

Network Standard

NETWORK	Document No	: NW000-S0055
	Amendment No	: 1
	Approved By	: Head of AEP&S
	Approval Date	: 25/10/2017

NW000-S0055

NS190 OIL CONTAINMENT OPERATIONAL REQUIREMENTS FOR MAJOR SUBSTATIONS



ISSUE

For issue to all Ausgrid and Accredited Service Providers' staff involved with the operation of oil containment systems at major substations, and is for reference by field, technical and engineering staff.

Ausgrid maintains a copy of this and other Network Standards together with updates and amendments on www.ausgrid.com.au.

Where this standard is issued as a controlled document replacing an earlier edition, remove and destroy the superseded document

DISCLAIMER

As Ausgrid's standards are subject to ongoing review, the information contained in this document may be amended by Ausgrid at any time. It is possible that conflict may exist between standard documents. In this event, the most recent standard shall prevail.

This document has been developed using information available from field and other sources and is suitable for most situations encountered in Ausgrid. Particular conditions, projects or localities may require special or different practices. It is the responsibility of the local manager, supervisor, assured quality contractor and the individuals involved to make sure that a safe system of work is employed and that statutory requirements are met.

Ausgrid disclaims any and all liability to any person or persons for any procedure, process or any other thing done or not done, as a result of this Standard.

All design work, and the associated supply of materials and equipment, must be undertaken in accordance with and consideration of relevant legislative and regulatory requirements, latest revision of Ausgrid's Network Standards and specifications and Australian Standards. Designs submitted shall be declared as fit for purpose. Where the designer wishes to include a variation to a network standard or an alternative material or equipment to that currently approved the designer must obtain authorisation from the Network Standard owner before incorporating a variation to a Network Standard in a design.

External designers including those authorised as Accredited Service Providers will seek approval through the approved process as outlined in NS181 Approval of Materials and Equipment and Network Standard Variations. Seeking approval will ensure Network Standards are appropriately updated and that a consistent interpretation of the legislative framework is employed.

Notes: 1. Compliance with this Network Standard does not automatically satisfy the requirements of a Designer Safety Report. The designer must comply with the provisions of the Workplace Health and Safety Regulation 2011 (NSW - Part 6.2 Duties of designer of structure and person who commissions construction work) which requires the designer to provide a written safety report to the person who commissioned the design. This report must be provided to Ausgrid in all instances, including where the design was commissioned by or on behalf of a person who proposes to connect premises to Ausgrid's network, and will form part of the Designer Safety Report which must also be presented to Ausgrid. Further information is provided in Network Standard (NS) 212 Integrated Support Requirements for Ausgrid Network Assets.

2. Where the procedural requirements of this document conflict with contestable project procedures, the contestable project procedures shall take precedent for the whole project or part thereof which is classified as contestable. Any external contact with Ausgrid for contestable works projects is to be made via the Ausgrid officer responsible for facilitating the contestable project. The Contestable Ausgrid officer will liaise with Ausgrid internal departments and specialists as necessary to fulfil the requirements of this standard. All other technical aspects of this document which are not procedural in nature shall apply to contestable works projects.

INTERPRETATION

In the event that any user of this Standard considers that any of its provisions is uncertain, ambiguous or otherwise in need of interpretation, the user should request Ausgrid to clarify the provision. Ausgrid's interpretation shall then apply as though it was included in the Standard, and is final and binding. No correspondence will be entered into with any person disputing the meaning of the provision published in the Standard or the accuracy of Ausgrid's interpretation.

