



ABN 86 673 835 011

**Standard Technical  
Specification  
Sodium Hypochlorite Storage  
and Dosing Facility**

**TMS1636**

## REVISION CONTROL

Revision Number	Date	Revision Details	Responsible Officer
0	6/09/2016	Original	Jose C
1	Dec 2016	Issued for Use – Stakeholder Comments Updated	Jose C

## DOCUMENT CONSULTATION

Revision Number	Date Sent	Name	Comments	
			Received	Incorporated
0	30/09/16	Harald Kemmetmuller	4/10/2016	Yes
0	30/09/16	Jeremy Torpy	14/10/2016	Yes
0	30/09/16	Ted Aston		
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# 1 SCOPE

This specification sets out the minimum requirement for the design, materials, fabrication, inspection, testing and installation for a Sodium Hypochlorite Storage and dosing facility for Sewage Treatment Plants (STPs).

# 2 REFERENCED DOCUMENTS

The following QUU Specifications apply

Document Number	Title
CHE135	Pre-factory Inspection Test Checks – Switchboards
CHE305	Standard Variable Speed - Sewage Pumping Station (FAT)
TEM336	Power System Analysis Guidelines
TMS62	Preferred Equipment List – Electrical and Instrumentation
TMS76	Corrosion Protection for Electrical and Mechanical Equipment and Structures
TMS78	Typical Switchboard Changeover Commissioning Plan
TMS849	Citect SCADA Configuration Standard
TMS1151	Preferred Equipment List – Control Systems
TMS1200	Electrical Installation - Technical Specification
TMS1201	Instrumentation Installation - Technical Specification
TMS1202	Control System Implementation for Network Assets
TMS1203	General Requirements for Hazardous Area Installation – Technical Specification
TMS1222	Control Panels - Technical Specification
TMS1229	PLC Programming and Configuration Standard
TMS1406	LV Variable Speed Drives – Technical Specification
PRO307	Procedure Drafting Guidelines – Contract Requirements
TMS1434	Technical Specification for Steel Structures
TMS1437	Technical Specification for Civil Works
TMS1439	Technical Specification for Concrete Structures
TMS 1639	Technical Specification for General Mechanical Works
PRO395	SEQ Water Supply and Sewerage- D&C Code Asset Information QUU Addendum
	SEQ Water Supply and Sewerage Design & Construction Code (SEQ WS&S D&C Code)
WI58	Arc Flash Assessment and PPE Selection

### 3 STANDARDS & REGULATIONS

All equipment and workmanship shall conform to the most recent requirements of the relevant statutory Local, State and Commonwealth Authorities and current applicable Australian Standards. Alternatively, where no Australian Standard exists, work shall conform to the most current and applicable International standard.

Where conflict exists between different Codes, Standards or Regulations, the most onerous conditions of specification shall apply unless accepted otherwise in writing by QUU.

The Supplier shall not deviate from the provisions of the relevant standard without first obtaining agreement in writing from QUU Superintendent.

#### 3.1 Standards

Particular standards and regulations relevant to the work include but are not necessarily limited to the following:

Document Number	Title
AS/ISO 1000	International System of Units (S.I.) and its Applications
AS 1159	Polyethylene pipes for pressure applications
AS1260	PVC-U pipes and fittings for drain, waste and vent application
AS 1275	Metric Screw Threads for Fasteners
AS 1319	Safety signs for the occupational environment
AS 1345	Identifications of the contents of pipes, conduits and ducts
AS 1460	Mechanical jointing fittings for use with polyethylene pressure pipes
AS1462	Methods of test for plastics pipes and fittings
AS1627.4	Metal Finishing – Preparation and Pre-treatment of Surfaces – Abrasive blast cleaning of steel
AS 1657	Fixed platforms, walkways, stairways and ladders
AS 1722	AS/NZS 4129:2000 Fittings for polyethylene (PE)
AS 1939	Classification of Degrees of Protection Provided by Enclosures for Electrical Equipment
AS 2033	Installation of polyethylene pipe systems
AS 2129	Flanges for pipes, valves and fittings
AS 3000	SAA Wiring Rules
AS 3500	Plumbing and drainage
AS 3735	Concrete structures retaining liquids

