chemicals are electrical conductors, safety of personnel within the bund must be considered when designing the layout of electrical equipment within the building.

One 3-pin, 240 V power outlets must be provided in the electrical control room for power supply. An additional twin GPO must be provided in the RTU section of the control panel.

A high impact weatherproof IP 55 socket outlet must be provided for the sump pump. This outlet should match that of the sump pump provided. Most often this is a single phase sump pump. The outlet must be mounted inside the building, on the wall, a minimum of 300 mm above the bund level. Power lead to the pump must be captive when the switch is in the on position. The outlet must be provided with a chemically resistant, engraved plastic label (10 mm high minimum lettering) screwed to the wall above the outlet, indicating, “For sump pump - do not use for filling”.

4.7 Ventilation

Adequate ventilation must be provided to prevent condensation build-up inside the building using door vents and extraction fans.

Separate electric ventilation fans must be provided for the chemical dosing room and the electrical controls room. The ventilation fans must be able to be run continuously, be corrosion resistant and be able to be operated via a programmable digital time clock if required. Fantech Compact 2000 series axial fans are preferred.

The electrical controls room and chemical dosing room fans must be mounted on the roof of the building. To provide adequate cross flow ventilation, mechanical vents must be provided low down, preferably on the eastern wall, a minimum of 300 mm above floor level in the electrical room and above the bund level in the chemical room. On transportable units, the vents are installed on the access doors only. These vents must be vermin proof. The fans must be capable of achieving 6-12 air changes per hour. The ventilation fans are not required to be monitored or controlled by the RTU.

4.8 Lighting

Internal and external lighting of the RCP building shall be provided to allow normal work to be carried out 24 hours a day. The external lighting must be provided to cover the area where filling is to take place and the entry door.

The lighting installation must meet all the applicable requirements of Sydney Water's Technical Specification - Electrical. Specific lighting requirements are described in the following:

- A minimum illumination level for internal lighting of 400 LUX using LEDs must be supplied and installed in each room. An automatic door switch must be provided, to automatically turn on the lights when the RCP doors are open and shut off the lights when the doors close. One emergency luminary with a 2 hour battery backup, must be supplied and installed for each room (not applicable for transportable units).
- Lighting must be arranged so that the liquid level in a translucent tank can be seen.
- The external lighting must be 30W LED floodlight fitting. Glare from the fitting must be carefully controlled for comfort and to prevent light pollution, specifically to surrounding areas where residential dwellings are visible. Lighting using unshielded lamps must not be visible to the public at normal viewing angles.
- The external lighting design must be vandal proof. It must utilise the building for mounting, where practicable. The lighting must be controlled via a light switch located inside the control room in the RCP building. The light can only be switched on and off by operator with an 'OFF' 15 minutes delay to allow operators to safely egress the site with lights still on.

4.9 Platform ladder

A lightweight, corrosion resistant 1200mm high safety type platform ladder must be supplied to provide access to the manholes of all tanks, level sensor, room lighting, and any elevated equipment. Platform ladder to be compliant with AS/NZS 1892 and any applicable SafeWork NSW requirements. Platform to include fall protection on all four sides and to have braking system for the wheels to prevent movement during use.

4.10 Safety equipment

Refer Section 3.5.

4.11 Chemical manifest

If the chemical is above the Dangerous Goods manifest quantity (i.e. >10,000 L), then a Hazardous Material (HAZMAT) box must be mounted just inside the site main entrance gate. A chemical manifest must be provided in the box and must meet the requirements of NSW Storage and Handling of Dangerous Goods Code of Practice 2005. Chemical manifest must comply with WHS Regulation 2017 Schedule 11. This typically contains the following details:

- Date of preparation
- Name and contact details of Occupier / Sydney Water Responsible Person
- Contact details for two people in case of emergency
- Details of dangerous goods storages including type, location, number and volume of tanks
- Safety Data Sheet (SDS) of the chemical
- A site plan of the premises which includes:
  - Location of essential site services, fuel and power isolation points

- Location of fire extinguisher and safety shower/eye wash facilities
- Location of the manifest
- Main entry and exit points
- Location and classes of dangerous goods storages and how they are identified
- Dosing area
- Location of all drains on site
- Nature of adjoining water storage facility
- Location of emergency assembly area.

5. Chemical storage and dosing tank(s)

Chemical storage tank(s) must be provided for safe storage of the Sodium Hypochlorite. The tank(s) must be located within the bunded area inside the RCP building dosing room. The preferred arrangement of the tank(s) is to have the dosing tank in the corner furthest from the control room and the storage tank closest to the control room and the entry door.

The storage tank(s) must be designed and constructed to provide maximum draining of the tank and its connections while still maintaining the structural integrity of the tank walls and base.

Equipment, such as access hatches and level sensors must be easily reached from the platform ladder for ease of operation and maintenance.

The storage tank must be designed for the maximum delivery temperature of the chemical. This temperature will be advised by Sydney Water or its representative.

The tanks provided must be the tallest and thinnest available with sufficient access to the level transducer on top. Clearance above the tanks must be a minimum of 500mm.

There are 3 acknowledged references to tank capacity as follows:

1) Nominal Capacity – This is the tanks capacity as stated by the manufacturer. It is the tanks nominal capacity without fittings.
2) Effective capacity – This is the capacity of the tank to contain product. It is the tanks volume as determined from the floor of the tank to the invert of the tank overflow.
3) Working capacity – This is the tank capacity to deliver product. It is determined from the obvert of the discharge to the invert of the overflow.

The storage volume must be calculated from the bottom of the tank to the invert of the overflow level.

5.1 Material

The storage and dosing tank(s) must be manufactured from rotomoulded polyethylene, FRP or other material suitable for Sodium Hypochlorite. It must be designed and constructed in accordance with AS/NZS 4766 when it is made from PE, DVS2205 / EN12573 for uPVC or as per the Sydney Water FRP Chemical Storage Tanks Technical Specification for FRP. The chemical storage and dosing tank(s) must be resistant to chemical attack and designed and constructed in accordance with the relevant requirement of AS 3780. A minimum of 1.5 times the specific gravity of the fluid to be stored in the tank must be assumed for calculation of wall thickness requirement.

Hold down brackets where required are to be situated above bund height to minimise penetrations into the bund where possible.

The tank/s supplied must be fitted out with the required branches, fittings, labelling and identification number. The labelling requirements must include, but is not limited to the material of construction, the name of the manufacturer and the date of manufacture.

All stub flange nozzles must be complete with stiffened gussets and supplied 316 stainless steel backing rings, ANSI 150. For indicative tank layout drawing including all required appurtenances refer to DTC drawings.

5.2 Structural

The tank must be suitably reinforced and supported to withstand all forces, including filling forces, without deforming when it is full. The tank must be fabricated such that the top of the tank is capable of supporting the weight of maintenance personnel.

For a FRP tank, it must be anchored and mounted on a suitable concrete plinth. Suitable lifting lugs must be fitted. Bitumen sealed mats or, alternatively, 10mm closed cell, high density polyethylene foam sheeting ('Parchem Jointflex' or similar), must also be installed between the storage tank and concrete plinth.

5.3 Access Hatch

For a covered tank with a sidewall height of not greater than 2 m, a minimum of one 600mm diameter access hatch must be provided in the top of the tank. Where the tank is small <5kL and a 600mm diameter access hatch is not feasible, a 450mm diameter access hatch must be provided.

For any other tank, the minimum dimension of the side access hatch is 600 mm diameter. The side access hatch must be hinged to the tank wall.

The hatch must be made from lightweight materials, weighing no more than 16 kg, in accordance with AS 3996, Class A. Weight limits must be labelled where appropriate.

5.4 Tank inlet and outlet

Tank must be as per the DTC drawings and have a minimum of the following pipework features:

- One 50 mm diameter vent (breather) on the apex of the tank roof must be supplied. The vent must penetrate the external wall and finish in a 90° bend with the open end facing downward. The end of the vent pipe must be covered with a sewer vent slotted cap.
- One 80 mm diameter overflow branch. The overflow line diameter should be at least 1.5 times the diameter of the filling line. The overflow line must be located such that it prevents immersion of instruments and equipment located in the tank roof and directs chemical safely away from operators and to the bund sump. The overflow must terminate in a water trap consisting of a bucket supplied by the Contractor.
- One drain branch with minimum diameter of 50 mm must be provided as close to the tank floor level as practicable.
- One 50mm diameter fill pipe to the top side inlet from tanker unloading point, complete with a fill valve. A 50 mm suitable male camlock style fitting, with cover, must be supplied and installed at the tanker filling point. This pipe must rise vertically and then slope downwards towards the tank (1 in 100 fall). It must enter the top of the chemical storage tank and be located above the level of the overflow pipe.
- One 180mm diameter branch in the roof of the tank for an Ultrasonic level transmitter fitted with female camlock connection. One must be used the other is to be a spare, both are to be located in positions which are accessible from a moveable access platform.
- One suitably sized discharge outlet located as close to the floor of the tank as practicable. It must be fitted with a manual isolation valve and a motorised isolation valve which must have a battery backup sufficient to drive the valve close in a power failure.
- Automatic cut out during filling when the tank reaches High Level (90%).
- Automatic cut out during dosing when the tank reaches Low Low level (5%).

- Isolation (stop) valves on each of the inlet and outlet connections.
- All branches on the tank must finish with 150 mm or more from the tank wall or roof with ANSI flanges with 316 stainless steel backing rings. All stub flanges to be externally welded and back welded from inside the tank and gusseted.
- A typical storage tank data sheet is included in Appendix D.

5.5 Level instruments

An ultrasonic level transducer to show the level/quantity of the contents inside the tank must be provided above the overflow line. It should be mounted on a removable camlock style fitting and easily accessible from a platform ladder. The transducer must be connected to the control and telemetry system to allow remote monitoring as specified in Sydney Water's – IICATS (General) TOG_TS01 and Sydney Water – IICATS Water Distribution Related Instrumentation and Control Standards TOG_TS02. 0% level must be at the obvert of the tank outlet and 100% must be at invert of the tank overflow.

In addition to the ultrasonic level transducer, a visible indicator must also be provided. A translucent tank with level markings is acceptable. Otherwise the transparent tube indicator must be adjacent to the tank wall. The actual liquid level inside the tank during filling must be visible from the filling/transfer point.

A separate capacitance type High Level switch (LSH) located just below the invert of the overflow and automatic cut out during filling must also be provided.

A separate capacitance type Low Level Switch (LSL) located just above the overt of the discharge must be provided.

5.6 Digital display

A weatherproof digital display of the tank level must also be installed at the filling transfer point to indicate the actual level during filling. An alarm system consisting of a klaxon and beacon must also be installed at the filling transfer point, to alarm if tank high level switch has been reached. The digital display for tank level must be suitable for operation with 24V DC power supply. It must be equipped with high contrast LED display and a minimum reading range of 10m. It must be suitable to display percentage values.

The digital display must have a minimum rating of IP 56 and must be installed with suitable mounting accessories. The digital display must be mounted on the fill line above the isolating valve as shown in the DTC drawings.

5.7 Dosing tank requirements

For a system where dilution of the neat Sodium Hypochlorite solution provided is required prior to dosing an additional tank with associated appurtenances, level indicators, access provisions and all associated pipework, instrumentation and control devices must be provided.

The tank must meet all material, structural, access hatch, tank inlet and outlet and level indicator requirements as per Section 5.1 through 5.5 of this Document unless noted below. A digital display of the tank level at the unloading point is required.

5.7.1 Dosing tank inlet and outlet

The Dosing tank must have all inlets and outlets as per Section 5.4 of this document with the following additions:

- One 50mm (nominal, to be confirmed on transfer pump size selection) diameter fill pipe to the top side inlet from the transfer pump. This pipe must rise vertically and then slope downwards towards the tank (1 in 100 fall). It must enter the top of the chemical dosing tank and be located above the level of the overflow pipe.
- One 40mm diameter inlet fitting from the carrier water pumps to the roof of the dosing tank. The inlet fitting internal to the tank must be angled such that the makeup water will enter the dosing tank at a 45^{o} angle to aid in the mixing of the solution when the tank is filling. The makeup water line will be fitted with solenoid and a mechanically operated bypass valve, diaphragm valve and flow switch connected to the RTU. This pipe must rise vertically and then slope downwards towards the tank (1 in 100 fall). It must enter the top of the chemical storage tank and be located above the level of the overflow pipe. One 25mm diameter return line from the calibration cylinder prior to the dosing pumps and linked to the Pressure Regulation Valves on the discharge side of the dosing pumps.
- One 50mm diameter outlet fitting for the recirculation line linked to the transfer/mixing pump. The discharge pipework to be fitted with a manual isolation valve in addition to an electrically actuated isolation valve

6. Batching and dosing system

The required dosing system must be designed to provide a reliable, continuous dosing of metered volumes of Sodium Hypochlorite. All pumps, valves, fittings, and pipework necessary for the proper operation of the dosing system must be provided. The piping must be suitable for the Sodium Hypochlorite conveyed. The system must be capable of operating in both automatic and local manual modes.

The system is to include the allowance for batching of the neat Sodium Hypochlorite (12.5%) delivered on site with make-up water. This dilution will enable a more accurate level of control of the amount of Sodium Hypochlorite injected into the system. The batching process is to be limited to a maximum of one (1) hour with a preferred total transfer, dilution, and mixing time of 40 minutes

The system must be supported by suitable supports for the required pumps, valves, fittings, and pipework (uni-strut is not considered suitable), all pipework to be supported by pipe manufacturer proprietary product as they allow for movement without damage.

6.1 Pumps and pipework

Refer Appendix A: DTC drawings for a list of generic P&IDs.

6.1.1 Transfer pumps

One flooded suction, Iwaki (or suitable equivalent) centrifugal, pump is required for transfer of Sodium Hypochlorite, with "seal-less" magnetic drive types. Appropriate materials of construction are:

- Fluoro-polymer lined steel
- Titanium
- Glass Fibre Reinforced Polypropylene

Where seals are used, they must have a double mechanical-seal with water flush. The seal must be constructed with wetted parts from titanium and have PTFE and ceramic seal faces.

The transfer pumps are to be designed to provide sufficient flow in the batching process in order to meet the time requirement set in Section 6 of this document.

The transfer pump is to be provided with suitable pipework and motor operated valves for mixing of the diluted Sodium Hypochlorite solution.

Approval from Sydney Water must be sought prior to procurement of pumps to be installed in the Rechlorination Plant.

6.1.2 Carrier water pumps

Two (2) identical duty / assist configuration pumps of suitable brand, type and capacity range, must be provided for make-up water and carrier water if the on-site pressures do not provide suitable pressure to meet the dilution and carry water process requirements. The pumps are to be centrifugal, multi-stage booster pumps.

During the batching process both pumps will operate in a duty/duty configuration to batch the sodium hypochlorite solution in the allowable batching time.

These Carrier Water Pumps are also required to supply the carrier water for the dosing system in a duty/assist configuration dependant on the site requirements. The carrier water pumps can be operated either automatically (via the control system) or manually. The pump output pressure is to be limited so as

not to overcome the dosing pump pressure, however it is still to be sufficient to supply 200kPa of pressure at the injection nozzle in the reservoir or overcome the mains pressure if dosing directly into a water supply. The switchover to the standby pump must be automatic via the control system. Automatic changeover between pump duties must be configured on time as well as pump fault.

The automatic carrier water pump cut-out after the dosing pumps have cut-out and after an adjustable time has elapsed to flush the doing line.

Approval from Sydney Water must be sought prior to procurement of pumps to be installed in the Rechlorination Plant.

6.1.3 Dosing pumps

Two (2) identical duty and standby dosing pumps (or one (1) dosing pump where the RCP is small, as approved by Sydney Water) of the Grundfos Digital Dosing Pump (or suitable equivalent) type of adequate capacity and pressure range, must be provided for dosing. The switchover to the standby pump must be automatic via the control system. Automatic changeover between pump duties must be configured on time as well as pump fault. Automatic dosing pump cut out when the chemical dosing tank reaches Low Low level (5%). The pumps must also be automatically disabled during batching. The dosing pumps must be designed to allow minimum dosing during the initial operation of the Rechlorination Plant.