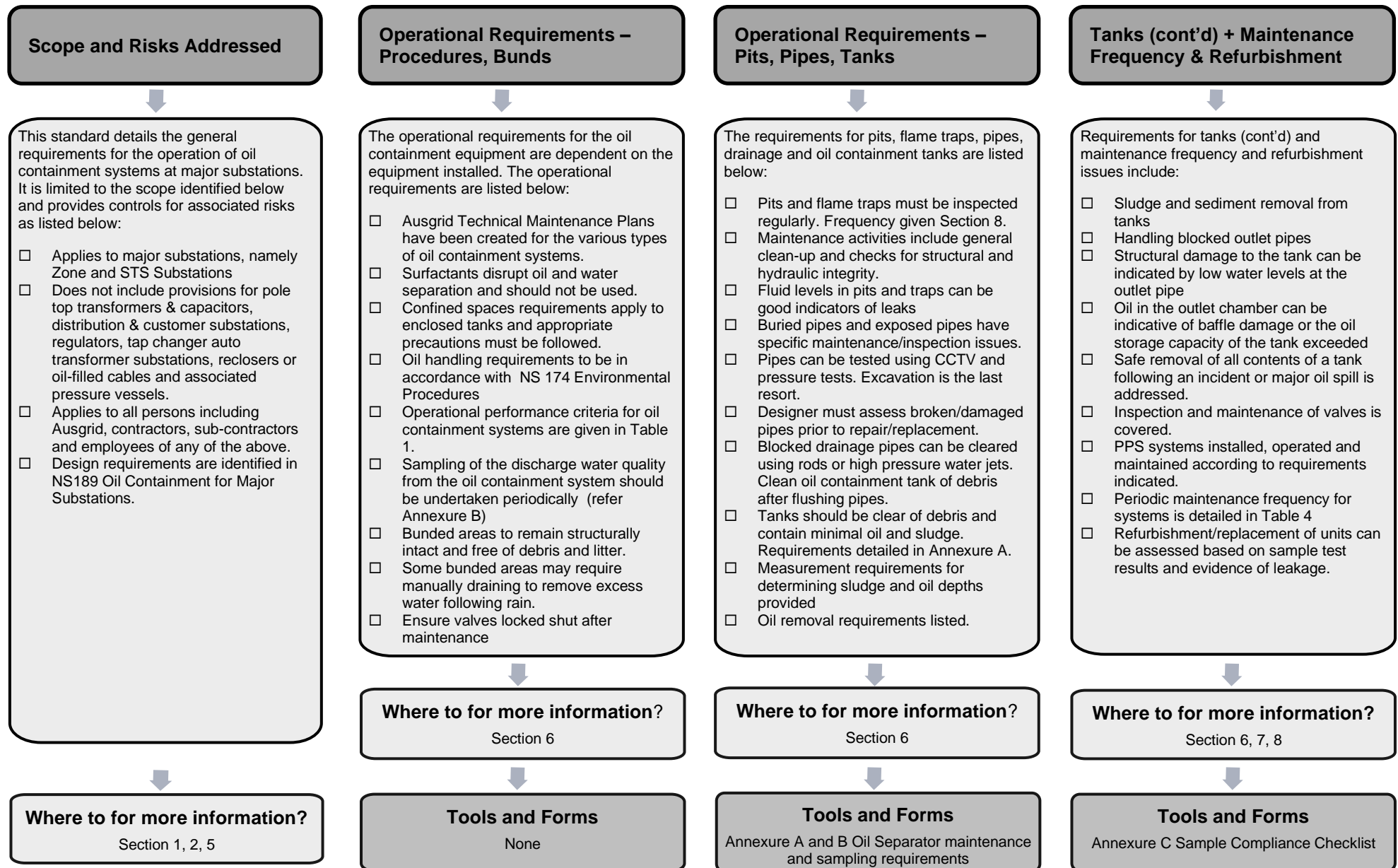
KEYPOINTS

This standard has a summary of content labelled "KEYPOINTS FOR THIS STANDARD". The inclusion or omission of items in this summary does not signify any specific importance or criticality to the items described. It is meant to simply provide the reader with a quick assessment of some of the major issues addressed by the standard. To fully appreciate the content and the requirements of the standard it must be read in its entirety.

AMENDMENTS TO THIS STANDARD

Where there are changes to this standard from the previously approved version, any previous shading is removed and the newly affected paragraphs are shaded with a grey background. Where the document changes exceed 25% of the document content, any grey background in the document is to be removed and the following words should be shown below the title block on the right hand side of the page in bold and italic, for example, Supersedes – document details (for example, "Supersedes Document Type (Category) Document No. Amendment No.").