AS 3780	Storage and handling of corrosive substances
AS 3996	Access covers and grates
AS 4775	Emergency eyewash and shower equipment
AS/NZS 3000	Electrical Installations (Australian/New Zealand Wiring Rules)
AS/NZS 4129	Fittings for polyethylene (PE)
AS/NZS 4680	Hot-dip galvanised (zinc) coatings on fabricated ferrous articles
AS/NZS 4766	Polyethylene storage tanks for water and chemicals
AS 60417(IEC 60417)	Graphical symbols for use on equipment
[NOHSC:2017(2001)]	National Code of Practice for the Storage and Handling of Workplace Dangerous Goods

### 3.2 Regulations

The current regulations and statutory requirements of the State of Queensland, Australia, apply.

### 3.3 Units and Language

AS/ISO 1000 (metric SI system) shall be used. All documentation and correspondence shall be in the English language.

### 3.4 Acronyms and Abbreviations

Term	Definition
AS	Australian Standards
CDU	Chemical Dosing Unit
EPDM	Ethylene Propylene Diene Monomer
ESD	Emergency Shutdown Device
FAT	Factory Acceptance Test
FRP	Fibre Reinforced Plastic
HDPE	High-density polyethylene
HSE	Health, Safety and Environment
ISO	International Standards Organisation
ITP	Inspection and Test Plan
MSDS	Material Safety Data Sheet
NC	Normally Closed
NO	Normally Open

P&ID	Process & Instrumentation Diagram
PE	Polyethylene
PLC	Programmable Logic Controller
PN	Pressure Nominal, Pressure Rating
PPE	Personal Protective Equipment
ppm	Parts per million
PVC	Polyvinyl Chloride
QA	Quality Assurance
QUU	Queensland Urban Utilities
RPEQ	Registered Professional Engineer Queensland
RPZ	Reduced Pressure Zone
SAT	Site Acceptance Test
SCADA	Supervisory Control and Data Acquisition
SDRL	Supplier Data Requirements List
SLD	Single Line Diagram
STP	Sewage Treatment Plant
UNO	Unless Specified Otherwise
UV	Ultra-violet
VSD	Variable Speed Drive
%w/vol	weight/volume percent

## 4 GENERAL REQUIREMENTS

All equipment shall be constructed and tested in accordance with the appropriate AS/IEC standards and SEQ code.

The 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.

### 4.1 Minimum Criteria

The CDU facility shall be designed:

- For minimum life duration of 20 years in the environment and for the duty specified and on the Project Data Sheets.



- The equipment shall be suitable for a minimum of 5 years normal continuous operation without maintenance at the duty specified and on the Project Data Sheets.
- Not cause interruption to the normal operation of the STP;
- Have complete chemical receiving, storage, transfer, and dosing systems, and the necessary safety facilities;
- Be capable of automatic dosing and report alarms via SCADA;
- Be capable of local manual operation, and;
- Contain all spills of the chemical being used.

## 4.2 Materials

All materials shall be as detailed on the Project Data Sheets and referenced specifications. When materials are not specified the Contractor may offer standard materials suitable for the environment and operating and design conditions. All materials shall be new and free of defects.

### 4.2.1 Corrosion Resistance

All internal parts in contact with the chemical substances (including spill areas) are required to be corrosion resistant against the chemical involved. Design Engineer must consider the corrosion effects and the installed micro environment or substance in contact in selecting materials.

### 4.2.2 Adhesive, Sealants, and Gaskets

All adhesive, sealants and gaskets shall be resistant to oil and water, non-supportive of microbial growth, and dimensionally stable. They shall also be resistant to chemical attack by the dosing chemical.

All gaskets shall be made from butyl, Ethylene Propylene Diene Monomer (EPDM), or Viton rubber materials.

## 4.3 Pipework

All pipework selected shall be designed specifically for use in the chemical industry and resistant to chemical attack.

All pipes, including those in pipe trays and trenches, shall be labelled in accordance with AS 1345.

Pipe trays located outside shall be supplied and installed with suitable covers.

Buried non-metallic pipes shall have continuous metal tape placed in the trench above the pipe to allow detection.

All chemical dosing lines external to the CDU (above ground or buried) shall be provided with secondary containment pipework (sleeved) arrangement OD63PE100.

