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Pr10999 - Specification for Odour Control Unit Design and Construction (Network)



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1. Purpose

The purpose of this specification is to define Unitywater's requirements for design, supply, construction, installation, and commissioning of odour control units within the sewer reticulation network and pumping stations.

2. Scope

This specification applies to oxidant cartridge, carbon, and biofilter odour control units installed within the sewer reticulation network and pumping stations. Consideration is provided for both naturally ventilated (or passive) units and mechanically ventilated (or fan forced).

While general design aspects of this specification may apply to Treatment Plants, the scale and complexity of odour control for Treatment Plants requires further consideration. The intent of this specification is not to limit the scope of Treatment Plant control units which may employ other technologies.

3. Design

3.1. General

The need for odour control shall be confirmed utilising either site environmental measurements or through an odour study performed by external consultants. Installation of odour control shall be minimised where possible. Odour control shall be designed to, in general, achieve the requirements of the Environmental Protection (Air) Policy 2019, considering the typical sewer air pollutant Hydrogen Sulphide.

The odour control system shall be designed for a minimum of 20 years useful lifetime without significant overhaul of any major components.

Odour control unit structures shall be suitably reinforced, able to withstand wind loads, expected operating pressure range and any other typical forces associated with unit maintenance. Design loads to be per AS 1170.

3.2. Location

Odour control units shall be located to ensure sufficient accessibility to maintain the unit, including but not limited to removal of components and media removal and replacement via vacuum truck.

Location should where reasonable minimise the distance from the ventilated structure.

All odour control units shall be located such that high risk works permits are not required to access and maintain the unit. No units shall be located within confined spaces or at the top of vent poles requiring working from heights.

Units shall be located where practical above Q100 levels to reduce risk of inundation.



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3.3. Natural Ventilation (Passive Odour Control)

Natural ventilation systems shall be limited where possible due to low effective media life compared to mechanically ventilated systems. As differential pressure increases over the media, foul air emission risk from other locations increases, prior to full consumption of the media life.

Typical natural ventilation installations consist of a cartridge only type unit, and are usually installed at air valves and discharge maintenance holes where mechanically ventilated systems are not feasible or have significant construction cost.

3.4. Mechanical Ventilation (Fan Forced Odour Control)

Where an activated carbon or biofilter unit has been specified for a pumping station site, mechanical ventilation is required.

Where possible, the fan and odour control system shall be designed to minimise the pressurised foul air segment to reduce risk of fugitive emissions.

3.5. Air Flow Rate

Required air flow rate for mechanically ventilated systems shall be determined based on the asset being ventilated. Minimum air flow rate calculation methods are detailed in Table 1 below. Air flow rate shall be the greater of all calculation methods.

Table 1: Design Air Flow Rate by Ventilated Asset Type (Greatest value of all methods)

Asset Type	Method 1	Method 2	Method 3
SPS	5 x ADWF	1.2 x Maximum upstream pump flowrate	6 Air Changes Per Hour
Air Valve	0.5 x Maximum upstream pump flowrate	Maximum air release rate from manufacturer specifications	
Discharge maintenance hole	1.2 x Maximum upstream pump flowrate		
Drop Structure / Barometric Loop	10 x ADWF	2 x Maximum Upstream Pump Flowrate	
Upstream of Siphon	5 x ADWF	1.2 x Maximum upstream pump flowrate	

Air Changes per hour shall be calculated as the volume between the duty start level and roof of the pumping station wet well.



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3.6. H₂S Load and Media Lifetime

Media life shall in general be designed to achieve >18 months between media replacements. Lower media lifetimes are acceptable if it is shown to result in a lower lifetime cost for the asset.

For existing assets, H₂S data should be measured to determine H₂S load. A minimum of two (2) weeks logging with an electrochemical logging unit shall be completed.

For new assets, an odour study shall be completed by a competent person to estimate the potential gaseous H₂S load for the station. Assessment completed should be consistent with the Guideline - Odour Impact Assessment from Developments.

For determining media lifetime, the H₂S loading rate shall be calculated as follows:

$$\text{H}_2\text{S Loading Rate (g/s)} = \frac{\text{Avg. H}_2\text{S (ppm}_v\text{)}}{1 * 10^6} * \frac{34.1 \frac{\text{g}}{\text{mol}} (\text{H}_2\text{S})}{24.46 \frac{\text{L}}{\text{mol}}} * \text{Average Air Flow Rate (L/s)}$$

Molar volume assuming ideal gas at atmospheric pressure (101.3kPa) and 25°C.