KEY POINTS OF THIS STANDARD



Network Standard NS190 Oil Containment Operational Requirements for Major Substations

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1.0 PURPOSE

This Network Standard details the general requirements for the operation of oil containment systems at major substations.

The primary objectives of this document are to:

- ensure a consistent approach is undertaken for the management of oil containment systems, and
- provide clear instructions on the general operational requirements for oil containment systems.

2.0 SCOPE

The scope of this document is to provide guidelines for the operation of oil containment systems at major substations, namely Zone and Sub-transmission Substations.

This document does not include provisions for pole top transformers & capacitors, distribution & customer substations, regulators, tap changer auto transformer substations, reclosers or oil filled cables and its associated pressure vessels.

Ausgrid has a number of different oil containment systems that have different and specific operating requirements. The as-built oil containment drawings will document the oil containment installed at each substation.

Oil containment operational activities may include inspection of oil depths, sludge depth and stormwater discharge concentrations, cleaning and waste removal.

This document applies to all persons including Ausgrid, Contractors, Sub-Contractors and associates, and employees of any of the above.

3.0 REFERENCES

3.1 General

All work covered in this document shall conform to all relevant Legislation, Standards, Codes of Practice and Network Standards. Current Network Standards are available on Ausgrid's Internet site at www.ausgrid.com.au.

3.2 Ausgrid documents

- Company Form (Governance) - Network Document Endorsement and Approval
- Company Procedure (Governance) - Network Document Endorsement and Approval
- Company Procedure (Network) - Production / Review of Network Standards
- Electrical Safety Rules
- Electricity Network Safety Management System Manual
- NS174 Environmental Procedures
- NS181 Approval of Materials and Equipment and Network Standard Variations
- NS189 Oil Containment for Major Substations
- NS212 Integrated Support Requirements for Ausgrid Network Assets
- Public Electrical Safety Awareness Plan

3.3 Other standards and documents

- AS 2865 Confined Spaces
- AS/NZS 3500 Plumbing and Drainage (Series)
- ENA Doc 001-2008 National Electricity Network Safety Code

3.4 Acts and regulations

- Electricity Supply (General) Regulation 2014 (NSW)
- Electricity Supply (Safety and Network Management) Regulation 2014
- Environmentally Hazardous Chemicals Act 1985
- Protection of the Environment Operations Act 1997
- Protection of the Environment Operations (General) Regulation 1998
- Protection of the Environment Operations (Waste) Regulation 1996
- Work Health and Safety Act 2011 and Regulation 2011
- All relevant WorkCover documentation.

4.0 DEFINITIONS

Accredited Service Provider (ASP)	An individual or entity accredited by the NSW Government Trade & Investment in accordance with the Electricity Supply (Safety and Network Management) Regulation 2014 (NSW).
Approved Equivalent	Equipment or materials approved in writing by Ausgrid.
Bund	A wall/barrier of sufficient height constructed around fluid filled equipment to contain spillage of liquids.
Butterfly valve	A valve used to close the outlet of the oil containment tank.
Business Management System (BMS)	An Ausgrid internal integrated policy and procedure framework that contains the approved version of documents.
Chain of Custody Form	Chronological documentation detailing the collection, custody, control, transfer and analysis of samples.
Designer	The designer is the nominated party responsible for the layout and design of the oil containment system under the overall direction of Ausgrid. The designer may be an internal group within Ausgrid, or an external party appointed for the project.
Document control	Ausgrid employees who work with printed copies of document must check the BMS regularly to monitor version control. Documents are considered "UNCONTROLLED IF PRINTED", as indicated in the footer.
EGOWS	Enhanced Gravity Oil and Water Separator. An oil containment tank developed by the UNSW. The tank contains stainless steel baffles and flow retarding devices.
Flame trap	A pit with a down turned pipe used as a fire quenching mechanism.
Gravel	Stone including blue metal and river stone used as a flame-quenching medium.
Knife Gate Valve	Manual valve or penstock used to close outlet to an oil containment tank.
Major Substation	For the purpose of this document, major substation means zone and sub-transmission substations with primary voltages of 132, 66, and 33 kV.