In addition to this, all chemical dosing and/or water lines passing through the CDU electrical controls room shall also be pipe-in-pipe (sleeved) arrangement. The arrangement of these pipes shall allow a leak to be readily identified and contained, and facilitate repair or replacement of the inner pipe. The arrangement of the pipework shall allow a leak to drain into the CDU bund or the dosing point. Dosing lines shall be kept to minimum length and changes in elevation shall be minimised to avoid air locks and gasification.

The valves used for Sodium Hypochlorite dosing system shall be Georg Fischer (G+F) products or approved equivalent, and of uPVC construction. Valves shall show direction of operation and flow.

All valve material shall be suitable for the application. The check valve spring shall be made of hastelloy C alloy. The actuated valves if any shall be electrically actuated.

The pressure rating of the valves shall be PN16 or higher as required for the application. Valves shall be supplied with union or socket connectors for connection of pipe.

All valves shall be full-bore type and listed under the SEQ Code (G+F preferred). These, along with other non-standard pipework fittings shall be double union type to minimise damage during repair and maintenance.

All water lines coming from QUU mains shall be provided with Reduced Pressure Zone (RPZ) valves to control the water pressure and prevent water flowing back into the mains. A separate RPZ shall be provided to ensure backflow from the Chemical Dosing Unit cannot enter the emergency shower and eye wash facilities.

Refer to QUU Technical Specification for General Mechanical Works TMS 1639

#### **4.4 Civil Works**

The design and construction of the civil works shall be in accordance with the requirements contained in QUU's Technical Specification TMS1437

#### **4.5 Mechanical Works**

The design and construction of the mechanical works shall be in accordance with the requirements contained in the Parent Project Requirements Technical Specification, SOW Document and QUU Technical Specification for General Mechanical Works TMS 1639.

#### **4.6 Electrical Works**

The design and construction of the electrical works shall be in accordance with the requirements contained in TMS1200.

#### 4.7 Instrumentation

All instrumentation including level transmitters, flow transmitter, flow switches and level switches shall comply with the QUU's Instrumentation and Control TMS62 and TMS1201

#### 4.8 Telemetry & Control

The CDU is to be supplied as a package by equipment supplier with all necessary control and instrumentation to meet the requirements set down in the functional specification and all other scope documents. The CDU shall be designed for connection into QUU's Telemetry System.

Specific requirements of telemetry and control for a CDU are detailed in TMS1202 and TMS1222, also in the Parent Project Requirements Technical Specification and SOW Document.

#### 4.9 Services

Services to the CDU shall include 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.

Any water supplied to the CDU shall not be installed near electrical equipment.

#### 4.10 Facility and Equipment Identification and Labelling

All equipment shall have a unique identification number. QUU designates unique identification numbers for all its asset and associated equipment, and QUU will assign these.

The Contractor shall mount a standard QUU facility asset sign on the outside of the CDU area.

#### 4.11 Warning Signs

Warning signs (UV stabilised ) shall be erected as required. These include, but are not limited to the following:

- A Hazardous Chemical (HAZCHEM) warning sign with UN number and chemical class to be placed on the main site entrances or on the CDU area as well as the storage tanks, when a hazardous chemical is stored on site.
- Information panels as per current edition of the Australian Dangerous Goods Regulation shall be placed in prominent and visible locations.
- As a minimum, there shall be one sign on the chemical storage tank, and another on the inside of the door to the bunded area.
- Confined Space Entry Permit sign to be placed on the storage tank.

- Capacity of the storage tank stated on the tank.
- Other relevant OHS signs shall 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.

#### **4.12 Elements of Sodium Hypochlorite storage and dosing system**

A CDU shall consist of the following elements:

- Chemical tanker delivery bay;
- CDU, which contains two separate areas; One for the electrical control panel & RTU, and the other a self-bundled wet area room for the chemical storage tank, dosing pumps and pipe work;
- Electrical control panel and RTU;
- Chemical storage tank(s);
- Dosing system;
- Pumps;
- Pipes;
- Valves;
- Instrumentation;

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

A CDU Process and Instrumentation Diagrams (P&ID) is available as appendix at the end of this document.

#### **4.13 Maintenance Access**

The concept design including the layout of the equipment inside the CDU area shall be submitted to QUU for approval prior to construction.

This is to ensure that access hatches, level indicators, mixers, pumps and so on, can be easily reached by personnel for maintenance and operation and that the contractor has followed the safety in design process.