For H₂S loading rates greater than 200kg/year, a comparison of biofilter and activated carbon technologies should be completed to evaluate the lowest lifetime cost solution.

Average air flow rate shall reflect the typical air conditions in the sewer. Typically, average air flow rate shall be calculated by asset type as follows:

Table 2: Average Air Flow Rate for Determining H₂S Loading Rate by Asset Type

Asset Type	Average Air Flow Rate Calculation Method
SPS	ADWF
Air Valve (Typical High Point)	2% of sewer volume from upstream to downstream low points * pump starts per day
Air Valve (Draining Rising Main)	Drained air volume * pump starts per day
Discharge Maintenance hole	Upstream Station ADWF
Drop Structure / Barometric Loop	2 x ADWF
Upstream of Siphon	ADWF
Existing mechanically ventilated assets	Existing fan flow rate



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3.7. Empty Bed Residence Time

Empty Bed Residence Time (EBRT) shall be sufficient to achieve the removal efficiency requirements outlined in Section 3.8.

The following minimum EBRT values by unit type shall be used:

Table 3: Minimum Empty Bed Residence Times by Odour Control Unit Type

Odour Control Unit Type	Minimum EBRT
Cartridge Only Units	2 seconds
Activated Carbon Units	4 seconds
Biofilter Unit (Bioremedia Bed)	45 seconds
Biofilter Unit (Carbon Polisher)	2 seconds

3.8. H₂S Removal Efficiency & Outlet Concentrations

H₂S removal efficiency shall be > 99% measured at the outlet of the odour control system.

H₂S removal efficiency shall be determined by the following formula:

$$\text{Removal Efficiency (\%)} = \frac{\text{Inlet H}_2\text{S (ppm}_v\text{)} - \text{Outlet H}_2\text{S (ppm}_v\text{)}}{\text{Inlet H}_2\text{S (ppm}_v\text{)}} * 100$$

Biofilter units shall achieve >95% removal efficiency over the bio component of the odour control system, with a total of >99% removal efficiency at the outlet of the system.

The odour control system shall be designed to ensure H₂S levels are less than 5 ppb at the nearest sensitive environment in peak H₂S conditions.

For new developments, an odour modelling study should be completed to assess the OU requirements as described in the Guideline - Odour Impact Assessment from Developments, Section 5 (Odour impact assessment criteria).

3.9. Cartridge Only Units

Cartridge only units shall not be used for mechanically ventilated systems due to their lower adsorption capacity.

Cartridge only units shall not be H₂S monitored due to their low capital cost with respect to monitoring and replacement.



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3.10. Activated Carbon Units

Activated carbon systems shall typically consist of the following equipment:

- Inlet Isolation Valve
- Pre-Filter Unit (Mechanically Ventilated Systems Only)
- Adsorption Unit
- Fan
- Control Panel
- Monitoring equipment where specified.

H₂S monitoring is required on all activated carbon units located within pumping station boundaries with a carbon bed greater than or equal to 1m³ volume (i.e. McBerns ZC1500, Aarcon SC1200 etc). Monitoring shall meet the requirements of Section 4.12 of this specification and shall consist of:

- Inlet H₂S (ppm).
- Outlet H₂S (ppb).

Monitoring may be specified on locations other than pumping stations and units smaller than nominated in above at the discretion of the Superintendent.

The carbon media bed shall consist of:

- Extruded steam activated carbon made from peat coconut shell or high grade coal.
- Potassium Hydroxide (KOH) impregnated carbon, minimum specifications per Table 4.
- For systems where other odorous compounds are potentially an issue (volatile sulphur compounds like methyl mercaptan, aldehydes etc.) virgin carbon may be used as a component of the media, minimum specifications per Table 5.
- Other proprietary media that predominantly consists of activated carbon and has been demonstrated to provide similar odour removal efficiencies to virgin or KOH impregnated carbon.

Table 4: Minimum Requirements – Potassium Hydroxide Impregnated Activated Carbon

Parameter	Requirement	Test Method
Potassium Hydroxide Content	< 10%	
Apparent Density	0.50-0.65 g/mL	ASTM D2854
Hardness	> 95%	ASTM D3802
Particle Diameter	4mm	ASTM D2862
Particle Length	6mm	ASTM D2862
H ₂ S Adsorption Capacity	> 0.14g(H ₂ S)/cm ³ (Carbon)	ASTM D6646



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Table 5: Minimum Requirements – Virgin Activated Carbon

Parameter	Requirement	Test Method
Apparent Density	0.50-0.65 g/mL	ASTM D2854
Hardness	> 95%	ASTM D3802
Particle Diameter	4mm	ASTM D2862
Particle Length	6mm	ASTM D2862
H ₂ S Adsorption Capacity	> 0.04g(H ₂ S)/cm ³ (Carbon)	ASTM D6646

3.11. Biofilter Units

Biofilter systems shall typically consist of the following equipment:

- Inlet Isolation Valve
- Biofilter Unit with Irrigation System
- Fan
- Carbon polishing unit
- Control Panel
- Monitoring equipment.