Non Return Valve	Also called a flap valve, it is a one way valve that prevents flow back up into the pipe.
Network Standard	A document, including Network Planning Standards, that describes the Company's minimum requirements for planning, design, construction, maintenance, technical specification, environmental, property and metering activities on the distribution and transmission network. These documents are stored in the Network Category of the BMS repository.
Oil Containment System	The oil containment system refers to the transformer bunds, together with a suitable combination of flame traps, pipes, oil containment tank and Parallel Plate Separator as required. The oil containment system is not designed as an oil storage system. It is designed for emergency situations and the treatment of minor oil contamination from transformer bunds.
Parallel Plate Separator (PPS)	A gravity separation device that uses parallel plates to coalesce and separate oil and water.
PPM	Parts per million. An oil-water concentration of 10 ppm equals 10mg/l which is equivalent to visibly free of oils and greases, i.e. no visible oil.
Review date	The review date displayed in the header of the document is the future date for review of a document. The default period is three years from the date of approval however a review may be mandated at any time where a need is identified. Potential needs for a review include changes in legislation, organisational changes, restructures, occurrence of an incident or changes in technology or work practice and/or identification of efficiency improvements.
Single Stage Separator	An oil containment tank that consists of a single chamber that discharges water from the bottom of the tank.
Sludge Judge	Device used to check the depth of sludge within the oil containment tank.
Surfactants	A substance, which emulsifies, disperses or dissolves other substances (eg. a detergent).
Tank Profiler	Clear plastic tube lowered into the oil containment tank to determine oil depths.
Triple Stage Separator	An oil containment tank that consists of three chambers through which the contaminated water runs through consecutively. Water is discharged from the bottom of the third chamber.
Waste	Captured oil and sediment within the oil containment system.

5.0 OIL CONTAINMENT DESIGN

The design requirements for oil containment at major substations are outlined in NS189 Oil Containment for Major Substations.

6.0 OPERATIONAL REQUIREMENTS

6.1 General

6.1.1 Technical Maintenance Plans

Ausgrid has developed a series of Technical Maintenance Plans (TMPs) for substations which includes Maintenance Standards for the various types of oil containment systems in operation. These TMPs are regularly updated and include a detailed description of the required maintenance activities and the frequency of inspection for oil containment facilities.

All current TMPs and Maintenance Standards are to be implemented as part of the operational requirements of this document.

6.1.2 Surfactants

The use of surfactants will disturb the operation of a Parallel Plate Separator or oil containment tank and oil and water separation may not be properly achieved. Where surfactants have been used, the entire contents of the oil containment system must be emptied and the system recharged with clean water to ensure the operational performance criteria can be achieved.

6.1.3 Confined spaces

All work in confined spaces are to be undertaken in accordance with the Work, Health and Safety (WHS) Act and Regulation and with AS 2865 Confined Spaces.

Enclosed tanks are confined spaces and will require signage, entry permits, standby personnel, gas detectors, training and rescue/escape procedures in accordance with AS 2865 and WHS Regulation.

For enclosed tanks, personnel shall enter the tank wearing a full harness and where possible should remain attached to a mechanical retrieval mechanism which can be operated from outside the tank. Class 3 fall arrest devices are preferred and provide both fall arrest and retrieval functions. Fall arrest protection is generally required when climbing vertical ladders where the fall distance may exceed 2 metres.

6.1.4 Other safety issues

Waste removal and waste sampling may have specific safety & PPE requirements and must be taken into consideration in the preparation of Safe Work Method Statements (SWMS).

6.2 Oil handling, waste and other environmental requirements

NS174 Environmental Procedures provides guidance to assist Ausgrid Employees with environmental issues including the handling, storing, transporting and disposing of oil, waste and other materials in accordance with legislative requirements.

6.3 Operational performance criteria

The relevant performance criteria that are applicable to Ausgrid's oil containment systems are listed in Table 1 below.