### **5 TECHNICAL REQUIREMENTS**

#### **5.1 Chemical Delivery Bay**

A chemical delivery bay shall be designed and constructed to provide safe arrival, parking, offloading, turning around, and departure of bulk chemical tanker trucks.

#### **5.2 Location**

The delivery bay shall be located adjacent to the CDU area. Unless otherwise specified.

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

### 5.3 Access

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. The Contractor must model the turn in radius for typical 10 Tonne rigid tanker truck

Alternatively, the access shall allow the tanker to drive through, make a safe turn around and exit the site in a forward direction.

The contractor must ensure that the design of the fill point complies with the requirements of the chemical supplier that currently has a supply agreements with QUU

### 5.4 Roll over bunded delivery area

The delivery bay shall be a concrete slab with a hump, to provide containment for any spill or leaks.

The bund shall be designed as a water retaining structure in accordance with AS 3735 and AS 3780.

The bunded area shall be designed with a 1 in 75 grade towards the sump pit, such that no pools of chemical will accumulate on either side of the bund.

Bund area floor must be profiled so than any liquid within the bund will fall away from the base of the tank and collect in a 900x900x400 sump with FRP grated cover and DN100 valved drainage pipe connected to stormwater The position of the drainage valve must be visible, obvious and labelled to alert operators when left open. The drainage valve must be accessible for maintenance from outside the bund area.

Any humps in the roadway at either end of the tanker delivery bay bund shall be are compatible with delivery trucks.

The delivery bay and CDU arrangement must ensure any stormwater from the surrounding roadway and ground shall be channelled away, and not flow into the delivery bay bund.

### 5.5 Sump and Discharge Line (roll over bund)

A sump pit to collect liquid from the roll over bunded area shall be provided. It shall have dimensions of 900x900x400 sump with FRP grated cover and DN100 valved drainage pipe connected to stormwater The position of the drainage valve must be visible, obvious and labelled to alert operators when left open. The drainage valve must be accessible for maintenance from outside the bund area. It shall be located where it is not subjected to vehicle loading outside the vehicle load area, but inside the bunded volume area. It shall be fitted with a grate/cover, made from lightweight materials,

weighing no more than 15 kg, in accordance with AS 3996, Class A. The weight limit shall be labelled where appropriate.

The sump shall drain by gravity (typically a 100 mm pipe) where feasible, to an appropriate location.

## 5.6 Safety Equipment

The following safety equipment shall be provided:

- A safety shower and eyewash station, which complies with AS4775, located within 2 to 7 m of the chemical filling connection point. This is typically mounted to the inside of the CDU area. Long water lines to the safety shower and eyewash station that are exposed to sunlight shall be lagged, to eliminate risk of water being too hot for use.
- An additional eyewash station located inside the CDU bunded area shall also be provided.
- A flow switch activated alarm to activate an audible and flashing light after the shower has been on for 5 minutes. The alarm shall also be connected into the control system to alert the remote site operators via SCADA that the safety shower is in use.
- A permanent lit green LED light source shall be provided for improved effectiveness of signalling eyewash and safety showers (Coolon EWL type).
- Eye wash safety showers to be full 316L SS construction.
- A UV resistant hose reel permanently attached to a water tap and capable of reaching all parts of the CDU, including the unloading area.
- Emergency shutdown provision, capable of stopping the unloading operation, is to be provided at least 10 m from the unloading point.
- Sufficient lighting to enable safe work beyond daylight conditions, particularly for the chemical delivery activities.
- When the delivery bay is not adjacent to the CDU (that is, in a remote location), an additional safety shower is required within 2 to 7 meters of the tanker connection point (unobstructed egress).

## 5.7 TANKER POWER CONNECTION OUTLETS

Two permanently mounted electrical power outlets are required for unloading of the dosing chemical. These power outlets are 415 V (32 amps) and 240 V (20 amps) UNO, and are interlocked with the storage tank high-level switch, to prevent operation of the tanker unloading pump on high-level.

They shall be located within 7.5 m of the filling hose connection point, and inside the CDU area.