The dosing pumps must be digital (minimum 7bar) with a turndown ratio of 100:1 or better.

The pumps are to incorporate digital indication of the set rate. Metering accuracy of the pumps must be better than 2.5% of the set rate at a variable suction head.

Each pump must be fitted with an external pressure relief valve, vented back into the calibration vent line returning into the top of the dosing tank.

Approval from Sydney Water must be sought prior to procurement of dosing pumps to be installed in the Rechlorination Plant.

Operation of the dosing pumps require several prerequisites both within the RCP unit and outside the RCP unit. Prerequisites external to the RCP include:

- Satisfactory operation of the Chlorine Residual Analyser
- Satisfactory operation of the reservoir mixer (if dosing to a reservoir)
- Flowmeter in the water main (if dosing to a water main).

Refer to DTC drawings.

6.1.4 Pipework and appurtenances

Carrier Water line

Carrier water must be piped from the carrier water system to provide a minimum dilution (or carrier) water ratio of 20:1 based on the maximum dosing pump speed.

Flow from the carrier water line must pass through an isolation valve, flow switch, rotameter, diaphragm flow control valve and non-return valve(s). The rotameters must have a minimum length of 250 mm.

A combined flow switch and flow transducer must be installed on the common line to provide flowrate and a “carrier water system failed” alarm (failsafe) as separate inputs to the control system. Model IFM SM8000 or equivalent.

A suitably sized RPZ valve must be provided in the dilution water line for backflow prevention. Only proprietary back flow prevention devices must be used.

Dosing Line

Adjustable pressure retaining valves must be incorporated on each discharge lines from the dosing pumps to maintain dosing accuracy over the range of operating depths in the dosing tank, and to act as anti-syphoning protection.

A suction strainer with a maximum opening of 1mm must be provided.

Pipework shall be laid, sloped appropriately, so as to facilitate venting and prevent the accumulation of oxygen.

Transfer Line

The transfer line must be double contained where it passes above the doorway such that any leaks will not impact on any person using the doorway.

6.1.5 Dosing cabinets

The pumps and associated instruments must be enclosed in a fabricated PE dosing cabinet with clear Polycarbonate doors. For systems with multiple dosing locations, each set of duty/standby dosing pumps will be contained within a separate cabinet. The dosing cabinets must be designed for ease of access and pump maintenance. There must be a divider in the centre of the dosing cabinet to separate the two dosing pumps. There must be a catch pot on the base of the dosing cabinet to ensure all spillages are contained and directed to the sump. A high level switch to detect fluid in the catch pot will be hardwired interlocked to stop the dosing pumps when activated. The cabinet requires adequate ventilation.

Dosing pipework from the point it exits the dosing cabinet must be double contained and drain back to the dosing cabinet for pipework within the RCP building.

For multiple dosing points, each dosing system will be supplied from a common discharge manifold and protected from syphoning by an individual electrically actuated isolation ball valve.

6.2 Dosing cabinets

Refer Section 6.1.5

6.3 Pulsation dampeners at pumps

Pulsation dampeners must be provided in the discharge pipework from the dosing pump and must be suitably sized for the displacement of the pump so that discharge pressure fluctuation does not exceed 10%. The pulsation dampeners must have a diaphragm separating the air chamber from the liquid chamber. The air chamber must be pressurised and be capable of re-pressurising by air pump via a Schrader valve. A pressure gauge must be installed. The position of the pressure gauge must be located before the pressure relief valve and the loading valve.

Where possible, pulsation dampener should be located vertically at the top of the common discharge from the dosing pumps, such that discharge flow is directly into the dampener before a change of direction along the dosing line.

6.4 Depressurising, flushing and draining

Adequate provision must be made for draining of lines for maintenance. This typically involves at least one drain valve on each of the suction and discharge sides of the pump. These valves must be fitted with a camlock style fitting. The valving must be provided to allow for flushing of the chemical dosing lines without dismantling the lines.

A 20mm Male polypropylene camlock style fitting must be provided on all flushing points to match that on the hose reel.

A 50mm Male polypropylene camlock style fitting must be provided at the chemical filling line fitted with a lockable cap.

All camlocks are to be supported.

6.5 Automatic isolation valves

The automatic isolation valve at the outlets of the storage and dosing tanks must be motorised PVC-U ball valves. The valves must consist of two separate modules – the valve body and the actuator. The material of construction must be suitable for the Sodium Hypochlorite. The valve must include a compact electric actuator capable of open/close feedback and be complete with open and closed position indicators and a facility for manual control. The valve position signal must be sent to the control system. The valve must close on power failure via the battery backed control power supply (note: internally mounted battery packs on the actuators are not required) and the actuator must be IP 65/67 per EN 60529.

An additional automatic isolation valve meeting the criteria above must be installed on a recirculation line. The recirculation line must enable the mixing of the chemical dosing tank via the transfer pump to ensure no concentrated plumes of Sodium Hypochlorite can be passed through the dosing pumps to the system.

6.6 Pressure transmitter indicator

A pressure Transmitter/Indicator must be installed and connected to the control system on the discharge side of the pumps for systems dosing to a water main. The instrument must include a digital indicator.

6.7 Dosing and transfer chemical flowmeter

A flowmeter (magnetic and Teflon coated type preferred) must be installed in each transfer and dosing line (typically prior to the pressure sustaining valve). There must be sufficient upstream and downstream straight pipe run to prevent flow disturbances affecting the flowmeter. The dosing flowmeter must be calibrated to units of litres per hour. The flow meter must measure the flow and transmit the flow signal to the control system. The flow meter must display the flow rate and any error messages.

Flowmeter must be flanged to ANSI 150. Note: additional gaskets are required between the flowmeter flange faces and the grounding rings to prevent leakages due to the reduced clamping forces allowable when using uPVC pipework and flange assemblies.

6.8 Carrier and potable water system

Carrier water must be piped from the service water system to provide a minimum dilution ratio of 4:1 to 20:1 of carrier water to dosing chemical. If site pressure is not able to accommodate 20:1 ratio then a carrier water booster pump must be installed in the RCP. The contractor must determine the capacity of the booster pump including pipeline and RPZ and valve losses.

Flow from the carrier water line must pass through an isolation valve, flow switch, rotameter, actuated valve(s) and non-return valve(s). The rotameters must have a minimum length of 250 mm.

Actuated valves must be solenoid valve for lines <50mm and motorised valve for lines > or equal to 50mm.

Actuated valves, isolation valves and all other items of equipment in the carrier water system must be compatible with the sodium hypochlorite solution being dosed.

A combined flow switch and flow transducer must be installed on the carrier water line of each dosing set pump to provide flowrate and a “carrier water system failed” alarm (failsafe) as separate inputs to the control system. Model IFM SM8000 or equivalent.

A suitably sized RPZ valve must be provided in the carrier water line for backflow prevention.

Only proprietary back flow prevention devices must be used.

The flushing water timing is a function of the automatic control system, where a solenoid valve must open and flush the dosing line and the solenoid valve will close at the end of timer duration. The flushing line must have a pressure indicator installed.

6.8.1 Potable water booster pump

At locations where the water pressure is insufficient to meet the service water requirements for the RCP (safety shower and eyewash), a potable water booster pump must be installed.

One duty pump of suitable type and capacity range must provide the required flow and pressure requirements. The booster pump is not controlled or monitored by the IICATS control system and requires integral or independent controls.

Approval from Sydney Water must be sought prior to procurement of pumps to be installed in the RCP.

6.9 Double containment of filling and dosing lines

Chemical dosing lines outside of the chemical room must be a pipe-in-pipe arrangement. The intention is to prevent a leak in the pipe from contaminating the soil and groundwater, and to protect it from accidental damage. Care must be taken with the design and installation of the outer pipe so that leaks from the inner pipe can be readily detected and must be sealed to stop ingress of ground water.

Concrete encasement of a conduit for the containment lines when laid in ground is acceptable.

Double containment from within the bunded area through to the dosing point must be constructed in such a way to facilitate replacement of dosing line without excavation of that section of pipe. Continuous PE or pressure rated uPVC pipe are preferred.

Where requested, an additional dosing line must be installed as a backup.

Leak detection must be included in accordance with Sydney Water’s Technical Specification – Mechanical (BMIS0209).

6.10 Dosing point

6.10.1 Water storage (reservoir) facilities

The dosing point must be designed with the following considerations:

- Located to maximise chemical dispersion within the water storage facility and minimise the chance of short circuiting. The dosing point is located feeding into the reservoir mixer.

- Be at a level that is normally submerged within the water storage facility.
- Be of rugged construction.
- Easily cleanable.
- Easily removable

The dosing apparatus must consist of:

- A stainless steel dosing nozzle (as per The DTC drawings).
- A stainless steel pipe support and dosing pipe connection.
- A stainless steel support and retrieval wire from the top of the reservoir to the dosing skid and clamps, to facilitate removal.
- A food grade hose.

6.10.2 Dosing to a water main

The dosing point must be designed with the following considerations:

- Located in a pit.
- Have a 20mm valved drain/flushing line fitted with hose connection point.
- Have a high level switch (LSH) in the pit to detect flooding or chemical leakage.
- Have an isolating ball valve and a non-return valve.
- Have a proprietary retractable injection quill with safety chains and integral ball valve.

6.11 Leak detection pits

Leakage detection pits must be installed at low points in the double contained dosing line. The double containment pipe must have a downward facing tee and branch pipe at the pit with valve to allow draining of the double containment. The branch pipe in the detection pit must be fitted with a LSH switch to detect a leak. The LSH signal cable must run back to the RCP and be connected to the control's cubicle.

6.12 Chlorine residual analyser

A Chlorine Residual Analyser is required for operation of the RCP dosing system. This may be existing on site, be located remote to the RCP unit, or be installed in the RCP unit as advised by Sydney Water.

If a remote chlorine analyser is required to be installed when dosing into a water main it shall be located in a suitable pit downstream of the water flowmeter. Sydney Water will indicate where this is required to be installed.

The analyser must not require a buffer solution and only require the changing of gel and cap every 6 months.

6.13 Labelling and identification

Labelling and identification of equipment and structures must follow the requirements of Sydney Water's Specification - Commissioning (D0001440).

7. Submission

The following must be submitted to Sydney Water for approval prior to ordering.

7.1 Design drawings

Design drawings of the proposed RCP installation must be provided. They must cover all design issues including:

- Location of the RCP on site including access and egress points, delivery bunds, drains, services, dosing lines, pits and where required, truck turning bays (general arrangement):
- Process & Instrumentation Diagram (P&ID) drawing(s) with an associated list of equipment, material and size details. Supplied by the Sydney Water with this specification
- Position and layout of all equipment including pipework and storage tank (dimensional layout – plan and elevation). Supplied by Sydney Water with this specification
- Electrical drawings (including circuits, control systems, equipment lists, manufacturer general arrangement, items, list, site general arrangement, conduit sizes and locations)
- Structural drawings, including the building.

The drawing format must be in accordance with Sydney Water's Specification - Commissioning (D0001440).

The Contractor must submit all "Work-As-Constructed (WAC)" drawings, as follows:

Type of copy	Details of copies required
Hard Copies	1 – 2 x A3 size bound in A3 size folders
Electronic copies (CD-R/DVD/USB) in both AutoCAD DWG and Adobe PDF formats	2 – Distribution Asset Information – Engineering Drawing Management System (EDMS) Contractor Portal, Reliability Maintenance Engineering

7.2 Operating and maintenance manual

A draft Operating and Maintenance (O&M) Manual for the RCP must be prepared and submitted to Sydney Water prior to SAT. It must be finalised and re-submitted after successful commissioning of the unit.

An exploded view of pump and consumables list is required in the O&M manual.

A template for the O&M manual is included with this specification.

The O&M manual must be in accordance with Sydney Water's Specification - Commissioning (D0001440).

7.3 Critical spare parts

The Contractor must supply critical spare parts lists for the installation. The list of critical spare parts shall be discussed and agree with Sydney Water prior to procurement. Sydney Water may purchase critical spares form the Contractor or elsewhere.

8. Testing and commissioning

Factory Acceptance Testing (FAT) of prefabricated units needs to be conducted in the presence of representative(s) from Sydney Water once all operation and maintenance manuals are complete and an updated set of all drawings are made available. Typical FAT requirements are outlined in Sydney Water's Specification - Commissioning (D0001440). This needs to be conducted prior to installation of the unit at the site.

Following installation, the RCP must be tested and commissioned in accordance with Sydney Water's Specification - Commissioning (D0001440). The Contractor must develop a Commissioning Plan based on D0001440 which must be submitted to Sydney Water for review. Written approval from Sydney Water must be sought prior to commissioning.

An example Commissioning checklist is shown in Appendix G.

The Contractor must provide the necessary expertise and resources for successful commissioning of the unit.

In addition, the following tests must be carried out:

8.1 Hydrostatic test and leak detection

The bund area must be watertight prior to the application of the internal coating. The bund area of chemical storage area must be filled with water for at least 24 hours and prior to the internal coating being applied. It will be satisfactory if there is no water leakage through the wall, slab, penetrations, joints, etc. The storage and dosing tank(s) must be filled to prevent any movement due to flotation.

New storage and dosing tanks and pipework must be filled with water and inspected for leakage for at least 24 hours. Tanks must be tested to the SG of the tank. Pipework must be pressure tested to 1.5 times the operating pressure.

8.2 Commissioning test run

For the purpose of the Site Acceptance Test (SAT), a test run must be undertaken in accordance with the Contractor's site commissioning methodology, which must be approved by Sydney Water. The test run must be a minimum of one month in duration. Typical SAT requirements are outlined in Sydney Water's Specification - Commissioning (D0001440).

The test run must be carried out in the following stages:

- Manual operation using water.
- Automatic operation using water.
- Manual operation using chemical.
- Automatic operation using chemical.

Commissioning must be deemed complete when the whole of the works is capable of running continuously without any fault for a period of two (2) weeks. The plant must start and stop during this two-week period as required by Sydney Water. The SAT must include at least one (1) chemical delivery.

During this period, the Contractor must maintain the unit in a proper working manner. The unit must be used to demonstrate system performance to Sydney Water. The chlorine residual in the water storage must be recorded. The Contractor must carry out any work necessary to ensure the unit is working correctly.

At the end of this period, the Contractor must issue a certificate stating the outcome of the testing and commissioning to allow Handover, in accordance with Sydney Water's Specification - Commissioning (D0001440).

8.3 Building certification

The Contractor must provide all building certification documents for design and certification of the unit to Sydney Water.

8.4 Submission of work as constructed (WAC) documents

The Handover is not complete until all WAC documents, such as detailed drawings, O&M Manuals, FMECA documentation, MAXIMO entries and so on, have been submitted to Sydney Water. Refer to Sydney Water's Specification - Commissioning (D0001440). This is a Hold Point.

8.5 Handover

The Asset Commissioning SAP as detailed in Sydney Water's Specification - Commissioning (D0001440) must be followed to ensure all issues are finalised before handover of the RCP to Sydney Water.