Biofilter media design lifetime shall be >3 years.

The biofilter bed shall consist of a rice husk/perlite blend, or other proprietary media blend which has demonstrated ability to achieve >95% removal efficiency per Section 3.8.

The carbon polishing unit shall be filled with carbon consistent with Section 3.10 above

The carbon polishing unit shall be sized to have an equivalent lifetime to the biofilter bed, assuming the H₂S loading rate calculated in Section 3.6 above has been treated to 95% removal efficiency.

Irrigation systems are to be electrical solenoid controlled, with control setpoints available to be adjusted by SCADA.

All biofilter units are to be H₂S monitored by units consistent with Section 4.12 of this document. The following H₂S monitoring is required:

- Inlet H₂S (ppm)
- Biofilter Outlet H₂S (ppm)
- Polisher Outlet H₂S (ppb).



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3.12. Condensate Drainage

All low points within the odour control system that are susceptible to water accumulation shall be connected to a condensate drainage system.

The condensate drainage system shall return condensate to the nearest suitable asset.

Condensate drains shall be water trapped, with sufficient height to avoid blow out of the trap due to fan pressure. For example, an odour control unit with a design maximum pressure drop of 2kPa should have a minimum water trap height of 200mm.

Requirements for condensate drainage on the treated air segment of the odour control system should be minimised or eliminated to reduce risk of foul air breaking through to the treated air system.

The water trap shall have a gas tight inspection port to check trap height and refill if required.

3.13. Noise

Noise levels shall not exceed 35dBA measured 1m away from the odour control unit, or 5dBA above the surrounding environment noise level measured at the boundary, whichever is lower.

When installed near sensitive environments, such as residential properties, noise shall not exceed 30dBA at the property boundary consistent with the Acoustic Quality Objectives in the Environmental Protection (Noise) Policy 2019.

Ductwork velocities shall, where possible, be less than 10m/s to minimise noise.

4. Construction and Materials

4.1. General

Materials used for construction shall in general be resistant to sulphuric acid or coated to minimise impact from sulphuric acid exposure.

All bolts, nuts and washers shall be constructed from 316 Stainless Steel unless otherwise indicated.

4.2. Foundation

The odour control unit shall in general be located on a concrete slab, suitably designed to carry the full load of the odour control unit and any potential vehicle loads pending slab location and size.

Where odour control units require elevation to meet Q100 requirements, the unit shall be located on an elevated aluminium platform designed to AS 1657.

Foundation civil works shall comply with the requirements of Unitywater's [Pr9902](#) - Specification for Civil and Earthworks.

Structural components such as elevated platforms shall comply with the requirements of [Pr9903](#) - Specification for Building and Structural Works.



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4.3. Ductwork

Ductwork shall be constructed of corrosion resistant materials, typically PVC-U SWJ (SN6 or SN8). Refer to the Civil IPAM for approved material and manufacturers.

Ductwork shall where practical grade down towards the sewer or asset being ventilated to reduce condensate draining requirements.

Ductwork shall be sized to minimise pressure drop, and should be no smaller than the inlet to the adsorption or biofilter unit. Ductwork shall have sufficient dismantling capability to replace major odour control components or damaged ductwork.

Above ground ductwork shall be supported at regular intervals per the maximum spacing requirements of AS 2032 (PVC) or other relevant AS. Supports where not specifically designed shall be standard purpose "Unistrut" components or equivalent.

Flanged connections shall utilise a full faced flange, stub flanges are not accepted.

Ductwork shall incorporate flexible connections where vibration and thermal expansion cycles are expected. Expansion joints shall be consistent with Section 5.9.5 of [Pr9693](#) - Specification for Mechanical Installations.

Ductwork shall be painted Mist Green, Code G54 to AS 2700, process per System 19 of [Pr9693](#) - Specification for Mechanical Installations (PVC).

4.4. Fans

For mechanically ventilated systems, a single fan with control panel and upstream isolation valve will be supplied.