## 5.8 CDU Area

A steel portal frame roof structure with a 900mm overhang shall be designed to accommodate the chemical storage tank(s) and its bund, dosing equipment, and control panel, along with the necessary control equipment, alarms and telemetry links. The frame must be hot dipped galvanised and painted with a 50µm epoxy zinc phosphate primer and minimum 400µm high build, high hardness, epoxy barrier coat protective paint system.

### 5.8.1 Layout and Dimension

The CDU area shall consist of two separately accessible areas; a bunded dosing area for chemical storage and dosing equipment, that is capable of containing any chemical leaks or spills. The second is a control area for electrical controls, telemetry, and document storage.

Normal working areas shall have immediate access to emergency egress out of the bund.

### 5.8.2 Bund Floor and Wall

The chemical storage area inside the CDU portal frame shall be bunded and designed as a water retaining structure in accordance with AS 3735. It shall have the capacity of at least 110% of the total capacity of the largest tank located within the bund compartment in accordance with AS3780.

The bund wall height shall be a maximum of 1 m for worst case emergency escape. The need for high bund walls needs to be balanced against the more difficult access and emergency egress and the overall size of the CDU area. The bund shall comply with AS1657 for safe access.

A high level alarm (connected to SCADA) shall be installed in the bund, to alert the operator that a spill may have occurred. The alarm set point shall be agreed with QUU, and cause an automatic shutdown of the CDU.

The bunded area shall be designed with a 1 in 75 grade towards the sump pit such that no pools of water/chemical will accumulate on the bund floor.

The bund wall and floor shall be adequately coated to protect the concrete. The floor surface shall be non-slippery.

All pipework shall be run around the perimeter of the dosing area to minimise trip hazards, and as far away from electrical wiring as practicable. With exception to the bund drainage pipe, all pipes shall pass above the top of bund wall.

Refer to TMS1439 Technical Specifications for Concrete Structures.

### 5.8.3 Sump and Discharge Line

To allow for the management of any chemical spills occurring in the bunded area, a sump shall be provided. The fall within the bund shall drain to this sump. The sump shall have dimensions of 900x900x400 sump with AS3996 Class B, FRP grated cover and DN100 valved drainage pipe connected to stormwater. The position of the drainage valve must be visible, obvious and labelled to alert operators when left open. The drainage valve must be accessible for maintenance from outside the bund area. The connecting pipe from the bund to the drain point shall be pressure rated and sealed with a suitable chemically resistant coating to avoid chemical ingress into the concrete wall.

The discharge line may be combined with the chemical delivery bay discharge line (see Section 5.5 of this Specification).

### 5.8.4 Electrical

All electrical equipment, including wiring, shall be installed above the full chemical bund level. All electrical equipment shall 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 CDU area.

### 5.8.5 Lighting

The Contractor shall design and supply lighting system to comply with the relevant Australian Standards. Lighting shall be designed to allow safe access and operation of the asset at night time.

Energy efficiency, easy maintenance and reliability of the lighting system shall be taken into consideration in the design. Light fittings shall be selected from suppliers listed in TMS62, Preferred Equipment List, Electrical and Instrumentation.

The lighting installation shall meet all the applicable requirements of QUU's Technical Specification TMS1200.

### 5.8.6 Chemical Manifest

If the chemical is classified as Dangerous Goods, and the volume stored is above the manifest quantity (i.e. >10,000 L), then a Hazardous Material (HAZMAT) box shall be mounted just inside the site main entrance gate. A chemical manifest shall be provided in the box and shall contain the following details:

- Date of preparation
- Name and contact details of Occupier / QUU
- Responsible Person



- Contact details for two people in case of emergency
- Details of dangerous goods storages including type, location, number and volume of tanks
- Material Safety Data Sheet (MSDS) 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 sewage pumping station
- Location of emergency assembly area

## 5.9 Chemical Storage Tank

Chemical storage tank(s) shall be provided for safe storage of the dosing chemical. The preferred location of the tanks is in the corner furthest away from the electrical equipment and the entry access.

The storage volume shall be calculated between the top of the tank discharge line to the dosing pump, and the maximum fill level, measured at the bottom of the overflow line at the top of the tank. Tanks shall be designed so that there is 10 % spare capacity between the high high and overflow levels.

Tank overflow connections shall be designed to prevent siphoning of the tank contents and shall discharge into bunds without excessive splashing.

Tank vents shall be located so that discharges do not present a hazard to other equipment or operators.