Ownership

Ownership

Role	Title
Group	Asset Life Cycle
Owner	Engineering Manager, Engineering and Technical Support
Author	Jason Smith, Senior Mechanical Engineer, Engineering and Technical Support

Change history

Version No.	Prepared by	Date	Approved by	Issue date
2	Jason Smith	March 2022	Norbert Schaeper	March 2022
1	Jason Smith	March 2019	Ken Wiggins	March 2019

Appendices

Attachment	Title
Appendix A	DTC Drawing List
Appendix B	Sydney Water Asset Data Management and Commissioning
Appendix C	Construction Hazard Assessment Implication Review (CHAIR)
Appendix D	Storage Tank Data Sheets
Appendix E	Operation and Maintenance Manual Template
Appendix F	Sydney Water Guide to Proven Products
Appendix G	RCP Commissioning Checklist

Appendix A - DTC Drawing List

	RECHLORINATION PLANT, COMMON DETAIL DRAWINGS
DTC7000	CHEMICAL DOSING & RECHLORINATION UNIT, COVER SHEET AND DRAWING LIST
DTC7001	CHEMICAL DOSING & RECHLORINATION UNIT, INSTRUCTIONS AND NOTES
DTC7002	CHEMICAL DOSING & RECHLORINATION UNIT, GENERAL NOTES
DTC7003	CHEMICAL DOSING & RECHLORINATION UNIT, GENERIC SITE LAYOUT - DRIVE-IN, REVERSE, DRIVE-OUT
DTC7004	CHEMICAL DOSING & RECHLORINATION UNIT, GENERIC SITE LAYOUT - DRIVE-IN, DRIVE-OUT
DTC7005	CHEMICAL DOSING & RECHLORINATION UNIT, GENERIC SITE LAYOUT SECTION (INCL. RCP/RCP FOUNDATION)
DTC7006	CHEMICAL DOSING & RECHLORINATION UNIT, GENERIC DELIVERY BUND, CONCRETE DETAILS
DTC7007	CHEMICAL DOSING & RECHLORINATION UNIT, GENERIC DELIVERY BUND - REINFORCEMENT DETAILS
DTC7008	CHEMICAL DOSING & RECHLORINATION UNIT, GENERIC DELIVERY BAY SUMP - PUMP-OUT & GRAVITY TYPE DETAILS
DTC7009	CHEMICAL DOSING & RECHLORINATION UNIT, TYPICAL CIVIL DETAILS
DTC7013	TYPICAL RECHLORINATION PLANT SODIUM HYPOCHLORITE DOSING CABINET DETAILS
DTC7014	TYPICAL RECHLORINATION PLANT SODIUM HYPOCHLORITE DOSING POINT DETAILS
DTC7015	TYPICAL RECHLORINATION PLANT SODIUM HYPOCHLORITE P&ID - DOSING POINTS
DTC7016	CHEMICAL DOSING & RECHLORINATION UNIT, MISCELLANEOUS DETAILS
DTC7017	CHEMICAL DOSING & RECHLORINATION UNIT, BUILDING SIGNAGE
DTC7018	CHEMICAL DOSING & RECHLORINATION UNIT, LINE LEGEND & INSTRUMENTATION SYMBOLS P&ID
DTC7019	CHEMICAL DOSING & RECHLORINATION UNIT, PREFIXES & PIPING CODES P&ID
DTC7020	CHEMICAL DOSING & RECHLORINATION UNIT, SYMBOLS LEGEND SHEET P&ID
	3kL + 7kL RECHLORINATION PLANT SODIUM HYPOCHLORITE
DTC7145	3kL + 7kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, P&ID – SHEET 1 OF 2
DTC7146	3kL + 7kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, P&ID – SHEET 2 OF 2
DTC7147	3kL + 7kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, GENERAL ARRANGEMENT PLAN & ELEVATIONS
DTC7148	3kL + 7kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, GENERAL ARRANGEMENT SECTIONS
DTC7149	3kL + 7kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, PIPEWORK DETAILS, SHEET 1 OF 2
DTC7150	3kL + 7kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, PIPEWORK DETAILS, SHEET 2 OF 2

DTC7151	3kL + 7kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, 3kL STORAGE TANK DETAILS
DTC7152	3kL + 7kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, 7kL DOSING TANK DETAILS
	7kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE
DTC7160	7kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, P&ID SHEET 1 OF 2
DTC7161	7kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, P&ID SHEET 2 OF 2
DTC7162	7kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, GENERAL ARRANGEMENT PLAN & ELEVATIONS
DTC7163	7kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, GENERAL ARRANGEMENT SECTIONS
DTC7164	7kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, PIPEWORK DETAILS, SHEET 1 OF 2
DTC7165	7kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, PIPEWORK DETAILS, SHEET 2 OF 2
DTC7166	7kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, 7kL STORAGE TANK DETAILS
DTC7167	7kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, 13.5kL DOSING TANK DETAILS
	13.5kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE
DTC7175	13.5kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, P&ID SHEET 1 OF 2
DTC7176	13.5kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, P&ID SHEET 2 OF 2
DTC7177	13.5kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, GENERAL ARRANGEMENT PLAN & ELEVATIONS
DTC7178	13.5kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, GENERAL ARRANGEMENT SECTIONS
DTC7179	13.5kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, PIPEWORK DETAILS, SHEET 1 OF 2
DTC7180	13.5kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, PIPEWORK DETAILS, SHEET 2 OF 2
DTC7181	13.5kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, 13.5kL STORAGE TANK DETAILS
DTC7182	13.5kL + 13.5kL RECHLORINATION PLANT SODIUM HYPOCHLORITE, 13.5kL DOSING TANK DETAILS

Appendix B - Sydney Water Asset Data Management and Commissioning

Information on Inspection & Test Plans and Defects Rectification Plan can be found Sydney Water's Specification - Commissioning (D0001440). A sample "*New Location Listing For Assets*" template is shown in the succeeding table. More information can be found from Sydney Water's Asset Information* group page on iConnect.

MEPR0063.02: Maximo (MXES) - Location Number Request Form for New/Existing Assets

Instructions:

1. Columns marked in RED are mandatory for Service Provider.
2. **Sydney Water will allocate Maximo Location Numbers for finalisation of the P & ID for Assets.**
3. **Reference on P & ID (by Service Provider) is a temporary identifier until Location Number is allocated by Asset Data Management.**
4. Examples (below highlighted in blue) are given for guidance only.
5. Do not over write or delete blue example area. Start entering your data after the last blue line (Line 18)
6. **Please email completed spreadsheet and P & ID diagrams to AssetDataMgmt@sydneywater.com.au**
7. For further assistance, please contact the Asset Data Management representative of Sydney Water.

FMIS Project Number	SW Project Manager or Rep (for Minor works)

Facility	Location Number (by SWC)	Maximo Location Number (by SWC)	External Reference Number (by SWC)	Ref on P & ID (Service Provider)	Location Description (by SWC)	Location Description (By Service Provider)	Location Within Facility	Asset Description	SWC Parent Location	Parent Location	P&ID / Drawing Number	Is High Voltage Asset? Yes/No	Telemetry Monitored	Comments

NOTE: * Asset Information is the new business unit name for the previous Asset Knowledge.

Appendix C - Construction Hazard Assessment Implication Review (CHAIR)

CHAIR Safety in Design Tool, developed by Work Cover NSW needs to be carried out in three phases namely:

- CHAIR-1: Conceptual Design Review (To be completed by the Contractor)
- CHAIR-2: Detailed Design Construction or Demolition Review (To be completed by the Contractor)
- CHAIR-3: Detailed Design Maintenance & Repair Review (Completed by Sydney Water). See attached CHAIR 3 report prepared by Sydney Water for the standard RCP Unit (refer below).

More information as to guidewords and how to conduct CHAIR refer to Sydney Water Safety in Design Procedure (D0000653) and https://www.safedesignaustralia.com.au/wp-content/uploads/2018/10/CHAIR_Safety_in_Design_Tool_WorkCoverNSW.pdf.

Rechlorination Plant - Sodium Hypochlorite Dosing

NOTE: THIS CHAIR 3 UNDERTAKEN ON 3rd NOVEMBER 2016 WHEN REVISED LAYOUTS WERE AVAILABLE

	Maintainability Aspect	Why?	Causes	ACTION		
				Recommendation/Comment	***Person Responsible***	***Action Outcome***
	Site Access General	**Hypochlorite Delivery Bund**				
1	POSTURE / MANUAL HANDLING	Lifting of sump covers Sump pump removal etc. (cut-out for valve key to be provided).	Heavy weights to be lifted for maintenance and operation tasks.	FRP grating to be used as preferred FRP to be added to acceptable products list Refer GRP specification	Andrew Rakvin	DTC Drawings
2	POSTURE / MANUAL HANDLING	Drain Valve location may be knocked off from tank	Movement of mobile platform around floor for access to top of tank.	Relocate to similar location as the CDU tank	Andrew Rakvin	DTC Drawings
3	ACCESS/EGRESS	Location of bund sump and cover	Too close to access ladder, trip point	Review design to move away from access stairs. Need to minimise length of drain pipe before drain valve.	Andrew Rakvin	DTC Drawings
4	ACCESS/EGRESS	Transfer pump line at 90 degrees to tank layout	Poor ergonomic location, insufficient room.	Transfer pump line at 45 degrees similar to the 13.5kL tank set up	Andrew Rakvin	DTC Drawings
5	ACCESS/EGRESS	Location of vent on tank	Vent to be at high point to enable sufficient venting	Vent from top of the tank, to come out through wall and turn upwards under the eaves with conical vent top. Vent line to slope back to tank for any condensation to run back into tank. Include sign for the vent on the wall	Andrew Rakvin/Gino Iori	DTC Drawings / Specification
6	ACCESS/EGRESS	Query of requirement for second set of dosing pumps in second dosing cabinet at some plants.	Requirement to dose to two points	Second dosing pumps are not required on small units only on large units. To be shown where required in layouts and PIDs.	Andrew Rakvin	DTC Drawings
7	ACCESS/EGRESS	Potential for tampering/injury	Unauthorised access to site	Remove camlock on the dosing system, camlocks to be poly.	Andrew Rakvin	DTC Drawings
8	ACCESS/EGRESS	Truck access to delivery bay.	Delivery of chemical and equipment	Ensure that appropriate truck access/turning is	Murray Simpson	RCP specification requirement on contractor
9	ACCESS/EGRESS	General access to site.	Unauthorised access to site	Ensure site is appropriately secured with fencing and locked gates.	Murray Simpson	RCP specification requirement on contractor

	Maintainability Aspect	Why?	Causes	ACTION		
				Recommendation/Comment	***Person Responsible***	***Action Outcome***
10	ACCESS/EGRESS	General site layout	Need space for future maintenance activities.	Allow for future laydown area for repair works. Generally, use delivery bund for large items (EG tanks) or keep on trucks until needing to be moved into position. Building roof to be suspended off crane whilst tank is replaced.	Murray Simpson	RCP specification requirement on contractor
11	ACCESS/EGRESS	Ladders/ Access Required	Access to top of tank level sensor and roof fans and lights.	Portable Ladder provided for access as needed. Bailey Part Number Required	Barry Cook to provide to Andrew Rakvin. Andrew Rakvin to add to drgs.	DTC Drawings
12	ACCESS/EGRESS	Camlock Connection for Delivery	Need to take load of hose off camlock fitting to minimise breakage.	To suit 600-900 Orica specification Support for Camlock hose connection to be provided, preferably resting on lip of entrance door.	Andrew Rakvin	DTC Drawings
13	ACCESS/EGRESS	Safety shower/eyewash height	Needs to be not too low or too high	Safety shower eyewash height to be in accordance with Orica guidelines	Andrew Rakvin	DTC Drawings
14	ACCESS/EGRESS	Dangerous Goods Trucks stopping in public Area. Preferred option is to stop truck in private area owned by SWC where truck driver can safely egress truck to open gates. If this is not possible individual solution to be sought.	Unsafe access by delivery truck driver to open gates. Vehicle parked in unsafe area, risk of being hit by other vehicles.	Create footprint plan views with rigid truck turning circles showing minimum acceptable dimensions on drawings Atlas to prepare drawings based on conservative truck bund width. Minimum footpath width to be specified (to allow opening of doors without stepping backwards off	Murray Simpson	RCP specification requirement on contractor
15	ACCESS/EGRESS	Bund roll over not clear to drivers and pedestrians	Nightwork Uneven surfaces	Stripes to be added to bund rollovers Colour coding of concrete Ferrous Chloride colour	Andrew Rakvin	DTC Drawings

	Maintainability Aspect	Why?	Causes	ACTION		
				Recommendation/Comment	***Person Responsible***	***Action Outcome***
16	ACCESS / EGRESS	Access to a small tank is limited due to the size of the manway	Small tank	Recommend 450mm min size manway in small tanks, 600mm in large tanks.	Andrew Rakvin/Gino Iori	DTC Drawings / Specification
17	HEIGHTS / DROPPED OBJECTS	N/A	N/A	N/A	N/A	N/A
18	WEIGHT	Roads and delivery bund	loading from delivery and maintenance trucks on site.	Design for expected loads.	Andrew Rakvin	DTC Drawings
19	DISCOMFORT / STRESS	N/A	N/A	N/A	N/A	N/A
20	PERSONNEL PROT. EQUIPMENT	Signage	Signage requirements have changed for Dangerous Goods.	New signage specification to be referenced	Andrew Rakvin	DTC Drawings
21	VISIBILITY	Refer lighting issues	Night work on site.	Standard lighting design to be undertaken	AR	DTC Drawings
22	VISIBILITY	Lighting of tank issues with inadequate transparency	Cannot see the tank level when sun is at your back	Wait until construction has been undertaken to determine if additional lighting or a level instrument required. Leave out for now as not required.	No action	N/A
23	SLIPS, TRIPS, FALLS	Potential for injury	Movement of operations and maintenance personnel and delivery drivers.	Appropriate paint markings on speed bump and trip points around bund Step height of RCP bldg relative to footpath. Non-slip additive to epoxy coating	AR	DTC Drawings
24	ROTATING / MOVING EQUIPMENT	Inlet valve	Lockable valve	Fill valve to be lockable by SWC personnel and not accessible by non SWC staff (i.e. truck driver) Camlock on bund pump out line to be fitted with padlockable cover/ dust cap	AR	DTC Drawings
25	ROTATING / MOVING EQUIPMENT	N/A	N/A	N/A	N/A	N/A
26	IS REPAIR DIFFERENT?	N/A	N/A	N/A	N/A	N/A
27	OTHERS THAT MAY APPLY	Site drainage	Chemical spillage onto footpaths	Footpaths to drain back to delivery bund.	AR	DTC Drawings

	Maintainability Aspect	Why?	Causes	ACTION		
				Recommendation/Comment	Person Responsible	Action Outcome
28	OTHERS THAT MAY APPLY	Safe vehicular access to site.	Movement of vehicles on site	Provide appropriate site signage. Provide bollards where traffic is prohibited. Traffic engineer to confirm the access is suitable, according to Australian Standards and safe.	AR	DTC Drawings
29	OTHERS THAT MAY APPLY	External Aerial required for all sites for 3G transmission	Must be indicated on layouts.	Show 3G aerial on roof	AR	DTC Drawings

	Maintainability Aspect	Why?	Causes	ACTION		
				Recommendation/Comment	Person Responsible	Action Outcome
	RCP unit	**Internals and externals of RCP**				
30	POSTURE / MANUAL HANDLING	N/A	N/A	N/A	N/A	N/A
31	ACCESS / EGRESS	Layout of electrical cabinets	Limited space within RCP	Electrical equipment to have adequate space for occupants within the RCP.	Andrew Rakvin	DTC Drawings
32	ACCESS / EGRESS	Layout of equipment	Limited space within RCP	Internals of RCP to have adequate space for personnel movement and use of tools and equipment.	Andrew Rakvin	DTC Drawings
33	ACCESS / EGRESS	Limited access to the Electrical Control room	Improvement needed to clearances around the electrical cabinet access.	2 cabinets required, one is a 50 / 50 split, the other is a 60/40 split	Andrew Rakvin/Gino Iori	DTC Drawings / Specification
34	HEIGHTS / DROPPED OBJECTS	Maintenance of light / fans on top of RCP Building	Need for night works	Platform ladder access - light to be LED.	Andrew Rakvin	DTC Drawings
35	WEIGHT	Potential for damage due to: incorrect lifting procedure, unknown lift type, unsound lifting points, equipment not restrained	Lifting of equipment for maintenance	Lightweight grates (FRP). Tank to be tied back to wall.	Andrew Rakvin	DTC Drawings
36	WEIGHT	Site layout	Need for use of large cranes for off loading	Design to include how RCP will be offloaded, lifted and located on site and cranage needs and loading.	Andrew Rakvin	DTC Drawings
37	DISCOMFORT / STRESS	Ease of access	Chemical delivery process	RCP building is to be located on the passenger side of the tanker.	Andrew Rakvin	DTC Drawings