Where fan flowrates require limiting to achieve empty bed residence times, either a smaller fan should be utilised (preferred), or a VSD should be installed to control fan speed.

Fan shall be of the centrifugal type with single inlet and outlet.

Fan impeller and volute shall be constructed of materials to withstand sulphuric acid exposure. Plastics (such as Polypropylene) or 316 Stainless Steel are common materials utilised to achieve this.

Fans are to be fitted with a weatherproof shroud, constructed from 3mm marine grade aluminium, powder coated Mist Green (AS 2700 G54) per System 18 of [Pr9693](#) - Specification for Mechanical Installations.

Where required, fans shall be fitted with inlet, discharge silencers and/or an acoustic enclosure to achieve the noise requirements in Section 3.13 of this document.



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4.5. Valves (Ductwork)

An odour control system shall incorporate at least one isolation valve, installed upstream of the prefilter, fan (for mechanically ventilated systems) or odour control unit, in order of preference.

Valves should be a dual flange butterfly valve, or lugged butterfly valve with sufficient downstream dismantling ability to remove components while the valve is closed.

Butterfly valves should be quarter turn to close (hand lever), with position indicator and lockable handle to reduce risk of inadvertent valve closure/opening.

Valves shall utilise an EPDM, NBR or SBR sealing surface, and should provide a gas tight seal in the closed position.

Due to the low-pressure and corrosive nature of odour control systems, PVC-U butterfly valves are acceptable (e.g. PAAS Lugged Butterfly Valve Type 578 or equivalent).

4.6. Pre-Filter

Pre-filters shall be installed upstream of fans and activated carbon/biomeia odour units to ensure the risk of foul air emissions from the maintenance/inspection area are minimised.

Pre-filters shall be of sufficient size to ensure cleaning events are in line with the civil maintenance program for the pumping station (typically 1-3 months)

Spares for filters shall be available as an off-the-shelf item, or available within the Unitywater Stores.

The pre-filter shall be designed to flow condensate back towards the sewer asset, or connect to the condensate drainage system for the odour control unit.

Pre-filter shall be painted Mist Green, Code G54 to AS 2700. Utilise relevant coating system per [Pr9693](#) - Specification for Mechanical Installations pending construction material.

4.7. Carbon Adsorption Units (Including Polishers)

Adsorption units shall be constructed from the following materials (in order of preference) to minimise the risk of corrosion:

- a) 316 Stainless Steel. Internal surfaces exposed to H₂S shall be electropolished per System 22 of [Pr9693](#) - Specification for Mechanical Installations. Alternatively, internal surfaces shall be epoxy coated per either System 10, 13 or 14 of [Pr9693](#) - Specification for Mechanical Installations.
- b) Polyethylene.
- c) Glass Reinforced Plastic (Fibreglass), Consisting of an internal corrosion barrier, structural lay and outer surface layer consistent with BS EN13121.
- d) Other material as approved by the Superintendent that is of equivalent strength and durability.

Removable components of the adsorption unit to replace the carbon bed shall be located on the treated air side of the carbon bed to reduce the risk of foul air emissions.

The external surfaces of the adsorption unit shall be painted Mist Green, Code G54 to AS 2700. Utilise relevant coating system per [Pr9693](#) - Specification for Mechanical Installations pending construction material.



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For high exposure locations, such as parks, an external vinyl wrap or similar is approved for use to improve aesthetic amenity and reduce risk of vandalism. Wrap should be suitable for exposure to direct sunlight.

For monitored sites, the adsorber unit shall have sample ports installed on the inlet and outlet side of the filter. Sample ports shall be installed prior to any coating systems to avoid damage of the corrosion protection.

4.8. Biofilter Units

Biofilter units shall be constructed from the following materials (in order of preference) to minimise the risk of corrosion:

- a) 316 Stainless Steel. Internal surfaces exposed to H₂S shall be electropolished per System 22 of [Pr9693](#) - Specification for Mechanical Installations. Alternatively, internal surfaces shall be epoxy coated per either System 10, 13 or 14 of [Pr9693](#) - Specification for Mechanical Installations.
- b) Polyethylene.
- c) Glass Reinforced Plastic (Fibreglass), Consisting of an internal corrosion barrier, structural lay and outer surface layer consistent with BS EN13121.
- d) Other material as approved by the Superintendent that is of equivalent strength and durability.

Removable components of the biofilter unit to replace the media bed shall be located on the treated air side of the bed to reduce the risk of foul air emissions.