The storage tank shall be designed and constructed to provide complete draining of the tank and its connections. Equipment, such as access hatches, mixers and level sensors shall be able to easily reached from the platform ladder for ease of operation and maintenance.

### 5.9.1 Material

The storage tank shall be manufactured from high-density PE, spirally wound FRP or other material suitable for the chemical specified. It shall be designed and constructed in accordance with AS/NZS 4766 when it is made from PE, or EN 13121 for FRP. Where the dosing chemical is a corrosive substance, the chemical storage tank shall 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 shall be assumed for calculation of wall thickness requirement.

To avoid external corrosion, all welded brackets such as hold-down lugs, pipe supports, and lifting lugs, shall be designed to allow water/chemical to drain away without pooling.

The tank supplied shall be fitted out with the required branches, fittings, labelling, and identification number. The UV resistant labels shall include, but is not limited to the material of construction, the name of the manufacturer and the date of manufacture.

### 5.9.2 Structural

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

For a FRP tank, it shall be anchored and mounted on a suitable concrete plinth. Suitable lifting lugs shall be fitted.

### 5.9.3 Access Hatch

For a covered tank with a volume capacity of 5,000 litres and under, a minimum of one 600 mm diameter access hatch shall be provided on the top of the tank.

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

The hatch shall be made from lightweight materials, weighing no more than 15 kg, in accordance with AS 3996, Class A. Weight limits shall be labelled where appropriate.

### 5.9.4 Tank Inlet and Outlet

Tank shall have the following pipework features but not limited to:

- One vent (breather) with minimum diameter of 50 mm on the apex of the tank roof shall be supplied. The vent shall penetrate the roof and finish in a 180° bend with the open end facing downward. The end of the vent pipe shall be covered with a 1 mm mesh to prevent vermin ingress.
- One overflow branch with minimum diameter of 80 mm in the tank wall, 50 mm down from the roof-wall joint. The overflow line diameter should be at least 1.5 times the diameter of the filling line. The overflow line shall 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.
- One drain branch with minimum diameter of 50 mm shall 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 Kamlok fitting, with cover, shall be supplied and installed at the tanker filling point. This pipe shall rise vertically and then slope downwards towards the tank (1 in 100 fall). It shall

enter the top of the chemical storage tank, and be located above the level of the overflow pipe.

- One suitably sized bottom side outlet. It shall be located 100 mm above the tank floor.
- Associated valves on the outlet pipe shall be located before the flange.
- Automatic cut out during filling when the tank reaches High Level (90%).
- Isolation (stop) valves on each of the inlet and outlet connections.
- All branches on the tank shall finish with 150 mm or more from the tank wall or roof, with a Table D or E flange of AS 2129.

### 5.9.5 Level Indicator

An Ultrasonic Level Transducer in accordance with TMS62, to show the level/quantity of the contents inside the tank, shall be provided. The transducer shall be connected to the telemetry system, to allow remote monitoring in accordance with TMS849.

In addition to the ultrasonic transducer, a hydrostatic level sensor shall also be provided for High, High-High and Low conditions.

A level indicator shall be adjacent to the tank wall, in order to indicate actual liquid level inside the tank during filling, and shall be visible from the filling/transfer point.

A weatherproof digital display shall also be installed at the filling transfer point, to indicate the actual level during filling. An alarm system, consisting of a klaxon and beacon shall also be installed at the filling transfer point, to alarm if tank has overflowed during filling.

In addition, the overflow pipe shall be piped to the sump in such a way, that the tanker driver can view the discharge point from outside of the bund, to indicate if the tank is overflowing.

### 5.9.6 Digital Display

The digital display for tank level shall be suitable for operation with 24 VDC power supply. It shall be equipped with sunlight readable LEDs, and a minimum reading range of 10 m. It shall be suitable to display percentage values.

If installed outside the CDU area, the digital display shall have a minimum rating of IP 56, and shall be installed with suitable mounting accessories.

## 5.10 Dosing System

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

### 5.10.1 Dosing Pumps and Pipework

A n+1 arrangement configuration with identical duty and standby dosing pumps (brand, type and capacity range) shall be provided for dosing. The switchover to the standby pump shall be automatic via SCADA. Automatic changeover between pump duties shall be configured on time as well as pump fault. Communication protocol with PLC shall be Profibus DP.