	Maintainability Aspect	Why?	Causes	ACTION		
				Recommendation/Comment	Person Responsible	Action Outcome
38	DISCOMFORT / STRESS	Temperature of the room too high breaking down the quality of the Hypo	High temperature / sun on western wall	Treat on case by case basis		
39	PERSONNEL PROT. EQUIPMENT	Exposure to chemicals	Chemical deliver and maintenance work.	BYO PPE. Folder on site with MSDS and emergency contacts etc. already in Switchroom.	Andrew Rakvin	DTC Drawings
40	PERSONNEL PROT. EQUIPMENT	N/A	N/A	N/A	N/A	N/A
41	VISIBILITY	Safe work requires adequate lighting	Night work	Provide external building light. Bollards with reflectors are located at various sites to protect discharge locations and act as guidance for reversing trucks onto site.	Andrew Rakvin	DTC Drawings
42	SLIPS, TRIPS, FALLS	finish applied to the floor to be confirmed as NOV can have grit included	SLX may not provide the finish required.	Remove SLX from drawings and specs use NOV.	Andrew Rakvin/Gino Iori	DTC Drawings / Specification
43	ROTATING / MOVING EQUIPMENT	N/A	N/A	N/A	N/A	
44	IS REPAIR DIFFERENT?	Easy repair offers less chance of injury Pipe specification to indicate correct materials to ensure and repairs required will use correct solvents for different materials.	Need to repair in constricted space.	Long radius bends on double-contained dosing line for ease of replacement of dosing line in future. Pipe specification to be provided on IFC & WAE drawings.	Andrew Rakvin	DTC Drawings
45	IS REPAIR DIFFERENT?	pump maintenance	Pumps have to be accessible / diaphragm has to be removed once a year.	ensure access is sufficient without need to remove pump.	Andrew Rakvin	DTC Drawings
46	OTHERS THAT MAY APPLY	Leakage of chemicals	Use of inground pipes to delivery dosing chemicals to dosing point.	Use secondary containment pipes.	Andrew Rakvin	DTC Drawings
47	OTHERS THAT MAY APPLY	Important to know site safety hazards before starting work or accessing areas where known hazards are present.	New or inexperienced workers on site.	Safety Signage: Following new Sydney Water safety signage specification.	Andrew Rakvin	DTC Drawings

	Maintainability Aspect	Why?	Causes	ACTION		
				Recommendation/Comment	***Person Responsible***	***Action Outcome***
48	OTHERS THAT MAY APPLY	Water pipes and chemical dosing lines enter through floor of electrical switchroom.	Water or chemical leakage onto switchroom floor.	Switchroom floor to fall to door	Andrew Rakvin	DTC Drawings
49	OTHERS THAT MAY APPLY	Water pipes and chemical dosing lines enter through floor of electrical switchroom.	Water or chemical leakage onto switchroom floor.	Splash guard to be added to standard drawings	Andrew Rakvin	DTC Drawings
50	OTHERS THAT MAY APPLY	Slope of footpath	Spillage of chemical onto footpath.	Footpath to slop towards delivery bund.	Andrew Rakvin	DTC Drawings
51	OTHERS THAT MAY APPLY	Site specific requirements	Not able to be covered in standard drawings or specifications.	Checklist of items to be added to specification (ACP0002) (to be used by writer of contract specification to cover non-drawing items) Deliverable to be added to contractors' work package to provide future lift plans,	Andrew Rakvin	DTC Drawings
52	OTHERS THAT MAY APPLY	Drainage of the pipe penetration in the electrical switchroom	Burst pipe in the enclosure	Include small drain at rear of enclosure through wall with flap valve / rodent protection	Andrew Rakvin/Gino Iori	DTC Drawings / Specification
53	OTHERS THAT MAY APPLY	Table and chair required in RCP	Ergonomically required	Include table and chair in the layout drawings	Andrew Rakvin/Gino Iori	DTC Drawings / Specification
54	OTHERS THAT MAY APPLY	No booster pump shown for the safety shower / eye wash	Required when pressure too low	Include in the drawings where required.	Andrew Rakvin/Gino Iori	DTC Drawings / Specification

Appendix D - Storage Tank Data Sheets

(Refer "Attachments Panel" for embedded Word appendices D, E and G)

Date:	Sodium Hypochlorite Storage Tank Data Sheet	

Project Number	
Site	
Description	**Sodium Hypochlorite Storage Tank**
Tag Number (s)	**TBA**
Qty Required	**1 (One)**

SPECIFICATIONS & REFERENCE INFORMATION

- Sydney Water Technical Specification Part 1 – Civil Works
- Sydney Water Technical Specification Part 2 – Mechanical Works
- AS3780 – The Storage and Handling of Corrosive Substances
- AS/NZS 3000 (SAA Wiring Rules)
- Draft Sodium Hypochlorite Network Chemical Dosing Unit Specification
- WSA 201 – Manual for Selection and Application of Protective Coatings
- SWC's supplement to WSA 201
- Sydney Water Maintenance Related Clauses for Capital and Operational Projects
- NSW WorkCover – Storage and Handling of Dangerous Goods: Code of Practice, 2005
- Work Health and Safety Act 2011
- Work Health and Safety Regulation 2011
- P&ID 20030170_CDP01 and CDP02
- 20030170_CDG02 – Scope of Works – Perspective
- 20030170_CDM02 – General Arrangement Pipework Section

SCOPE OF SUPPLY

- The design, fabrication, supply, assembly, shop testing, delivery to site of a Sodium Hypochlorite Storage tank suitable for storage of 12.5% Sodium Hypochlorite.
- The tank shall include the required nozzles, access manholes, hand holes (if applicable), fasteners and gaskets (for manholes and hand holes only), hold down lugs, lifting lugs, safety railing, level indicators and access ladders where specified.
- Painting and surface protection (internal and external) where required.
- Supply of test documentation, drawings and manuals in accordance with Sydney Water Specifications
- Inspection and Test Plans (ITPs)
- Delivery of the unit to site and unloading
- Testing and commissioning of the unit at the factory
- Training for operations and maintenance personnel

Note: Civil works and tank connections of services are excluded from the scope

NOTE: All tanks, appetences and equipment specified to be taken from the Sydney Water approved product suppliers list or DTC drawing set. If any alterations to these documents is requested, it is to be indicated in the returnable schedule in **BOLD and CAPS.**

Item	Units	Requirement	Suppliers offer
VENDOR INFORMATION			
Function	-	Dosing of Sodium Hypochlorite into the water supply mains and transfer of neat sodium hypochlorite to the sodium hypochlorite dilution tank.	
Type	-	Circular PVC Vertical Tank	
Tank Manufacturer	-	Supplier to advise	
Tank Manufacturing Facility	-	Supplier to advise	

Date:	Sodium Hypochlorite Storage Tank Data Sheet	

DESIGN LIFE			
Tanks	Years	20	
AMBIENT CONDITIONS			
Ambient Environment		Inland	
Ambient Temperature Range	Deg. C	-5 to 45	
Ambient Humidity Range	% RH	5 to 100	
Wind speed (for outdoor tanks)	m/s	N/A. Indoor.	
OPERATING CONDITIONS			
Fluid To Be Stored	-	Sodium Hypochlorite (12.5%)	
Service Type	-	Cyclic. Emptying and filling cycle, once every 30 days	
Fluid Specific Gravity	g/m^3	1.2 @ 20°C	
Design Specific Gravity	-	1.5 x Fluid S.G.	
Fluid Temperature	Deg. C	5 to 40	
Storage Pressure	m	Atmospheric	
Tank Roof Loading (i.e. human traffic, snow loading, etc.)	kPa	One man loading (allow for 1.4kN point load).	
UV exposure	-	Minimal – tank is located indoors.	
Negative Pressure	-	N/A, atmospheric	
Gases	-	N/A	
Foundation Type	-	Bitumen Mat on Concrete Plinth	
TANK SPECIFICATIONS			
No. of Tanks	-	1	
Tank shape	-	Circular	
Type of Tank	-	Vertical	
Effective Tank Volume	L	8000	
Total Tank Volume	L	Supplier to advise	
Roof Type	-	Flat	
Bottom Floor Type (Specify Slope if required)	-	Flat	
Support Legs	-	N/A	
Tank Material	-	uPVC	
Internal Lining	-	N/A	
Tank Design Code / Standard	-	AS3780 / DVS 2205 / EN 12573 as applicable	
Nominated Tank Dimensions (ϕ / W x L x shell H)	mm	ϕ 2100 x H2700	
Actual Tank Footprint (ϕ / W x L)	mm	Supplier to advise (Dependant on standard sizes available)	
Tank Shell Height	-	Supplier to advise	
Tank Overall Height	-	Supplier to advise	
Allowable Freeboard	mm	150	
Tank Model	-	Supplier to advise	

Date:	Sodium Hypochlorite Storage Tank Data Sheet	

Insulation system	-	N/A	
Heat Tracing	-	N/A	
Maximum inflow rate	L/s	TBC	
Maximum outflow rate	L/s	TBC	
Tank Weight (Empty)	-	Supplier to advise	
Fasteners	-	SS316 or better	
TANK APPURTENANCES			
Access ladder type	-	N/A	
Lifting Lugs	-	Yes, Positioned on side of tank.	
Internal Piping (attach sketch / drawing)	-	N/A	
No. and size of roof access	-	1 x DN600	
No. and size of side access	-	N/A	

Nozzle Table
Nozzle location to be in line with the DTC drawings. If location altered then Nozzle table to be completed and Tank drawing provided.

Mark	Service	Qty	Size (DN)	Orientation	Height	Connection

1. All branches on the tank shall finish with min. 150 mm from the tank wall or roof with a Table D/ E flange (AS 2129)
2. Pump outlet shall be located 100 mm above the tank floor.
3. The drain with minimum diameter of 50 mm shall be provided as close to the tank floor level as practicable.

MOUNTED EQUIPMENT AND WEIGHTS			
Mixer	-	N/A	
Heater	-	N/A	
Other	-	N/A	
CONNECTING PIPEWORK			
Type	-	Plastic Pipe	
Material	-	uPVC Schedule 80	
Termination connections	-	PN18 Flange or Camlock coupling (where specified)	
Gaskets	-	FPM (Viton) or better (Sodium Hypochlorite)	

Date:	Sodium Hypochlorite Storage Tank Data Sheet	

EQUIPMENT LABELLING			
Label Material	-	Stainless Steel 316	
Lettering	-	Engraved, black in filled	
Information Required	-	As per Clause M44 of SWC Technical Specifications Part 2	
Fixing Method	-	Oval Head Stainless Steel Screws	
PROTECTIVE COATINGS			
Requirements	-	As per WSA 201 and SWC Technical Specifications Part 2	
DOCUMENTATION & CERTIFICATION			
Drawings	-	As per specification	
Test Documentation	-	As per specification	
Operation and Maintenance Manuals	-	N/A	
INSPECTION & TEST REQUIREMENTS			
Inspection and Test Plan	-	Required	
Leak Test	-	Required (witnessed)	
PERFORMANCE TESTING			
Leak Test: Leak testing shall be carried out with the tank filled to full capacity. **Operational Test:** The Site Acceptance Test (SAT) shall be carried out in the following sequence: 1) Water Test 2) Chemical Test Commissioning shall be deemed complete when the whole of the works are capable of running continuously without any fault for a period of two (2) weeks.			
SPECIFIC REQUIREMENTS			
- Include delivery to site			

Date:	02/02/15	20/03/15	6/12/2016		
Revision:	0	1	2		
Prepared by:	JN	JN	MS		
Mechanical checked by:	DB	DB	DB		
Electrical checked by:	SL	SL	N/A		
Process checked by:	N/A	N/A	N/A		
Approved by:	N/A	N/A	N/A		

Appendix E - Operation and Maintenance Manual Template

(Refer "Attachments Panel" for embedded Word appendices D, E and G)

Appendix E

NOTE: Sections highlighted in yellow are to be completed or deleted by the Contractor supplying the Chemical dosing Unit

Name of Plant

Sodium Hypochlorite Rechlorination Plant

Chemical Storage & Dosing System

Operation and Maintenance Manual

Sydney Water Facility No:

WX????

Installed at

Address Line 1
Suburb NSW Postcode

Sydney Water Contract No. ??????

Manufactured by

Name of Company
Address
Suburb NSW Postcode
Phone: ??????

Service Telephone Name: mobile phone number

Contents

CHAPTER 1 DESCRIPTION

1.1 General

This Rechlorination Chemical Storage & Dosing System is a complete storage and dosage system for Sodium Hypochlorite. Additionally referred to in the technical data specifications detailed in Chapter 2.

1.2 General description

The chemical storage and dosing system is contained within a fully reinforced concrete monolithic structure exhibiting a seamless connection between the floor and walls. This structure comprises two (2) separately accessible rooms. The design of which, along with epoxy coating, ensures the bunded process room is capable of containing any unforeseen chemical spills or leaks whether minor or catastrophic except for a leak in the water supply.

The roof of the structure has the ability of being removed, if required, to enable unimpeded access to the process and control rooms, if either replacing a chemical storage tank or installing large process equipment skids. Even without removing the roof the process room, the access doors have a large enough opening whereby a storage tank up to 5KL capacity can be removed through the door opening if required. The structures walls and roof have a smooth finish both inside and outside and are painted to the approved Sydney Water colour.

The separately accessible, segregated control room has a viewing window to enable operators to view and manage the control of process from a protected area. This room houses the process control panel, RTU, site safety information in addition to operator manuals and drawings etc.

The bunded process room is accessed via external and internal stairs through double security doors. The right hand door is interlocked to open first and provides the mounting for a safety shower/eyewash which remains charged and ready for operation. The left hand door then can be opened providing access to the storage tank filling point including the digital tank level indicator.

Both the external and internal stairs for accessing the process room are suspended from the door frame and feature a hinge arrangement, enabling the stair assemblies to pivot. Suspending the stairs independently from the ground ensures they remain level irrespective of the slope of the surrounding walkway and provides the benefit of swinging upwards to allow access underneath for ease of cleaning.

A mobile work platform ladder is included for accessing both the manhole on the top of the storage tank and to inspect the storage tank ultrasonic level transmitter. It also provides operator access to unplug the roof mounted ventilation fans & lights from their switched outlets in the event the roof requires removal.

Relevant safety signage is mounted on both doors, clearly visible when accessed by operators. Both doors are supplied with a Deadlatch which is retrofitted with Sydney Water bi-lock barrels when required.

The drain point for the bunded room is located on the front wall adjacent to the stairs. For ease of access in the event of a bund high level, the process room bund isolation valve is located

externally to the structure within the delivery bund sump. The capacity of the bunded room easily exceeds the storage tank capacity which ensures full containment of chemical in the unlikely event of a catastrophic tank failure. System design parameters ensure that in the event of a flood in the bunded area, normal operation can recommence once the bunded area has been evacuated.

Storage tank and process equipment mounting arrangements employed in the construction of the system minimise where possible the number of penetrations for fixings within the bunded area to further ensure its long term containment integrity. All fixings required that are larger than 6mm are made by way of chemical anchors.

1.3 Electrical

Installation of all the process electrical services and equipment is carried out in accordance with Australian Standards with attention to ensure all equipment (IP) ratings are maintained. Cabling is surface mounted and enclosed where possible within chemical resistant PVC ducting, conduits and saddles are clearly labelled for individual circuit identification. Fans are fitted to the roof of each room of the structure to ensure adequate ventilation; weatherproof lighting fixtures for both rooms provide sufficient lighting to enable operation and maintenance day or night.

The ventilation fans are designed to operate when the site is accessed to provide operator comfort when on-site. Both the ventilation fans and internal lighting are activated automatically by limit switches on the access doors and the external flood light is operated by a manual switch within the control room.

The door limit switches also automatically activate the ‘site attended’ input to the IICATS RTU negating the need for a manned/unmanned switch to be manually activated.