The external surfaces of the biofilter unit shall be painted Mist Green, Code G54 to AS 2700. Utilise relevant coating system per [Pr9693](#) - Specification for Mechanical Installations pending construction material.

For high exposure locations, such as parks, an external vinyl wrap or similar is approved for use to improve aesthetic amenity and reduce risk of vandalism. Wrap should be suitable for exposure to direct sunlight.

For monitored sites, the biofilter unit shall have sample ports installed on the inlet and outlet side of the biofilter, as well as the outlet of the carbon polisher. Sample ports shall be installed prior to any coating systems to avoid damage of the corrosion protection.

Biofilter units shall incorporate an ability to bypass the biofilter bed and direct flows to the carbon polisher to allow continued operation of the odour control unit while servicing the biofilter bed.

Irrigation sprays and pipework shall be constructed from 316 Stainless Steel, or PE-100 nominal bore sized to suit the flow required to the bed.

Irrigation systems shall be connected downstream of the pumping station RPZ. If no RPZ is installed at the station, a new assembly per SEQ-SPS-1308-1 shall be provided.

Irrigation systems shall be controlled by an electrical solenoid, energise to open. See Unitywater F10678 - Accepted Electrical Equipment List for approved solenoids.



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4.9. Condensate Drainage

Condensate drains shall be constructed of minimum size DN25 and out of Sch80 PVC-U or PE-100 SDR17.

Above ground drainage shall be supported at regular intervals per the maximum spacing requirements of AS 2032 (PVC) or AS 2033 (PE). Supports where not specifically designed shall be standard purpose "Unistrut" components or equivalent.

Above ground PVC condensate drains exposed to significant sunlight shall be painted Mist Green, Code G54 to AS 2700, process per System 19 of [Pr9693](#) - Specification for Mechanical Installations (PVC).

Above ground PE condensate drains shall be carbon black or white to prolong lifetime when exposed to solar radiation.

As per Section 3.12 above, condensate drains shall incorporate a water trap of minimum height by maximum design pressure before discharging back to sewer.

4.10. Outlets and Vent Stacks

Outlets where possible shall be directed either vertically or horizontally such that the outlet is directed away from the nearest sensitive customer.

Structural vent poles should not be utilised unless indicated it is required by an odour control study to achieve odour levels at the nearest sensitive environment.

4.11. Control Panel and Wiring

Where possible, controls shall be incorporated to the main switchboard of the pumping station. Control panels and wiring for odour control units shall comply with [Pr9380](#) - Electrical Installations at Network Sites, and components shall be per the Unitywater F10678 - Accepted Electrical Equipment List.

4.12. H₂S Monitoring System

H₂S analysers shall be of the pumped electrochemical cell type. Current approved analysers are the Acrulog IPX PPM and PPB analysers.

Analysers shall be installed in a switchboard panel, complying with [Pr9380](#) - Electrical Installations at Network Sites.

Analysers at pumping stations shall have a 24VDC input and 4-20mA output signal, and outputs shall be connected to the pumping station SCADAPack I/O panel.

Analysers installed remotely shall include a 4G LTE or NB-IoT modem and lithium batteries.

Sample lines shall be constructed from PTFE or other low gas permeability tubing that is resistant to sulphuric acid.

Sample lines shall not exceed the maximum length as nominated by the manufacturer of the H₂S analyser.

Sample lines shall continuously rise to the analyser to avoid condensate build up in the line. If this is not achievable, the sample line shall have a water trap or drain point installed to avoid blockage of the sample line due to condensate. Alternatively, a sample dryer head may be installed upstream of the low point to reduce the sample air humidity and risk of condensate build up.

Sampling lines shall include return lines from the analyser to return the foul air sample back to the odour control system, or alternatively discharge to a small external filter where required.



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5. Telemetry

5.1. General

Where located within a sewer pumping station, odour control units shall be connected to the site SCADAPack to provide basic monitoring and control where applicable.

Connections to the SCADAPack shall comply with [Pr9380](#) - Electrical Installations at Network Sites.

All inputs and outputs to the odour control system shall be able to be trended within SCADA.

5.2. Fan

Where a mechanically ventilated system is installed, fan running state and a fan fault relay shall be provided as digital inputs to the SCADAPack.

Running state shall be alarmed to provide indication when the fan has stopped running.

5.3. Irrigation Systems (Biofilter)

Where a biofilter is installed, the irrigation solenoid shall be connected to a digital output of the SCADAPack.

The SCADA mimic shall provide a "Irrigation Spray Duty Cycle" that provides a specific period of on-time in % for the irrigation solenoid that is adjustable to suit site specific requirements.