The dosing pumps shall be of the mechanically or hydraulically operated, piston diaphragm reciprocating-type, driven by an electric motor. Solenoid-driven pumps, double simplex capabilities via multiplexing, and ganging of gearboxes are not acceptable.

The pumps shall incorporate local indication of the set rate. Metering accuracy of the pumps shall be better than 2% of the set rate at a variable suction head.

A dose rate turndown ratio of 1:100 by means of stroke speed control through accurate speed control with position feedback shall be provided.

Each pump shall be fitted with an external pressure relief valve, vented back into the calibration vent line or tank vent.

The dosing pump must have at least 2 volt free contacts to be used for fault output to the PLC. One fault will be used to indicate that the pump has a general fault and is not able to run. The other fault is to be used to indicate that the dosing pump has abnormal flow/pressure correlation, indicating that there is a problem with the suction or discharge of the pump. All fault output relays must move to the abnormal state when the pump power supply is de-energised.

Pumps shall monitor pressure and flow, and shall incorporate features like automatic detection of overpressure, burst pipe, cavitation and air bubbles in diaphragm. Refer to TMS62 for approved equipment.

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

Duty and standby suction strainers with a maximum opening of 1 mm shall be provided. Splashguards shall be installed around the duty and standby pumps to contain chemical spray if dosing lines/pumps were to break.

### 5.10.2 Pulsation Dampeners at Pumps

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

### 5.10.3 Depressuring, Flushing, and Draining

Adequate provision shall 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 shall be piped to the sump. The valving shall be provided to allow for flushing of the chemical dosing lines without dismantling the lines.

A 50mm Male polypropylene Kamlock fitting shall be provided at the chemical filling line, and on all flushing points on the dosing line.

### 5.10.4 Pressure Indicator

A pressure indicator shall be installed on the discharge side of each pump. The hydraulic oil type shall be used for process fluids that may damage the pressure indicator. The purpose of the indicator is to enable setting of the pressure relief valve and the loading/anti-syphon valve.

### 5.10.5 Double Containment of Filling and Dosing Lines

Chemical dosing lines are typically a pipe-in-pipe arrangement. The Contractor must provide secondary containment pipework for all pipe that could potentially leak to a location outside the storage bund. Care must be taken with the design and installation of the outer pipe so that leaks from the inner pipe can be readily detected.

Concrete encasement of the lines when laid in ground is acceptable. Double containment from within the bunded area through to the dosing point shall be constructed in such a way to facilitate replacement of dosing line without excavation of that section of pipe. PE pipe shall be considered secondary containment.

### 5.10.6 Dosing Point

The dosing point shall be installed with withdrawable injection quill with internal non return valve for anti-siphon.

The use of shields to prevent splashing to nearby walls (where a corrosive chemical is used)

## 6 DOCUMENTATION

The Contractor shall be responsible for providing all documentation as specified in the Project General Specification for Supplier Documentation Requirements and the Supplier Data Requirements List (SDRL) supplied by QUU.

Fabrication of any equipment shall not commence until QUU has reviewed and approved calculations, drawings and any other design documentation.

## 6.1 Drawings

All design drawings shall be provided on QUU standard drawing template and cross referencing between documents shall use QUU assigned drawing numbers. Drawings shall be provided in native AutoCAD format as well as A3 size PDF. Refer to QUU standard specification PRO307 Drafting Guidelines – Contract Requirements.

## 7 COMMISSIONING AND STARTUP

The Contractor shall identify in their tender any special requirements or recommendations for QUU support during commissioning and start-up of the equipment supplied. The QUU final acceptance of the equipment will be subject to a performance test once the equipment has been installed and commissioned.

### 7.1 Site Support

The Contractor shall provide in their tender details of their site technical support capability. Contractors shall advise their nearest service representative and nearest service facility to the project fabrication yard and the facility location.

### 7.2 Operating and Maintenance Instructions

The contractor shall supply Operating and Maintenance instructions for the equipment supplied.

The instructions shall be fully detailed and cover all items supplied under the contract and shall be indexed and cross referenced, as applicable.

The documents shall apply specifically to the plant being supplied and shall be specially prepared where necessary. The instructions shall include comprehensive lists of all part numbers of all items supplied.