Storage tank digital level display, high level warning flashing beacon and high level warning klaxon are all situated on the storage tank fill line above the fill point in full view of the delivery driver. The delivery truck pump power outlets are mounted within easy reach of the door way, allowing the driver to remain outside the bund whilst connecting power and delivering product into the storage tank. The truck pump power outlets are both interlocked to the tank high level switch, automatically shutting off the power supply when a tank high level is reached. The high level flashing light and warning siren is activated upon reaching a predetermined high level to warn the driver of an imminent overfill occurring, this klaxon however can be muted by way of a pushbutton on the control panel.

The electrical control designed into this system provides for both automatic and manual operation. This will be covered in detail in Chapter 3.

1.4 Plumbing

Plumbing pipework used for the delivery of potable and non-potable water is (insert piping material). An accessible roof mounted hose reel is installed within the process room to aid in flushing dose lines and to enable washing down of the process room as well as the truck bund if required.

All chemical process and delivery lines within the building are fabricated using Schedule 80 uPVC pipe and fittings. The selection of pipe and fittings are determined by their suitable resistance to Sodium Hypochlorite.

Dosing pumps nominated for the system are (insert brand of pump) Pumps. The pumps have been selected due to their suitable resistance to the effect of the dosed chemical, user friendliness and the ability to easily deliver the required dose rates. Dosing pumps are installed above the bund height in dosing cabinets to provide equipment protection in the event of a bund flood occurring.

Operators are quickly alerted to any dosing pump leak or pipe rupture by way of a capacitive level switch located directly beneath the dosing pumps in the dosing cabinet sump.

1.5 Chemical Dosing Unit Dimensions and Parameters

A) Structure:

Overall Length	?? metres
Overall Width	?? metres
Overall Height	?? metres
External Wall Thickness	?? mm
Internal Wall Thickness	?? mm
Floor Thickness	?? mm
Dry Weight	?? Tonnes
Construction Materials	?? MPa reinforced concrete

B) Process Room:

Internal Length	?? metres
Internal Width	?? metres
Internal Height	?? metres (at lowest point)
Bund Wall Height	?? mm
Door Opening	?? metres Wide x ?? metres Height

C) Control Room:

Internal Length	?? metres
Internal Width	?? metres
Internal Height	?? metres (at lowest point)
Door Opening	?? metres Wide x ?? metres Height

D) Building Security

Process Room Doors	Double Steel Doors and Frame
Control Room Door	Single Steel Door and Frame
Locks	Brand and type

CHAPTER 2 TECHNICAL DATA

Details of the parameters of the dosing process.

Parameter	Quantity/Requirements	Units
Type of dosing system;	Flow paced/Set Rate with a chlorine residual window with Chlorine Analyser feedback	-
Type and properties of dosing chemical;	Sodium Hypochlorite 12.5% solution	-
Chemical supplier name and contact details	??	-
Location of the RCP	(Insert street address, reservoir number etc.)	-
Mobility requirement of the RCP Building;	TRANSPORTABLE / PERMANENT	-
Concentration of dosed chemical (diluted with water)	??%	
Rate of batched (diluted) chemical dosing minimum	??	Litres/hour
Rate of batched (diluted) chemical dosing maximum	??	Litres/hour
Carrier water flow rate	??:1 with maximum chemical dosage rate	-
Pressure of available water supply for Carrier water	??	Metres head
Pressure of available water supply for safety shower and eyewash;	??	Metres head
Advise whether Chlorine analyser monitoring is fed back to the RCP;	YES / NO	-
Diurnal minimum pressure of the water main being dosed into;	??	Metres head
Diurnal maximum pressure of the water main being dosed into;	??	Metres head
Delivery tanker size;	??	kilolitres
Maximum temperature of the delivered chemical;	??	°Celsius
Chemical tank storage size	??	kilolitres
Minimum performance parameters, (for example, pH and dissolved sulphide levels expected before and after chemical dosing).	??	-

Details of the major components of the dosing process.

Storage Tank TNK01

Manufacturer:	??
Model:	??
Part Number:	??
Effective Capacity	3000 litres
Inlet / Discharge / Drain Diameters	NB50
Overflow Diameter	NB80
Flanges	ANSI 150
Vent	NB??mm Piped to outside wall of building
Access Manhole	Removable 450mm dia.
Height of tanks	?? mm

Nominal Diameter of tank	?? mm
Circumference of tank when filled with chemical at top, middle and bottom.(This information is used to track the deformation of the tank over time.)	?? mm top ?? mm middle ?? mm bottom
Tank wall thickness (This information is used to track the deformation of the tank over time.)	?? mm

Level Transducer LTX01

Manufacturer:	??
Model:	??
Part Number:	??
Serial Number:	??
Power:	24VDC Loop Powered
Signal output:	4-20mA
4mA output distance (tank empty 0%)	?? metres
20mA output distance (tank full 100%)	?? metres
Programmed Span distance	?? metres
Manufactures Range (default)	?? metres
High Level Setpoint LSA	*??% of Full Scale.*
Low Level Setpoint LSC	*??% of Full Scale*

Level Display LIX01

Manufacturer:	??
Model:	??
Part Number:	??
Serial Numbers:	??

Level Switches LSH01 & LSL01

Manufacturer:	??
Model:	??
Part Number:	??
Serial Numbers:	??
Power:	*24VDC*
Control Input:	??
Control Output:	*Programmable*

Dosing Tank TNK02

Manufacturer:	??
Model:	??
Part Number:	??
Effective Capacity	7000 litres
Inlet / Discharge / Drain Diameters	NB50
Overflow Diameter	NB80
Flanges	ANSI 150
Vent	NB??mm Piped to Outside Wall
Access Manhole	Removable 600mm dia.
Height of tanks	?? mm

Nominal Diameter of tank	?? mm
Circumference of tank when filled with chemical at top, middle and bottom.(This information is used to track the deformation of the tank over time.)	?? mm top ?? mm middle ?? mm bottom
Tank wall thickness (This information is used to track the deformation of the tank over time.)	?? mm

Level Transducer LTX02

Manufacturer:	??
Model:	??
Part Number:	??
Serial Number:	??
Power:	24VDC Loop Powered
Signal output:	4-20mA
4mA output distance (tank empty 0%)	?? metres
20mA output distance (tank full 100%)	?? metres
Programmed Span distance	?? metres
Manufactures Range (default)	?? metres
High Level Setpoint LSA	*??% of Full Scale.*
Low Level Setpoint LSC	*??% of Full Scale*

Transfer Pump PMP02

Manufacturer:	??
Model:	??
Part Number:	??
Serial Numbers:	
Power:	*?? KW @ ??Volts* AC/DC
Control Input:	*??*
Signal Output:	*??*
Transfer Rate:	*??Ltr/Hr*

Dosing Pumps PMP10 & PMP20

Manufacturer:	??
Model:	??
Part Number:	??
Serial Numbers:	*PMP10:* ?? *PMP20:* ??
Power:	*?? KW @ ??Volts* AC/DC
Control Input:	*??*
Signal Output:	*??*
Minimum Dose Rate:	*??Ltr/Hr @ ??Hz*
Maximum Dose Rate:	*?? Ltr/Hr @ ??Hz*
Turndown:	*??:1*

Sump Pump PMP02(if Supplied)

Manufacturer:	??

Model:	*??*
Part Number:	*??*
Serial Number:	*??*
Power:	*?? KW @ 415Volts AC*
Control Input:	

Carrier/Batching Water Pump PMP??(if Supplied)

Manufacturer:	*??*
Model:	*??*
Part Number:	*??*
Serial Number:	*??*
Power:	*?? KW @ 415Volts AC*
Control Input:	

Potable Water Pump PMP??(if Supplied)

Manufacturer:	*??*
Model:	*??*
Part Number:	*??*
Serial Number:	*??*
Power:	*?? KW @ ??Volts AC*
Control Input:	

Level Switches LSH03 & LSL03 & LSHH03 (if supplied) (delete this table if no sump pump)

Manufacturer:	*??*
Model:	*??*
Part Number:	*??*
Serial Numbers:	*??*
Power:	*24VDC*
Control Input:	*??*
Control Output:	*Programmable*

Motorised Isolating Valves VLV10, VLV22 and VLV50

Manufacturer:	*??*
Model:	*??*
Part Number:	*??*
Serial Numbers:	*??*
Power:	*?? watts at 24VDC*
Control Input:	*??*
Control Output:	*??*

Carrier/Batching Water Solenoid Valve VLV27 and VLV 74

Manufacturer:	??
Model:	??
Part Number:	??
Serial Numbers:	??
Power:	*?? watts at 24VDC*
Control Input:	??
Control Output:	??

Flowmeter FTX40

Manufacturer:	??
Model:	??
Part Number:	??
Serial Number:	??
Power:	24VDC Loop Powered
Signal output:	4-20mA
Minimum measurable flow	?? Litres/hour
Maximum measurable flow	?? Litres/hour
Measurement Accuracy	??% of ??

Injection Quill ??01

Manufacturer:	??
Model:	??
Part Number:	??
Serial Number:	??
Material	??

Provide additional data tables for other major equipment items supplied.

2.1 MANUFACTURERS TECHNICAL INFORMATION

NOTE: Information for preparation of this section. This note to be deleted when information is completed.

- Provide information from the manufacturers of the equipment.
- Each page shall have the relevant equipment number on it.
- Irrelevant pages or sales literature not to be included.
- Where several models or sizes are covered on the information supplied the information relevant to this chemical dosing unit shall be highlighted preferably in yellow.

Insert data from equipment list here.

Provide information for:

- Storage and Dosing Tanks
- Level Transducers
- Level Switches
- Transfer and Dosing Pumps
- Sump and Water Pumps if supplied
- Motorised Valves
- Solenoid Valves
- Diaphragm Valves
- Flowmeter
- Rotameters
- Injection Quill
- Pulsation Dampener if supplied
- Loading/Anti-Syphon Valve
- Add general information for ball and NRV valves
- Dosing Cabinet
- Switchboards and Control Cubicles

CHAPTER 3 PRINCIPLES OF OPERATION

3.1 Introduction

The purpose of this standard operating procedure (SOP) is to provide personnel with a clear and easy to follow set of operating instructions for the sodium hypochlorite Chemical Dosing System, WX??, at ?insert address?.

The Dosing System is designed to dose sodium hypochlorite solution based on ??.

The chemical solution is delivered into the reservoir/water main through a dedicated dosing line that is secondary contained to prevent any leak in the dosing line escaping into the environment. The digital diaphragm dosing pumps in this system are flowpaced/set flow within a chlorine residual window via a chlorine analyser feedback located inside/remote(name location) from the RCP building.

The dose rate for the system will be based on a pre-determined pattern to allow modifications if desired. A facility will be provided to change the set point of this pre-determined pattern. This will allow manual adjustment of dosing rates if desired by Sydney Water.

The system is designed to top up the chlorine content of the reservoir/water main, to manage the chlorine residual reaching consumers.

WX?? consists of the following major components:

- ?size of tank?L Chemical Storage Tank (TNK01) Effective capacity
- ?size of tank?L Chemical Dosing Tank (TNK02) Effective capacity
- Transfer Pump (PMP02)
- Duty / Standby Dosing Pumps (PMP20, PMP21)
- Carrier water supply from the watermains with pumps.
- A potable water supply for the safety shower, eyewashes and hose reel with a pump.

3.1.1 Storage Tank Operation

The Storage tank effective capacity will nominally provide >30 Days storage based on anticipated flows. The frequency of chemical deliveries will be dependent on the dose rate. A re-order set point (LSB01), determined by IICATS and referenced off the storage tank level transducer (LTX01), generates a notification for the reorder of chemicals.

A high-level switch (LSH01) is fitted to the storage tank (TNK01) along with a high level set-point (LSA01) derived from the level transducer (LTX01). If either is activated during filling of the storage tank, this isolates the power to both the Single and 3-phase GPOs used by the chemical delivery tanker to power the electrical unloading pump. Upon reaching a high level determined by either (LSH01) or the level transmitter set point (LSA), an audible alarm (KLX01) and beacon (BEA01) will be activated. The audible alarm (KLX01) can be muted from the control panel, however the beacon (BEA01) remains on until the tank level falls below that of (LSH01) and (LSA01).

3.1.2 Batching the chemical for dosing

The batching process is manually initiated by the operator and is then automatic subject to confirmation by the operator at each completed phase of the batch (refer Chapter 4 Operation). Dosing of the chemical to the Reservoir/water main is stopped automatically during the batching process and restarted automatically when the batching process is complete. Batching time and water and pump flowrates are set to complete the batching process within 40 minutes.

To initiate the batching process the operator inputs the required volume to be filled to and the concentration of chemical required. When the transfer pump (PMP02) is called to run, an automatic ball valve (VLV10) on the storage tank initially opens. Once the valve is opened, as determined by the valve limits switches (ZSC10 & ZSO10) the transfer pump then starts. The transfer pump sends the pre calculated volume of chemical to the Dosing Tank (TNK02)

Once the transfer pump has completed the transfer of chemical, automatic ball valve (VLV10) is closed. The operator is next required to confirm that the next step (make-up water addition) can proceed. Then a calculated volume of make-up water, which is flow rate adjusted through diaphragm valve (VLV27) and controlled from solenoid (SOV01), is delivered to the dosing tank. This provides the diluted chemical for dosing. The make-up water is supplied by the Carrier Water pumps operating in duty/duty mode. Carrier water volume is set at commissioning taking into account the length of the delivery pipework and minimum loop times to return a chlorine residual reading.

The operator is next required to confirm that the next step (recirculation) can proceed. The dosing tank is then recirculated for a predetermined time via the transfer pump (PMP02) and opening of recirculation motorised valve (VLV22).

Once the recirculation time has elapsed the transfer pump (PMP02) stops and valve (VLV22) closes.

The system then returns to dosing automatically.

3.1.3 Dosing Process

The Chemical dosing process in Automatic is flow paced/set rate in operation within a set chlorine residual window, with the dosing rate profile determined by IICATS. Confirmation of dosing is through monitoring of the chlorine residual trend over time.

Prerequisites for dosing external to the RCP unit are:

A functional chlorine analyser;
Reservoir mixer in operation;
Minimum flow in the water pressure main.

When the duty pump is called to run, an automatic ball valve (VLV50) on the dosing tank initially opens. Once the valve is opened, as determined by the valve limits switches (ZSC50 & ZSO50) the duty pump then starts.

Once the pump is running, carrier water, which is flow rate adjusted through diaphragm valve (VLV74) and controlled from solenoid (SOV02), is simultaneously delivered with the chemical solution to the dose point. This aids in the mixing of the chemical into the water. The carrier water is set to run on for a pre-set time when the duty pump is called to stop to aid in flushing the dose point. Carrier water to maximum chemical flowrate varies from 4:1 to 20:1 depending on length of pipe to dosing point and need for effective mixing at the dosing point. The carrier water

flowrate is set at Commissioning and changed when required. Carrier water is supplied by duty/standby Carrier Water pumps. High pressure in the water main to site is reduced by a pressure control valve PCV01.

At the end of dosing carrier water continues to flow for a period to flush the dosing lines clear.

Upon loss of any or all dosing permissives, the dosing pump stops, the automatic valve (VLV50) closes and the system is inhibited from operation until receipt of another dosing permissive signal. Dosing will also be inhibited in addition to IICATS alarms being raised if the Low-Level Switch (LSL02) in the storage tank, Dosing Cabinet High Level Switch (LSH26) or Bund Flood Alarm (LSA26) is activated or a high chlorine residual is detected.

Other notable inclusions within this Chemical Dosing Unit:

- Door mounted Safety Shower and Eyewash (SEQ50)
- Internally mounted eyewash (SEQ51)
- Roof Mounted hose reel (UTY10)
- Fill point line isolation and drain valves (VLV01 & 07)
- Storage tank drain valve (VLV08)
- Dose line filter/strainer (STN01)
- Multiple dose line flushing and drain valves
- Fill line mounted digital Storage Tank Level Indicator (LIX01)
- Secondary Storage Tank Level Indicator mounted on control panel (LIX02)
- Weather proof lighting including internal and external.
- Ventilation fans within each room.
- Safety Signage

Refer to Drawing No: WX?? P&ID Rev ?? for the P&ID layout of the chemical dosing process. (as attached).