"Irrigation Spray Duty Cycle" shall be specified by the Biofilter manufacturer. In lieu of this information, the setpoint shall be set at 1% (Approx. 36 seconds / hour).

5.4. H₂S Monitors

H₂S monitored systems shall have provision to connect each analysers 4-20mA output to an analog input on the site SCADAPack.

The pumping station mimic shall be configured to calculate odour unit removal efficiency as outlined in Section 3.8.

For biofilter units, there shall be two removal efficiencies calculated, "Biofilter Removal Efficiency" using inlet H₂S and biofilter outlet H₂S, and "Carbon Polisher Removal Efficiency" using biofilter outlet H₂S and polisher outlet H₂S.

Low alarms shall be provided for removal efficiency with preliminary setpoints of 99% for activated carbon units and 95% for biofilter units.



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6. Commissioning

6.1. General

The Contractor shall prepare a Commissioning Plan in accordance with [Pr11211](#)- Specification for Commissioning and Handover of Active and Passive Assets and must be submitted to the Superintendent for acceptance a minimum of 6 weeks prior to commencing any commissioning activities and no commissioning activities may commence until the Plan has been accepted.

Any works on or in proximity of existing assets will require operational notification with a minimum of 21 days notice. Notification to be provided to the Superintendent, or the contractor may directly submit a request for a permit to work as advised through Pr8996 - Network Permit to Work Procedure.

6.2. Factory Acceptance Tests

Factory acceptance testing for mechanical assets (i.e. units, fans, valves) shall be per the requirements of [Pr9693](#) - Specification for Mechanical Installations.

Factory acceptance testing for electrical assets (i.e. local control panels, monitoring panels) shall be per the requirements of [Pr9380](#) - Electrical Installations at Network Sites.

Calibration of all H₂S analysers shall be completed by the manufacturer with calibration certificates provided.

6.3. Site Commissioning and Site Acceptance Tests

Site acceptance testing for electrical assets shall be per the requirements of [Pr9380](#) - Electrical Installations at Network Sites.

In addition to electrical asset SATs, the following minimum tests are to be completed:

- Confirm operation of all isolation valves and ensure valves are in their normal positions.
- Soap test / smoke test all solvent welded and electrofusion joints at design flow to ensure joints are gas tight.
- Confirm fan flow rate is as per design using a hot wire anemometer, adjust fan speed or valving to achieve design fan flow rate.
- Confirm empty bed residence time is as per design using fan flow rate measurements.
- Confirm noise at design fan flow rate does not exceed requirements of Section 3.13 of this document.
- Confirm all condensate water traps are full.

The contractor shall submit their ITPs with 28 days' notice on intention of site commissioning.



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6.4. Proof of Performance and Reliability Testing

Following site commissioning, at the approval of the Superintendent, a 14 day performance and reliability period shall apply.

The intention of this period is to confirm odour unit performance with respect to design requirements and ensure there are no major faults that occur.

As part of the performance and reliability period, the following equipment shall be installed:

- An electrochemical cell PPB logger consistent with Section 4.12 above shall be installed at the nearest sensitive environment (for pumping stations, typically the fenceline of the nearest property adjacent to the pumping station).
- For sites that are not permanently monitored, 1 x ppm logger shall be installed at the inlet location and 1 x ppb logger shall be installed in the outlet location of the odour unit. Loggers to be per Section 4.12 above.
- Installed loggers for the performance and reliability period shall have been calibrated within the last 6 months, with calibration certificates to be provided.
- The contractor shall provide the logging equipment.

At the end of the performance and reliability period, the logging data from Section 6.4 of this document shall be assessed to confirm:

- Average removal efficiency does not fall below the design requirements per Section 3.8 of this document.
- Minimum removal efficiency does not fall below the design requirements per Section 3.8 above for greater than 2% of the performance and reliability period.
- Maximum H₂S measured at the nearest sensitive environment does not exceed 5ppb for a period of 30 minutes, and not greater than 2% of the performance and reliability period.

The contractor shall provide evidence that the above requirements are met.

In the event that the requirements of Section 6.4 of this document are not achieved, the Contractor shall perform adjustment of the odour control system in an attempt to achieve these requirements. Typical adjustments may include increasing empty bed residence time by reducing fan speed or replacing the media bed with a KOH impregnated carbon and virgin carbon media blend.

After adjustment of the odour control system, another 14 day performance and reliability period shall apply.