## 8 SUPPLEMENTARY INFORMATION

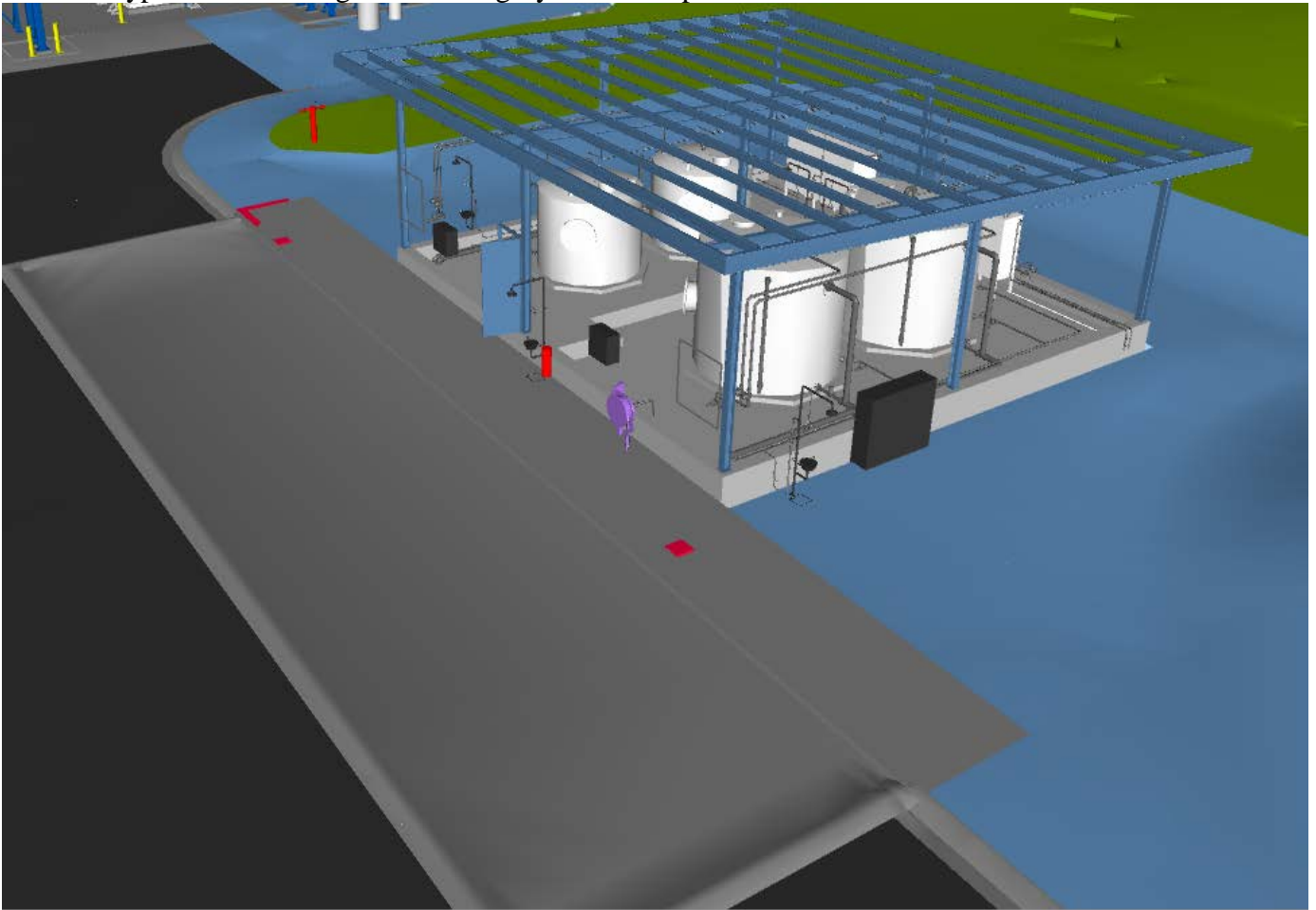
The Contractor must comply with the following attached documents:

- Appendices and Bibliography (where present).
- Equipment data sheets
- Template P&ID for Hypochlorite Storage and Dosing Facility



## APENDIX A

### Sodium Hypochlorite Storage and Dosing System example



P+ID example for Sodium Hypochlorite Storage and Dosing System