3.2 Responsibilities

- Treatment Operations is responsible for reviewing this SOP
- Treatment Operations is responsible for carrying out this SOP

3.3 Conditions

- Treatment Operations personnel are trained in this SOP
- This SOP is carried out on normal weekdays and whenever required
- Any equipment operating in an abnormal manner must be investigated and rectified.

• Any process reading that is out of range must be investigated and rectified

• Personnel comply with all safety requirements

• All equipment is tagged, if required, as per Sydney Water procedures

3.4 Dosing Profile

The Chemical Dosing Profile for WX?? is based on a flow paced/set flow profile within a chlorine residual window.

This profile is loaded by IICATs into the RTU and changed upon request from Treatment Operations (OCR).

3.5 Control Modes

The dose rate will be controlled by either of two control modes within the chlorine residual window.

Mode 1: Flow Paced Control

Dosing shall be initiated by the RTU. When selected to run on flow paced control the dosing pumps will run at an operator adjustable pre-set dose rate dependant on the flow in the water main. This is operator adjustable in terms of mg/litre.

Mode 2: Set Flow Control

Dosing shall be initiated by the RTU. When selected to run on Set Flow control the dosing pumps will run at an operator adjustable pre-set rate.

Note: the pump running speed will be bounded by the minimum and maximum allowable pump running speed. (Engineering Adjustable, programmed at 10-50Hz).

The pump will run at the speed preset by the operator for that time of day.

Mode 3: Fixed Speed Control

Dosing shall be initiated by the RTU. When called to operate in this control mode, the pumps will run at a fixed, engineering adjustable, speed (10-50Hz).

The initial Dose Rate will be as follows using diluted sodium hydroxide as the dosed chemical.

Chemical Dosing Rate: .....?? L/Hr.

Carrier Water Flow Rate (nominal).....?? L/Hr.

3.6 Specific Safety Requirements

• Refer to attached hazard identification and risk assessment and site specific hazard identification

• Ensure appropriate personnel protective equipment (PPE) is worn, minimum to include safety shoes, gloves, eye protection, appropriate work clothing

• Ensure procedures for entry to confined spaces is followed

• Comply with occupational health and safety requirements

3.7 Environmental Aspects

• Failure to carry out this SOP may result in low chlorine residual with public health implications and customer complaints.

CHAPTER 4 OPERATING INSTRUCTIONS

This Standard Operating Procedure (SOP) covers the following operational tasks:

- Start up and shutdown of the chemical batching system in AUTOMATIC control.
- Start up and shutdown of the chemical batching system in MANUAL control.
- Start up and pre-start checks of the chemical dosing system in AUTOMATIC control.
- Shutdown of the chemical dosing system in AUTOMATIC control.
- Start up, shutdown and pre-start checks of the chemical dosing system in MANUAL control.
- Chemical delivery procedure.
- Emergency stopping of dosing in AUTOMATIC mode.
- Emergency stopping of dosing in MANUAL mode.
- Emergency stopping of batching in AUTOMATIC mode.
- Emergency stopping of batching in MANUAL mode.
- Abnormal operation.

4.1 Start up, shutdown and pre start checks of the Chemical Batching System for Automatic Mode

Steps / Activity (AUTO)	Photographs
1. Acknowledge and reset any alarms on electrical control panel	Insert photograph here
2. Check level of MHL in storage tank via the Digital Level Indicator (LIX01). Re-order chemicals if required.	Insert photograph here
3. Check all equipment and instruments are available for operation and all LOTO tags are removed.	Insert photograph here
4. Ensure Potable Water Valves (VLV39 & VLV40) are all OPEN.	Insert photograph/s here
	Insert photograph/s here

Steps / Activity (AUTO)	Photographs
5. Ensure Potable Water and Carrier Water Pumps Valves are all OPEN (if fitted) (VLV32, 33, 34, 35, 36, 37)	
6. Check operation of the door mounted safety shower and eyewash (SEQ50)	Insert photograph here
7. Check operation of the internally mounted eyewash (SEQ51)	Insert photograph here
8. Check the following isolation valves are CLOSED: • Suction manifold flushing and drain valves (VLV11, VLV13 & VLV15) • Dosing Tank Drain Valve (VLV21) • Make-up water solenoid valve bypass isolating valve (VLV81)	Insert photograph here
9. Check the following isolation valves are OPEN: • Storage tank discharge isolation valve (VLV09) • Transfer Pump suction isolation valve (VLV16) • Transfer Pump discharge isolation valve (VLV19)	Insert photograph here
10. Check the following isolation valves are OPEN: • Dosing tank recirculation isolating valves (VLV 20 & 23). • Batching water Manifold Isolation Valves (VLV79 VLV80 & VLV82)	Insert photograph here

Steps / Activity (AUTO)	Photographs
Note: Batching Water is flow rate adjustable through (VLV77) and is set upon commissioning to provide batching water to fill the dosing tank in the required time.	
11. Ensure the field isolation switches for the transfer pump (PMP02) are switched to the ON position.	Insert photograph here
12. Ensure the "TANK IN SERVICE" selector switch is set to the IN position.	Insert photograph here
13. Position the Batching Water Control Switch to AUTO. This will turn the Dosing system off. The duty dosing pump (PMP20 or PMP21) will stop automatically. • This sends a signal to close the automatic valve (VLV50) and initiates the shutdown of the makeup water. Local indication of the valve position is provided by status lights on the control panel. Note the lamp illumination to confirm valve operation.	
14. Position the control selector switches for Transfer pump (PMP02) to AUTO. The transfer pump (PMP02) will then start automatically and run to transfer chemical into the dosing tank based on the IICATS preset values. The transfer pump will stop and chemical feed motorised valve (VLV10) will close.	Insert photograph here

Steps / Activity (AUTO)	Photographs
15. CONFIRM on the touch panel that the next process (make-up water addition) can start. Once confirmed, Solenoid valve (SOV01) will open and Carrier Water pumps (PMP06 and PMP07) will both start in DUTY/DUTY. Batching makeup water will flow into the dosing tank based on the IICATS preset values. SOV01 will close. Local indication of the valve position is provided by status lights on the control panel. Note the lamp illumination to confirm valve operation.	Insert photograph here
16. Visually confirm the make-up water flow by looking at the rotameter (FIX20) float.	Insert photograph here
17. CONFIRM on the touch panel that the next process (recirculation) can start. Once confirmed, Dosing tank recirculation motorised valve (VLV22) will open and the transfer pump (PMP02) will run for a time based on the IICATS preset values. Then transfer pump (PMP02) will stop and motorised valve (VLV22) will close, ending the batching process. Local indication of the valve position is provided by status lights on the control panel. Note the lamp illumination to confirm valve operation. Note: The operator does not have to be present once this process has started.	Insert photograph here
18. The system will return automatically to Dosing.	

Steps / Activity (AUTO)	Photographs
19. Contact SOC to confirm that the batching system has operated and that no alarms have been raised.	

4.2 Start up, shutdown and pre start checks of the Chemical Batching System for Manual Mode

Steps / Activity (MAN)	Photographs
1. Undertake steps 1 through to 12 as per startup in AUTOMATIC mode.	
13. Turn the Dosing system OFF, by positioning the control selector switches for dosing pumps (PMP20 & PMP21) to OFF. The duty dosing pump will then stop automatically. • This sends a signal to close the automatic valve (VLV50) and initiates the shutdown of the carrier water. Local indication of the valve position is provided by status lights on the control panel. Note the lamp illumination to confirm valve operation.	Insert photograph here
14. Position the control selector switches for transfer pump (PMP02) to MAN.	Insert photograph here
15. Open the motorised Valve (VLV10) Local indication of the valve position is provided by status lights on the control panel. Note the lamp illumination to confirm valve operation.	Insert photograph here

16. Press the transfer pump START Pushbutton. The pump will run for a time determined by the operator to add the required volume of chemical.	Insert photograph here
17. Press the transfer pump (PMP02) STOP Pushbutton. Close the motorised Valve (VLV10)	Insert photograph here
18. Start both Carrier water pumps (PMP06 and PMP07) by pressing both STAR buttons and Open the make-up water solenoid valve (SOV01) for an operator determined time to add the required volume of water. Local indication of the valve position is provided by status lights on the control panel. Note the lamp illumination to confirm valve operation. STOP both Carrier water pumps (PMP06 and PMP07) and close the make-up water solenoid valve (SOV01)	Insert photograph here
19. Open the recirculation motorised valve (VLV22) and press the transfer pump (PMP02) START Pushbutton. The pump will run for a time determined by the operator. Local indication of the valve position is provided by status lights on the control panel. Note the lamp illumination to confirm valve operation.	Insert photograph here
20. Press the transfer pump (PMP02) STOP Pushbutton and close the recirculation motorised valve (VLV22) Local indication of the valve position is provided by status lights on the control panel. Note the lamp illumination to confirm valve operation.	Insert photograph here

21. Follow the next section 4.3 to restart the dosing system in automatic or section 4.5 to start the dosing system in manual.	
22. Contact SOC to confirm that the dosing system has stopped operating and that no alarms have been raised.	

4.3 Start up and pre start checks of the Chemical Dosing System for Automatic Mode

Steps / Activity (AUTO)	Photographs
1. Acknowledge and reset any alarms on electrical control panel	Insert photograph here
2. Check level of MHL in dosing tank via the Level Indicator (LTX02).	Insert photograph here
3. Check all equipment and instruments are available for operation and all LOTO tags are removed.	Insert photograph here
4. Ensure Potable Water Valves (VLV39 & VLV40) are all OPEN.	Insert photograph/s here
5. Ensure Potable Water and Carrier Water Pumps Valves are all OPEN (if fitted)	Insert photograph here
	Insert photograph here

Steps / Activity (AUTO)	Photographs
6. Check operation of the door mounted safety shower and eyewash (SEQ50)	
7. Check operation of the internally mounted eyewash (SEQ51)	Insert photograph here
8. Check the following isolation valves are CLOSED: • Suction manifold flushing and drain valves (VLV51, VLV53, VLV55 & VLV57) • Discharge manifold drain valve (VLV66) • Carrier Water Solenoid bypass isolation valve (VLV72)	Insert photograph here
8. Check the following isolation valves are OPEN: • Dosing tank discharge isolation valve (VLV50) • Dosing Pump 1 & 2 suction isolation valves (VLV56 & VLV59) • Dosing Pump 1 & 2 discharge isolation valves (VLV61 & VLV63)	Insert photograph here
9. Check the following isolation valves are OPEN:	Insert photograph here

Steps / Activity (AUTO)	Photographs
• Carrier water Manifold Isolation Valves (VLV69, VLV70 and VLV71) Note: Carrier Water is flow rate adjustable through (VLV02) and is set upon commissioning to provide a carrier water to chemical rate as required.	
10.Ensure the field isolation switches for the dosing pumps (PMP20 & PMP21) are switched to the ON position. Ensure the field isolation switches for the Carrier Water pumps (PMP06 & PMP07) are switched to the ON position.	Insert photograph here
11. Ensure the "TANK IN SERVICE" selector switch is set to the IN position.	Insert photograph here
12. Position the Carrier Water Control Switch to AUTO.	Insert photograph here
13. Position the control selector switches for dosing pumps (PMP20 & PMP21) to AUTO. The duty dosing pump will then start automatically based on the IICATS preset pump speed with reference to the dosing profile. The Carrier Water DUTY pump will start (PMP06 or PMP07)	Insert photograph here
14. Visually confirm the carrier water flow by looking at the rotameter (FIX30) float elevated to the set flow position	Insert photograph here

Steps / Activity (AUTO)	Photographs
15. Contact SOC to confirm that the dosing system is operating and that no alarms have been raised.	

4.4 Shutdown of the Chemical Dosing System for Automatic Mode

Steps / Activity (AUTO)	Photographs
1. Position the control selector switches for dosing pumps (PMP20 & PMP21) to OFF. The duty dosing pump will then stop automatically. • This sends a signal to close the automatic valve (VLV50) and initiates the shutdown of the carrier water solenoid valve (SOL02) and Carrier water pump (PMP06 or PMP07). Local indication of the valve position is provided by status lights on the control panel. Note the lamp illumination to confirm valve operation.	Insert photograph here
2. Contact SOC to confirm that the dosing system has stopped operating and that no alarms have been raised.	

4.5 Start up, shutdown and pre start checks of the Chemical Dosing System for Manual Mode

Steps / Activity (MAN)	Photographs
1. Undertake steps 1 through to 11 as per startup in AUTOMATIC mode.	
12. Position the control selector switches for dosing pumps (PMP20 & PMP21) to MAN. Position the control selector switches for carrier water pumps (PMP06 & PMP07) to MAN.	Insert photograph here
13. Press the required dosing pump (PMP20 or PMP21) START Pushbutton. The Automatic Valve (VLV50) will open and the pump will run at a speed determined by the operator adjustable potentiometer on the panel. • Pump speed feedback is displayed on the VSD display in % of maximum speed.	Insert photograph here
14. If carrier water is required press the START button on one of the Carrier Water Pumps (PMP06 or PMP07), open solenoid valve (SOV02) and check flow via rotameter (FIX30)	Insert photograph here
Shutdown Procedure in Manual Mode	Insert photograph here
15. On the control panel, press the dosing pump (PMP20 or PMP21) STOP button to stop the system operation. This sends a signal to close the automatic isolation valve (VLV50). Local indication of the valve position is provided by status lights on the control panel. Note the lamp illumination to confirm valve operation.	Insert photograph here

17. If carrier water is operating, allow it to run for ong enough to flush the lines clear and then press the STOP button on the Carrier Water Pump (PMP06 or PMP07), close solenoid valve (SOV02).	
16. Contact SOC to confirm that the dosing system has stopped operating and that no alarms have been raised.	

4.6 Chemical delivery procedure

Steps / Activity	Photographs
1. Unlock the Dosing system building, fully open the doors and engage the captive door stops. This allows access to the safety shower & eyewash (SEQ50 and SEQ51), hose reel (UTY01), fill point connection (VLV06) and High level alarm mute on the control panel.	Insert photograph here
2. Ensure and Potable Water Valves (VLV39 & VLV40) are all ON.	Insert photograph here
3. Check operation of the safety shower & eyewash (SEQ50 and SEQ51) and the hose reel (UTY01),	Insert photograph here
4. Visually check the level of the storage tank (TNK01) using the fill point mounted level display (LIX01) showing tank level in percentage • The storage tank level can also be confirmed by viewing the secondary level indictor (LIX01) mounted on the control panel.	Insert photograph here

Steps / Activity	Photographs
5. Remove the protective Camlock cap and inspect the fill point connection for damage and any sign of contamination, report prior to filling if evident. 6. Connect the chemical transfer hose to the camlock fitting. 7. Ensure the fill point drain valve (VLV07) is CLOSED. 8. Open the fill point isolation valve (VLV06) **Note:** it is possible to fill the dosing tank directly via VLV05. This should only be done as a manual process.	Insert photograph here
9. Connect the transfer pump power cable from the delivery tanker to either the Single Phase or Three Phase RCD Power Outlet located beside the fill point within the process room. 10. Once connected, initiate the power by pressing the START button.	Insert photograph here
11. Start the chemical transfer pump on the delivery tanker and commence chemical transfer to the storage tank. 12. Whilst filling, inspect the transfer hose for any leaks. If leaks are detected, stop the chemical transfer pump immediately by pressing the STOP button located on the power outlet. 13. If the leak cannot be rectified on-site then cease the chemical transfer operation. 14. Monitor the filling of the storage tank (TNK01) by viewing the level indicators (LIX01 or the level in the translucent tank). 15. STOP the chemical transfer pump when the storage tank nears safe fill capacity (90%), or when the chemical load has been delivered.	