After the second performance and reliability period, the removal efficiency requirements of Section 6.4 may be removed at the discretion of the Superintendent, provided it will not impact employee or community health and safety, and that the environmental H₂S requirement of < 5ppb is still met.



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7. Handover Documents

The Contractor shall provide commissioning documentation and information in accordance with:

- [Pr11211](#) - Specification for Commissioning and Handover of Active and Passive Assets
- Electrical test certificate.

7.1. Project Closure

Provide final project cost and confirmation that all identified works have been completed.

A completed Unitywater Asset Template of all active and decommissioned assets on site shall be returned to Unitywater.

All relevant QA documentation to be provided through Objective Connect.

7.2. As Constructed Information

The As Constructed drawings shall be prepared and supplied in accordance with the Asset information data shall be recorded on the 'As-Constructed Asset Record for Water Supply Assets' spreadsheet will be provided by Unitywater. This asset data shall include full asset details including installed value of all items.

7.3. Asset Manuals

Asset manuals shall be prepared and provided in accordance with the SEQ WS & SD & C Code Asset Information Specification.

Table 6 describes the required documentation on handover to Unitywater based on odour control unit type.

Table 6: Documentation Requirements by Odour Control Unit Type

Document	Odour Control Unit Type		
	Cartridge Only Unit	Activated Carbon Unit	Biofilter System
O & M Manual	Yes	Yes	Yes
Civil As Constructed Drawings	No	Yes	Yes
Electrical As Constructed Drawings	No	Yes (Mechanically Ventilated Only)	Yes
P & ID Diagram	No	No	Yes
Asset Data Template	Yes	Yes	Yes
Performance and Reliability Period H ₂ S Data	Yes	Yes	Yes
H ₂ S Analyser Calibration Certificates	No	Yes (H ₂ S monitored sites only)	Yes



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7.4. Operating and maintenance manual

A draft Operating and Maintenance (O&M) Manual for the OCU must be prepared and submitted prior to process commissioning. It must be finalised and re-submitted after successful commissioning of the unit and incorporate any learnings or changes required during commissioning and proof of performance.

The Operations and Maintenance (O&M) Manual shall be provided in PDF format and include the minimum following information:

- Unitywater site at which odour control unit has been installed and the date of installation.
- General description of odour control unit provided with photographs.
- Design assumptions and requirements for the odour control unit as detailed in Section 3 above.
- Instructions for operation of the odour control unit, such as normal valve positions, any valves that are to be partially closed for EBRT requirements, detail of control setpoints, instructions for any alternate arrangements (e.g. biofilter bypass).
- Maintenance schedule, including recommended maintenance events and intervals.
- Maintenance instruction, including type and weight / volume of media required, process for media replacement, and any specialist tools required.
- Troubleshooting guidelines for when unit is operating outside of design parameters.

The electrical as constructed drawings shall comply with the requirements of [Pr9380](#) - Specification for Electrical Installations at Network sites.

The asset data template shall be provided to the contractor by Unitywater, with the contractor to complete and return to the Superintendent.

8. Appendices

Refer to following pages.

Appendix A – Definitions/Acronyms

The following definitions, abbreviations and acronyms are used throughout this specification.

Term	Meaning
ADWF	Average Dry Weather Flow. Typically determined by reviewing pumping station trends, or through population estimates
AS	Australian Standard
Biofilter	Odour control units which utilise a media suitable for biological growth to consume hydrogen sulphide, typically supplemented by a water irrigation system. Not to be confused with Biotrickling Filters, which utilise a nutrient irrigation system, and are typically employed at waste water treatment plants
BS	British Standard
Cartridge Unit	Any odour control unit employing a cartridge only system, rather than raw media. An example is the McBerns GM series of odour control units.
DN	Nominal Diameter
EBRT	Empty Bed Residence Time. The contact time of air travelling over the media bed, assuming there was no media in place.
EF	Electrofusion
EPDM	Ethylene Propylene Diene Monomer
H ₂ S	Hydrogen Sulphide
ITP	Inspection and Test Plan
KOH	Potassium Hydroxide. An alkali typically impregnated in carbon to improve its H ₂ S adsorption capacity.
NBR	Nitrile Butadiene Rubber
O&M	Operations and Maintenance
OCU	Odour Control Unit
Perlite	A volcanic glass, typically expanded by heat to increase its surface area allowing a large bacterial biome to form
PE	Polyethylene
ppm	Parts per million (by volume unless otherwise stated)
ppb	Parts per billion (by volume unless otherwise stated)
PTFE	Poly Tetra Fluro Ethylene (Teflon-DuPont)
PVC-U	Un-plasticised Poly Vinyl Chloride
RPZ	Reduced Pressure Zone device
SBR	Styrene Butadiene Rubber
SCADA	Supervisory Control and Data Acquisition
SS	Stainless Steel
SWJ	Solvent Welded Joint
Q100	Flood level at which there is 1% annual exceedance probability, or a 100-year average recurrence interval
Virgin Carbon	Carbon that has not been impregnated with any additives
VSD	Variable Speed / Frequency Drive



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Appendix B – References

General

All design, equipment and workmanship shall conform to the most recent requirements of relevant local, State and Commonwealth statutory requirements and applicable, current Australian Standards.