Steps / Activity	Photographs
Above 90%, the storage tank high level switch (LSH01) will be activated which in turn cuts power to the truck power outlets. This is designed to prevent inadvertent overflows. *A flashing Beacon (BEA01) and audible warning (KLX01) will also be activated. The audible warning can be muted from the control room switchboard however the flashing beacon and power outlet interlock continues until the storage tank level drops below that of (LSH01)*	
16. Open the fill point drain valve (VLV07) to drain any residual chemical from the fill line and transfer hose into a bucket. 17. Close the fill line isolation valve (VLV06) 18. Disconnect the chemical transfer hose and replace the protective camlock cap on the fill point. 19. Disconnect the transfer pump power cable from the truck power outlet.	Insert photograph here
20. Hose down any splashes or small spills in the Chemical Dosing Unit or chemical unloading bay to ensure the area remains clean and tidy.	
21. Close building doors, secure and depart site.	

4.7 Emergency stopping of Dosing in automatic mode

Steps / Activity (AUTO)	Photographs
1a. Position the control selector switches for dosing pumps (PMP20 & PMP21) to OFF.	Insert photograph here

Steps / Activity (AUTO)	Photographs
1b. Or turn pump isolator switches to OFF. The duty dosing pump will then stop automatically. • This sends a signal to close the automatic valve (VLV50) and initiates the shutdown of the duty carrier water pump (PMP06 or PMP07) and solenoid valve (SOL02). Local indication of the valve position is provided by status lights on the control panel. Note the lamp illumination to confirm valve operation.	
2. Contact SOC to advise them of the problem and check on alarm status.	
3. Close isolating valves as required.	

4.8 Emergency stopping of Dosing in manual mode

Steps / Activity (MAN)	Photographs
1a. On the control panel, press the operational dosing pump (PMP20 or PMP21) STOP button to stop the system operation. The pump which has returned to running based on the current diurnal profile now stops. 1b. Or turn pump isolator switches to OFF. • This sends a signal to close the automatic isolation valve (VLV50). Note the lamp illumination to confirm valve operation.	Insert photograph here

Steps / Activity (MAN)	Photographs
2. Shutdown the carrier water solenoid valve (SOV02) and operating carrier water pump (PMP06 or PMP07). Local indication of the valve position is provided by status lights on the control panel.	
3. Contact SOC to advise them off the problem and check on alarm status.	
4. Close isolating valves as required.	

4.9 Emergency stopping of Batching in automatic mode

Steps / Activity (AUTO)	Photographs
1a. Position the control selector switch for the Transfer pump (PMP02) to OFF. 1b. Or turn the pump (PMP02) isolator switch to OFF. The transfer pump will then stop automatically. • This sends a signal to close the automatic valves (VLV10 and VLV22) and initiates the shutdown of the makeup water by stopping both carrier water pumps (PMP06 and PMP07) and closing SOV01. Local indication of the valve positions is provided by status lights on the control panel. Note the lamp illumination to confirm valve operation.	Insert photograph here

Steps / Activity (AUTO)	Photographs
2. Contact SOC to advise them of the problem and check on alarm status.	
3. Close isolating valves as required.	

4.10 Emergency stopping of Batching in manual mode

Steps / Activity (AUTO)	Photographs
If pump is operating then: 1a. Position the control selector switch for the Transfer pump (PMP02) to OFF. 1b. Or turn the pump isolator switch to OFF. The transfer pump will then stop automatically.	Insert photograph here
2. **If automatic valves are open** then close: Storage tank outlet motorised valve VLV10 Dosing tank recirculation valve VLV22 Make-up water valve SOV01	
3. If carrier water pumps (PMP06 and PMP07) are running press the STOP button on both pumps.	
4. Contact SOC to advise them of the problem and check on alarm status.	
5. Close isolating valves as required.	

4.11 Abnormal Operation

This plant should not be operated unattended in abnormal conditions.

Abnormal conditions include testing of the system, flushing of the system and dosing to achieve an agreed outcome and should be done with operators present at all times.

Possible abnormal operations include:

- Feeding chemical direct to the dosing tank and bypassing the storage tank. Only when the storage tank has problems.
- Diluting chemical in the storage tank and transferring this mix to the dosing tank to remove chlorates.

CHAPTER 5 INSTALLATION AND COMMISSIONING INSTRUCTIONS

5.1 Installation Procedures

Provide instructions for installation of the re-chlorination plant here including:

Footing and compacted base requirements.

Lifting arrangements

Positioning in place requirements

Methods of connecting the pipework. electrical power, controls and instrumentation

5.2 Pre-Commissioning and Commissioning Checklists

Detail checklist for pre-commissioning checks here.

Detail commissioning procedure and checklists here.

5.3 Commissioning Instructions

Refer to Commissioning Plan attached as Appendix B

CHAPTER 6 MAINTENANCE PLANS (PREVENTATIVE MAINTENANCE)

6.1 Periodic Maintenance

Item	Plant or Equipment Reference	Operation	Frequency
1	Dosing Pumps (PMP20 and PMP21)	Check for leaks	Each visit
		Clean pumps of any dust or debris to allow adequate cooling.	Monthly
		Relace diaphragms, valves, valves seats or peristaltic hoses.	Annually
		Check calibration.	Annually
2	Transfer Pump (PMP02)	Check for leaks	Each visit
		Clean pump of any dust or debris to allow adequate cooling.	Monthly
3	Carrier Water pumps (PMP06 and PMP07) Potable Water pump (PMP08)	Check for leaks	Each visit
		Clean pump of any dust or debris to allow adequate cooling.	Monthly
4	Loading Valve (PCV02), Pulsation Dampener (PD10), Pressure Relief Valves (PRV10 and PRV20).	Replace diaphragms.	Annually
5	Manual Valves	Check operation of manual valves not normally operated	Annually
6		Check for leaks from the tank or piping	Each Visit

	Storage Tank (TNK01) and Dosing Tank (TNK02)		
		Inspect tank for visible defects	Annually
		Inspect inside of tank via Manhole.	Annually
7	Level Transducers (LTX01 and LTX02)	Check calibration	Annually
8	Flowmeter (FTX02)	Check calibration	Annually
9	Low and high level switches and alarms (LSL01, LSL02, LSH01, LSH02, LSL03, LSH03, LSHH03, LSH26, LSA26)	Check operation	Annually
10	Flow switch alarms (FSA06, FSA55, FSA03)	Check operation	Annually
11	Pressure indicators (PIX15, PIX16, PIX58)	Check operation	Annually
12	Pressure Relief Valves (PRV10 and PRV20)	Check operation	Annually
13	Rotameters (FIX30 and FIX31)	Check operation	Annually
14	Chlorine Analyser	Change gel and cap.	Six-Monthly
15	Controls Panel 24V Battery and	Check battery condition	Annually
	Level Transmitters and motorised valves 24V Battery	Replace Batteries	3 yearly

16	Electrical Power and Control Cabinets	Check and clean	Annually
17	Emergency Shower, eyewashes and hosereel	Inspect and clean	Each visit
18	Control Panel Indication Lamps	Activate Control Panel “Lamp Test” Function to indicate any faulty lights. Replace if necessary.	Annually.
19	Doors, Hinges and Locks	Lubricate Hinges and locking mechanisms with suitable penetrating grease or similar. Lubricate lock barrels with Graphite powder or similar	Annually.
20	Ventilation Fans	Clean Roof mounted ventilation fans of all debris, dust etc to maintain airflow within structure	Annually
21	Sump Drain Valve and Pipework	Prevent blockage of the bunded room drain valve and pipework by avoiding hosing any rubbish into it. Sweep floor and remove all material that could block the drain prior to hosing down area.	Monthly.
22	Internal and external Bunds	Sweep down to remove leaves, debris etc. Do not hose into the sumps.	Monthly
		Inspect for damage to linings.	Annually
23	External Sump	Inspect for damage to linings. Inspect for damage and corrosion of pump (if	Annually

		fitted), valves, pipes and instruments	
24	General	Check doors, lighting, door open alarm, vent fans, leaks, condition of fill point Camloc.	At each visit

6.2 Spillage Cleaning Procedures

6.2.1 Spill prevention

Spillage or leakage of chemicals should be avoided during filling and maintenance work by locating a bucket or drip tray under the location where a spill or leak might occur (EG storage tank fill point) and disposing of the chemical into the storage tank if clean or offsite to a suitable location if contaminated.

6.2.2 Sodium Hypochlorite

Contain chemical within bunded area and follow Sydney Water Chemical Spill Management Guidelines.

CHAPTER 7 MAINTENANCE PLANS (Overhaul / Major Maintenance)

The following excerpts from the equipment and instrument suppliers' manuals detail the procedures for undertaking major periodic maintenance and troubleshooting.

Procedures include:

Item	Plant or Equipment Reference	Operation	Frequency
1	Storage Tank TNK01 and Dosing Tank TNK02	Message diameter of full tank. Compare with original diameter (no greater than 2% bigger than original) Empty tank and inspect for cracks, opaqueness, and damage to inlet/outlet nozzles.	10 Yearly

List additional procedures here

Attach equipment suppliers information for major maintenance here.

CHAPTER 8 TEST DATA, INSPECTION RESULTS AND TROUBLESHOOTING

Insert documents for:

Concrete Structure Inspection and Tests Plans

Letter from Structural Engineer confirming acceptance of the Structure Re-enforcing.

Test reports from the Concrete Supplier

Process Room Bund Hydrostatic Test

Bund Epoxy Coating

Storage Tank and Dosing Tank Hydrostatic Certificate

Switchboard Inspection and Test Plans.

Electrical Fitout Inspection and Test Plans

Pipework & Mechanical Fitout Inspection and Test Plans

Pipework installer's certificates for SWC and Georg Fischer solvent welding courses.

Dosing and Transfer Pumps Configuration

VSD Programming Settings (configuration) for (dosing pumps if required)

Equipment, Instruments and Drives Inspection Checklists

Calibration Certificates

FAT Test Results

SAT Test Results

Attach equipment suppliers' information for troubleshooting here.

CHAPTER 9 PARTS LIST AND RECOMMENDED SPARES

Insert Parts list here

9.1 Equipment Supplier Details

Supplier	Phone	Fax/email address	Street Address
Insert Details here			

9.2 Equipment Spare Parts Drawings and Details

Insert any suppliers information here E.G. exploded diagrams, tank details including nozzles and manholes etc.

Provide an exploded drawing of the dosing pump here showing enough detail to allow for regular wearing part replacement and including descriptions and part numbers of replaceable parts.

9.3 Recommended Spares

Insert list of recommended spare parts for 2 years operation, suppliers and recommended stock levels.

Appendix A - DRAWINGS

9.1 W.A.E. DRAWING REGISTER

Drawing Reference	Description
Insert Details here	

9.2 W.A.E. DRAWINGS

Attach all Work as Executed Drawings here.

Appendix B – COMMISSIONING PLAN

Attach Commissioning Plan here.

Appendix F – Chemical Dosing Installations - Sydney Water Guide to Proven Products

Chemical Dosing installation – Sydney Water Guide to Proven Products

Table of Contents

Tables

Introduction

This Guideline is for the chemical dosing installations for Sydney Water assets.

Sydney Water makes no warranties, express or implied, that compliance with the contents of this Specification shall be sufficient to ensure safe systems or work or operation.

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1. Introduction

The following tables contain the majority of equipment found within Networks or Treatment Plant chemical dosing installations at Sydney Water sites. These lists have been developed to assist Contractors and Sydney Water employees with identifying equipment that has been found to be suitable and complying to Sydney Water's stringent requirements.

It is to be noted that use of Supplier/Manufacturer equipment not listed on the following tables will be subject to Sydney Water approval.

If any noted equipment is no longer available or superseded, please advise Sydney Water such that the document may be updated.

This document is to be read in conjunction with the current revisions of the Sydney Water Specifications. Where ambiguity exists, this must be raised with Sydney Water.

2. General

The following sections cover general requirements regarding chemical installations within Sydney Water. These requirements are in addition to those covered in:

- Sydney Water Technical Specification - Civil
- Sydney Water Technical Specification - Mechanical
- Sydney Water Technical Specification - Electrical
- Sydney Water Instrumentation and Control Standards
- The CDU (ACP0002) and RCP (D0000389) Technical Specifications
- The Project Specific DS100 Technical Specification
- The Sydney Water Generic Chemical Dosing P&IDs.

2.1 Spill and leak containment

All chemical dosing installations are to be designed to provide a complete containment strategy. This requires the designer to develop a solution for containing chemical spills at any point of a chemical dosing installation.

A double containment piping system should be selected based on the practicalities of the site, and provision of the highest level of safety to plant personnel. Selection should be made in consideration of site specific aspects such as:

- Will the pipe work be buried?
- Access for maintenance/emergency repair.
- Length and bends in pipe runs.
- Proximity of pipe runs to walkways, process units, vehicle operating areas etc.
- Can the outer containment become pressurised?
- Where will a leak in the pipe run be directed to?

It should be noted that all systems have mechanical limitations, with most external containment pipes being de-rated in pressure due to jointing methodologies. The supplier of the selected system should be consulted in this regard.

2.2 Chemical Training

The following specific training requirements apply to all personnel working on chemical dosing systems: All project engineers, design engineers, projects managers, supervisors and leading hands specifically working on the chemical dosing systems will attend Sydney Water 's Chemical Dosing Training (also refer Sydney Water Jointing Requirements for Solvent Cement Welding Using Weldon 724 System, Introduction to SWC Chemical Dosing Systems, Awareness of Safe Operations of SWC Chemical Dosing Plants).

- All personnel installing plastic pipework including uPVC, cPVC and fusion polyethylene will undertake specific supplier or industry training on installation techniques.
- Records/certificates for this training will be produced when requested by Sydney Water.

2.3 Consistency of installation

Consistent brands/models are to be used throughout all chemical dosing installation. Where possible, equipment should be selected in consideration of what has been used at other installations located at the same site. This is particularly applicable to Treatment Plants.

2.4 Material selection and standard chemicals used

The following chart lists the commonly used chemicals at Sydney Water assets. All chemicals have specific requirements, and as such the following list is to be used as a guide only. Chemicals highlighted in **red** are less common and as such will have specific requirements for materials or fittings not covered within this document.

All pipes are to be labelled, painted and/or coloured as specified in Sydney Water Technical Specification - Mechanical.

Chemical	Chemical/Seal Material
Aluminium Sulphate	FPM (Viton)
Hydrochloric Acid	FPM (Viton)
Sulphuric Acid	FPM (Viton)
Citric Acid	FPM (Viton)
Sodium Bisulphite	FPM (Viton)
Calcium Nitrate	FPM (Viton)
Magnesium Hydroxide	FPM (Viton)
Lime Solutions	FPM (Viton)
Potassium Permanganate	FPM (Viton)
Carbon Dioxide Solutions	FPM (Viton)
All forms of Chlorine (incl. Hypochlorite and Chlorine solutions)	FPM (Viton)
Iron Salts (incl. Ferric Chloride, Ferric Sulphate and Ferrous Chloride)	FPM (Viton)
Ammonia Solutions	EPDM
Methanol	EPDM
Ethanol	EPDM
Caustic Solutions	EPDM

3. Acceptable products list

Table 1 Chemical pipework and fittings – acceptable supplier list

Item Description	Supplier/Model	Supplier/Model	Supplier/Model	Comments/Requirements
uPVC/cPVC Schedule 80 Pipe	Georg Fischer	Ipex (currently available through Allmach)		ASTM D1784 ASTM D1785 **NOTE:** PN15 is not acceptable.
uPVC/cPVC Schedule 80 Fittings	Georg Fischer	Ipex (currently available through Allmach)		ASTM D1784 ASTM D2467 ASTM D2464 **Unions to be PN16 or better**
uPVC/cPVC Double Containment Pipe Systems	Georg Fischer Double-See™ Schd. 80 x Schd. 80 Schd 80 x Schd. 40	Ipex (currently available through Allmach)	Georg Fischer Contain-It™ Schd. 80 x PE100 **Must specifiy Sched 80**	Rating of outer containment subject to the containment strategy adopted (can the containment pipe be pressurised). Un-pressurised outer preferred.
PE100 Polyethylene PN16 Pipe with PE100 Polyethylene PN16 Containment Pipe (*PE Use Subject to Approval)	-	-	-	AS4130 AS4131
Polyethylene PN16 Fusion Fittings (*PE Use Subject to Approval)	Georg Fischer	Vinidex/Plasson	-	AS4129 AS4131
PE100 Polyethylene PN16 Pipe with DWV outer containment pipe.	-	-	-	• Outer pipe to be coloured and labelled. Buried lines should be identified with custom labelled and colour coded tracing tape or approved alternative. 1. All solvent welds must utilise the IPS Weldon 724 as per below..
Solvent Welding Products/System	IPS Weldon 724 System (with P70 Primer)			• Fitters to be trained on and use Sydney Water's Solvent Welding procedure. • Acceptable training currently conducted by PAAS or Georg Fischer.

Item Description	Supplier/Model	Supplier/Model	Supplier/Model	Comments/Requirements
Pipe Support/Clip Systems	Georg Fischer	Unistrut/Ezystrut etc. Loose fitting with suitable isolation material only.	Ipex (currently available through Allmach) and Stauff	2. Pipe clips to allow for axial movement. 3. Allow sufficient spacing off backing boards/concrete for access to unions and fittings. 4. Consideration to be given to thermal expansion and bends on long runs.
uPVC/cPVC Ball Valves	Georg Fischer Type 546 pro	FIP VKD	-	Valves must be suitable for chemical use.
uPVC/cPVC Check Valves	Georg Fischer Type 561	FIP SXE	-	Valves must be suitable for chemical use.
uPVC/cPVC Check Valves (Spring Loaded)	Georg Fischer Type 562	FIP SXE	-	Any internal spring to be suitable for the chemical used.
uPVC/cPVC Diaphragm Valves	Georg Fischer Type 514	FIP VM	-	
uPVC/cPVC Motorised Valves	Georg Fischer Type 546 with EA-25 24VDC	(Mag Hydroxide) Process Systems BLSE	-	• Motorised valves to be 24VDC. • Stainless steel option for Magnesium Hydroxide
uPVC/cPVC Solenoid Actuated Valves	Burkert 0142	Process Systems	-	• Not to be used on main chemical dosing lines. • Used for dilution water - PVC body for corrosion resistance
uPVC/cPVC Strainers	Georg Fischer Type 305	FIP RV	-	Highest Pressure Rating Available.
uPVC/cPVC Back Pressure Control/Relief Valves, Anti-syphon valve.	Stubbe Reducing – DMV Relief - DHV712-R	Georg Fischer Type 582	-	• Valves to be selected in consideration of process requirements. • Anti-syphon applications should be designed to close if a suction effect occurs downstream of the valve.
Camlock Connections	Dixon (or equivalent)	-	-	• Poly camlock fitting for sodium hypochlorite, ferrous chloride and calcium nitrate. • Stainless Steel 316 or Aluminium for MHL.

Table 2 Mechanical equipment – acceptable supplier list

Item Description	Supplier/Model	Supplier/Model	Supplier/Model	Comments/Requirements
Bund and Unloading Bay Sump Pumps	Tsurumi TM Series	-	-	Titanium to be used where any aggressive chemical is used.
Transfer Pumps - General	Iwaki	-	-	Magnetic type, suited to the required duty and chemical.
Chemical Dosing Pumps - Digital	Grundfos DME, DDA	-	-	5. Pumps to be selected in consideration of site control/electrical setup. 6. Digital dosing pumps that utilise DC stepper motors are preferred to ensure constant dosing in lieu of a pulse dosing arrangement. 7. Where possible 10 bar dosing pumps are preferred.
Chemical Dosing Pumps – Peristaltic	Bredel SPX	-	-	8. Forced ventilation dependant on turn down ratio 9. Bredel requires a VSD. Preferred VSD is Schneider Altivar 61
Pulsation Dampeners	Blacoh	AccuPulse (rebadged Blacoh)	-	10. Include bladder pressure gauge and Schrader valve for hand pump. 11. Bladder holder to be flanged & bolted. 12. Solvent Cement Connections. (Flange is the second preference)
Storage Tank Magnetic Level Indicators	Weka (uPVC/cPVC)	Faco	-	Any fabricated PVC pipework supplied must be constructed by appropriately trained fitters (in the gluing and piping system)
Calibration Cylinders	**KoFlo	Other	-	Requirement for Schedule 40 minimum PVC clear tube. May require custom fabrication.
Backflow Prevention Devices	Valvcheq RP03	Caleffi	-	
FRP Chemical Storage Tanks	Corrosion Technology Australia	Newel Composites	RPC	BS4994 Category 1. Should be 3rd party verified.
3rd Party Verifiers of FRP Tanks	Oceania Composites	Dennis Southam & Associates	-	
Polyethylene Rotomoulded Storage Tanks	Dex Australia	Duraplas	Polymaster Rotadyne	• Generally Networks Installations only. • Minimum SG 2 rating
Safety Showers/Eyewash	Enware	-	-	AS4775 compliant.

Item Description	Supplier/Model	Supplier/Model	Supplier/Model	Comments/Requirements
Mixers	Teralba Industries Mixquip	-	-	

Table 3 Instruments for chemical systems – acceptable supplier list

Item Description	Supplier/Model	Supplier/Model	Supplier/Model	Comments/Requirements
Pressure Indicating Gauges	Stubbe w/diaphragm	Wika	-	Solvent welded connection.
Pressure Transmitters	Refer to TS01 – I&C Standards	Vega	-	• Consistent with site. • Drawing of commissioned instrument setup (heights etc.) to be provided. • Consistent brand across installation.
Rotameters	Georg Fischer	Stubbe	Prominent	
Float Type Level Switches	Refer to TS01 – I&C Standards	Xylem ENM -10	-	Consistent with site.
Capacitive Type Level Switches	Refer to TS01 – I&C Standards	IFM Efector	-	Consistent with site.
Level Transmitters	Refer to TS01 – I&C Standards	Vega Vegapuls	-	• Consistent with site. • Drawing of commissioned instrument setup (heights etc.) to be provided. • Consistent brand across installation.
Flow Transmitters (Water/Sewer)	Refer to TS01 – I&C Standards	ABB Magmaster Endress + Hauser	Siemens	Consistent with site.
Flow Transmitters (Chemical)	Refer to TS01 – I&C Standards	Yokogawa	-	• Consistent with site. • Hastelloy flanged connections
Flow Switch	Refer to TS01 – I&C Standards	IFM Efector (Thermal Dispersion)	-	Consistent with site.

Table 4 Miscellaneous other equipment

Item Description	Supplier/Model	Supplier/Model	Supplier/Model	Comments/Requirements
Mobile Platform Ladder	Bailey FS10863	-	-	
Hose Reels	ReCoila AW1215	-	-	Minimum 12mm diameter
Ventilation Fans	Fantech Compact 2000	-	-	
Analogue Level displays	Amalgamated Instruments LDIV	-	-	High visibility LED version
Door switches	Panasonic AZ	Tend TZ	-	
Door catches	SABRE	-	-	
Power supply (Battery backed 24V)	Dyne Industries	-	-	
Surge Protection	Erico	Pheonix	-	

Appendix G - RCP Commissioning Checklist

(Refer "Attachments Panel" for embedded Word appendices D, E and G)

Prior to commencing commissioning the following mandatory requirements to be addressed: -

- Latest revision of construction drawings are provided including:-
  - Electrical.
  - Mechanical
  - Process & Instrumentation Diagram.
  - Civil showing pipework layouts, services and operational valve locations relative to the RCP.
- A draft copy of the O&M manual is available.
- The relevant IICATs RTU I/O listing is available.
- Completed Inspection & Test Plans as well as Factory Acceptance Test Documentation.
- Sign off from IXOM (formerly ORICA) for installation conformance to chemical delivery requirements.
- Sydney Water Bi-Lock barrels to suit the Pink CBY key are installed on the access doors to the RCP. Sydney Water Bi-lock padlocks to suit the CBY key are installed on all pit covers and site access gates.
- Access doors to the RCP are able to be secured in the open position.
- Externally located electrical meter panels where supplied will have a spare key provided to suit the energy suppliers proprietary padlock.
- ITP showing compliance to minimum containment volume as per this specification and hydrostatic test completion.
- Power to the RCP is connected and phase rotation is correct.
- A label clearly identifying the origin of the electrical sub-circuit is provided above the main isolator for the RCP.
- Potable & Non-Potable (where applicable) water is connected.
- Potable water pressure is adequate at all times of the day to operate the safety shower (minimum 75.7 L/min @ 210 kPa).
- RPZs are clearly labelled, protected by vandal resistant cages and fitted with Sydney Water Bi-Lock padlocks that suit the CBY key.
- Externally located taps are fitted with vandal resistant handles and are clearly labelled NON POTABLE, DO NOT DRINK.
- A roof mounted retractable Hose Reel (UTY) c/w camlock fitting and hose nozzle is provided and has sufficient length to reach the entire truck delivery bund.
- The chemical dosing line is installed according to site design either in a dedicated chemical dosing pit for a water main or directly into a reservoir. The dosing line is appropriately supported and terminated to allow future removal and re-installation where possible, negating the need for confined space entry.
- IICATs RTU, touch screen HMI, ethernet switch where applicable and 3G modem are installed, powered and loaded with the site specific control program ready for testing
- Internal and external lighting is operational.
- Ventilation fans are operational, and the controlling time clock is programmed to operate the fans between 6am and 10pm, 7 days a week.
- All electrical instrumentation is programmed and correctly ranged including:-
  - Variable Speed Drives. (VSD)

  - Digital Dosing Pumps. (PMP)
  - Level Transducers. (LTX)
  - Pressure Transducers. (PTX)
  - Flow Transducers. (FTX)
  - Set-point relays within Analogue Level Displays. (FIX)
  - Programmable Level Switches. (LSH,LSL)
  - Programmable Flow Switches. (FSL)
  - Chlorine Analyser/s (Externally located control and interlock signals such as Reservoir Mixer (MIX), Secondary Containment high level (LSH), Dose pit High Level (LSH) [all if applicable])
- Motor thermal or electronic overloads are correctly set to the F.L.C. of the motors.
- Automatic Valves are configured for open / close operation and feedback position indication.
- Chemical Storage and Dosing tanks hold sufficient water to conduct automatic and manual testing (i.e. above low-level cut-out and below high level cut-out).
- Pressure loading and relief valves are adjusted to the required operational pressures and marked accordingly. (PCV, PRV)
- Pulsation dampeners are charged with air or nitrogen to 80% of system designed operational pressure. (DMP)
- All internally and externally located equipment is labelled with allocated MAICS numbered tags as required.
- Appropriate valve isolation keys and or handles are provided for operation of exterior located valves and removal of associated pits or covers.
- Relevant site safety and Asset ID (WX####) signage is securely affixed to access doors and is clearly visible when doors are open.
- Safety Shower and eyewash signs securely affixed to the wall and door as required.
- DG Labelling is correct and affixed to the chemical storage tank. A tank capacity label is affixed to the tank.
- DG labelling is also affixed to the external wall of the building, so it is clearly visible when approaching from the access roadway.
- All chemical pipework is correctly labelled for the chemical to be dosed. Direction of flow is clearly indicated.
- Potable and Non-Potable (where applicable) water pipes are correctly labelled.
- HAZCHEM signage is attached to site access gates.
- Site access gates are able to be secured in the open position.
- HAZMAT box is installed inside the site perimeter fence and contains site safety folder (applicable for chemical installations over 1KL).
- All plug-in electrical equipment is tested and tagged.
- A dry powder fire extinguisher is located on the wall of the control room and is tested and tagged.
- Fire extinguisher signage is affixed to the wall above the extinguisher.
- A suitable mobile platform ladder is located within the process room for access to instrumentation located on the roof of the chemical storage and dosing tanks. Instrumentation as well as the tank

manway should be within easy reach whilst standing on the ladder. The level transducer (LTX) should be able to be removed for cleaning without unscrewing from the tank, i.e. secured via a camlock coupling.

- A table, chair, document storage and spare parts cabinet (if required) are supplied in the control room.
- Control panels are lockable, accessible with a square or triangular access key.

Rechlorination Plant Sequence Testing

- RTU Digital and Analogue Inputs
  - Manually activate each RTU input and confirm both local and remote operation.
  - RTU Digital and Analogue Outputs
  - Remotely activate each digital and analogue output to check for automatic sequence operation.
- Drop test each Dosing Pump (PMP) to confirm correct calibration to the chemical dosing Flowmeter (FTX)
- Sequentially run each Dosing Pump (PMP) in manual and check for the following operations:-
  - Switch off Dosing Pump local isolator, Dosing Pump stops and auto valve closes. Pump fault light illuminates.
  - Dosing Pump drives from minimum to maximum speed when operated in manual from the control panel.
  - Dosing Pump stops operation and the auto valve closes in accordance with the FDS when associated interlocks are activated. These interlocks include:-
    - Process Room Bund High Level (LSH)
    - Dosing Cabinet Catch-pot (if applicable) (LSH)
    - Secondary Containment High Level (if applicable) (LSH)
    - Dose Pit High Level (watermain if applicable) (LSH)
    - Dosing Tank Low Level (LSL & LSC)
  - Isolate the chemical dose line discharge isolation valve and check the Dosing Pump Pressure Relief Valve (PRV) opens at the set pressure. Re-open the chemical dose line discharge isolation valve and check the Pressure Relief Valve fully closes.
  - Place both of the Dosing Pumps (PMP) in auto and check for the following operations:-
    - Dilution Water pumps (duty / standby) in lieu of solenoid in RCPs activate when Dosing Pump runs. Dilution Water Running light illuminates. Dilution water Rotameter (FIX) is set to provide a ‘minimum’ dilution water flow of 20:1 to that of the Dosing Pump maximum operating speed.
      - Fail the dilution water pumps and check for correct operation of the Dilution Water Low Flow switch (FSL) and associated alarm input on the RTU.
    - Switch off the duty Dosing Pump local isolator, the duty Dosing Pump stops, pump fault light illuminates and the standby Dosing Pump starts running.
    - Dosing Pumps operate on either a window setpoint as determined by the residual chlorine analyser or a flow paced profile as determined by the water main flowmeter.
    - Dosing Pumps stop operation and the auto valve closes in accordance with the FDS when associated interlocks are activated. These interlocks include:-
      - Process Room Bund High Level (LSH)
      - Dosing Cabinet Catch-pot (if applicable) (LSH)

  - Secondary Containment High Level (if applicable) (LSH)
  - Dose Pit High Level (watermain if applicable) (LSH)
  - Storage Tank Low Level (LSL & LSC)
  - Failure of chlorine signal or reaching the programmed setpoint value. Chlorine analyser also has an alarm output if the associated flow switch on the flow cell registers a low flow.
- Where applicable check the automatic operation of the batching sequence including Transfer / Mixing Pump run time and make up water pumps and control valves (either actuated ball valve or solenoid dependant on the size of the system) activation with cut-out on high level.
  - Check batching sequence stops operation when associated interlocks are activated.
- Activate the Truck Power Outlets and then fill the storage tank with water to activate both High Level set-points (LSA & LSH). Confirm Truck Power Outlets are de-activated and subsequent activation of the High Level warning Klaxon (KLX) and Beacon (BEA). Press the Siren Mute button on the control panel to silence the Klaxon.
- Drain the storage tank to flood the process room bund in order to check the bund containment capability and bund capacity.
- Fill the delivery bund sump with sufficient water to activate the delivery bund Sump Pump (if applicable). Run the delivery bund Sump Pump in manual and check for automatic stop operation at low level cut-out.
- Check for correct mounting and operation of the Safety Shower / Eyewash and separate Eyewash (SEQ).
- Undertake site inspection to identify all externally located valves and controls associated with the RCP. These include:
  - Process Room Bund Drain Valve
  - Secondary Containment Drain Valve (if applicable)
  - Dose Pit Drain Valve (if applicable)
  - Delivery Bund Drain Valve (if applicable) and doseline Isolation valves located at the dosing point within the reservoir or water main.
  - External Lighting Switch
- Check valving for correct labelling and descriptions are in accordance with design requirements.
- Identify access and egress to the RCP for delivery operations, after-hours access, are free from potential trip hazards and obstacles.

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