Where no Australian Standard exists, work shall conform to the most applicable, current IEC Standard.

The following legislation, related Regulation and Codes apply to this specification:

- [Workplace Health and Safety Act 2011 \(QLD\)](#)
- [Workplace Health and Safety Regulation 2011 \(QLD\)](#)
- [Water Supply \(Safety and Reliability\) Act 2008 \(QLD\)](#)
- [Environmental Protection Act 1994 \(QLD\)](#):
 - [Environmental Protection \(Air\) Policy 2019 \(Subordinate Legislation No.153\)](#)
 - [Environmental Protection \(Noise\) Policy 2019 \(Subordinate Legislation No.154\)](#)
- [Managing Noise and Preventing Hearing Loss at Work 2021](#), WorkSafe QLD
- [SEQ Water Supply and Sewerage Design and Construction Code](#) (SEQ WS & S D & C Code)
- [Guideline - Odour Impact Assessment from Developments](#), Department of Environment, Science and Innovation Qld.

Relevant Unitywater documents that relate to this specification

Document No	Title
Pr8843	Specification for Drawing, Document and Equipment Tag Numbering
Pr8996	Network Permit to Work Procedure
Pr9380	Specification for Electrical Installations at Network Sites
Pr9693	Specification for Mechanical Installations
Pr9875	Specification for Non-Pressure Pipe Construction
Pr9902	Specification for Civil and Earth Works
Pr9903	Specification for Building and Structural Works
Pr10618	Specification for Power System Analysis and Arc Flash Studies
Pr11211	Specification for Commissioning and Handover of Active and Passive Assets

International and Australian Standards referenced within this specification

Standard	Title
Quality Systems	
AS 2990	Quality Systems for Engineering and Construction Projects
AS 3901	Quality Systems for Design/Development, Production, Installation and Servicing
AS 3902	Quality Systems for Production and Installation
AS 3903	Quality Systems for Final Inspection and Test



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Standard	Title
Drawings	
AS 1100	Technical Drawings
AS 1101	Graphical Symbols for General Engineering
AS 1102	Graphical Symbols for Electrotechnology
Materials and Workmanship	
AS 1055	Acoustics – Description and Measurement of Environmental Noise
AS 1111	ISO metric hexagon commercial bolts and screws
AS 1112	ISO metric hexagon nuts, including thin nuts, slotted nuts and castle nuts
AS 1260	PVC Pipes and Fittings for Drain Waste and Vent Applications
AS 1319	Safety signs for the occupational environment
AS 1345	Identification of the contents of pipes, conduits and ducts
AS 1359	Rotating electrical machines – General requirements
AS 1554	Structural steel welding
AS 1627	Metal finishing – Preparation and pre-treatment of surfaces – Method selection guide
AS 1654	ISO system of limits and fits
AS 1657	Fixed platforms, walkways, stairways and ladders – Design, construction and installation
AS 2032	Installation of PVC pipe systems
AS 2033	Installation of Polyethylene Pipe Systems
AS 2312	Guide to the protection of iron and steel against exterior atmospheric corrosion
AS 2528	Bolts, studbolts and nuts for flanges and other high and low temperature applications
AS 2566	Buried flexible pipelines
AS 2700	Colour standards for general purposes
AS 2887	Plastics Waste Fittings
AS/NZS 3000	Electrical Installations
AS 3500	Plumbing Code of Australia
AS 4024	Safeguarding of Machinery
Media Testing	
ASTM D2854	Standard Test Method for Apparent Density of Activated Carbon
ASTM D2862	Standard Test Method for Particle Size Distribution of Granular Activated Carbon
ASTM D3802	Standard Test Method for Ball-Pan Hardness of Activated Carbon
ASTM D6646	Standard Test Method for Determination of Accelerated Hydrogen Sulfide Breakthrough Capacity of Granular and Pelletized Activated Carbon