Table 1: Operational performance criteria

Item	Criteria
Total Suspended Solids (TSS)	50 ppm
Total Petroleum Hydrocarbons	Oil containment tanks – 10 ppm under normal flow as defined in NS 189 Oil Containment for Major Substations.
	PPS – 10 ppm
pH	6.5 – 8.5

6.4 Sampling requirements

Oil containment systems are required to be sampled periodically to ensure proper functioning of the equipment and compliance with the operational performance criteria.

The sampling frequency and general procedures are outlined in Annexure B. Refer to the Technical Maintenance Plans for further details.

6.5 Bunds

6.5.1 General

Bunds must remain structurally stable, free of litter, debris, sediment and pooled water or oil. Bunded areas should not be used for equipment storage.

Operational works include:

- Removing debris, sediment and rubbish from the sumps, grates and surface of the bunded area.
- Ensuring drainage paths are free flowing.
- Inspecting brickwork, blockwork or concrete structural integrity, including joint condition. Check for cracking along mortar joints in brick or blockwork walls. Refer any defects to the designer.
- If bund is not drained to an oil containment system ensure that valves are locked shut.



Figure 1: Typical Oil Containment Bund

6.5.2 Gravel

Gravel within transformer bunds must remain free draining. Where gravel within transformer bunds is clogged, the gravel should be either cleaned and reinstated, or replaced. Advice shall be sought from the designer on the most suitable replacement option.



Figure 2: Oil Containment Bund with Gravel

6.6 Pits and flame traps

6.6.1 General

Pits that form part of an oil containment system can include sludge pits, valve pits and junction pits.

All pits and flame traps must remain structurally stable, free of litter, debris, sediment and accumulated oil and shall not have any leaks. Pits are to be inspected periodically to ensure these requirements are satisfied.

The required frequency of inspections for pits and flame traps is detailed in Section 7.

6.6.2 Operational maintenance items

The following operational maintenance items shall be carried out:

- Remove any build-up of material such as leaves and dirt from around pit lids.
- Ensure grates are clear of debris.
- Remove all sediment, floating oil, litter, etc. as required.
- Classify and dispose of wastes.
- Ensure pits and flame traps are free draining after maintenance works. This may require running water to prove the system is flowing freely.

Where excessive sediment and debris have been identified, an assessment of the on-site and off-site factors that contribute to the condition of the drainage system is required (e.g. overhanging trees, open pits, sandy soils etc.). Advice shall be sought from the designer where external issues may be affecting the efficient operation of the oil containment system.

Where required, replace or repair pit covers, grease and position all pit covers level with the surrounding ground. Pit replacement shall be in accordance with NS189 Oil Containment for Major Substations.

6.6.3 Periodic inspection items

To ensure that pits and flame traps are operating as intended, and to minimise the risk of pollution, the following periodic inspection checks are required in addition to the normal operational maintenance items:

- a) **Check for structural integrity** – Inspect for any cracks or deformed walls of the pit, noting that damaged pits can be more prevalent in trafficable areas.

In addition, check visually for the following aspects:

- Overall condition of the pit, pit covers, ladders, steps or step irons, noting any corrosion or other defects.
- Any surface depressions around the pit (may be difficult to detect when surrounded by concrete).

- b) **Check for hydraulic integrity** – This is particularly important in flame traps where there is likely to be a build-up of oil. The water level within the pit (Figure 4) or flame trap (Figure 5) must be maintained at the level of the invert (bottom) of the lower outlet pipe. If the water level has dropped below this level the pit may be damaged.

For flame traps, the bottom of the down-turned pipe must be submerged at all times as shown in Figure 6. Where required, fill the flame trap to the pipe invert and check for a drop in level over a two hour period.

In addition, inspect the pits and flame traps specifically for:

- Cracks around pipe entry points, joints and corners.
- Malformed pits.
- Presence of tree roots.
- Inadequate rendering and mortar seals.

Where requested by the designer, pressure tests may also be used to check the integrity of the pit.

Where defects are identified in pits or flame traps, or where a drop in water level has been observed, advice should be sought from the designer on the specific controls required.



Figure 3: Typical Pit

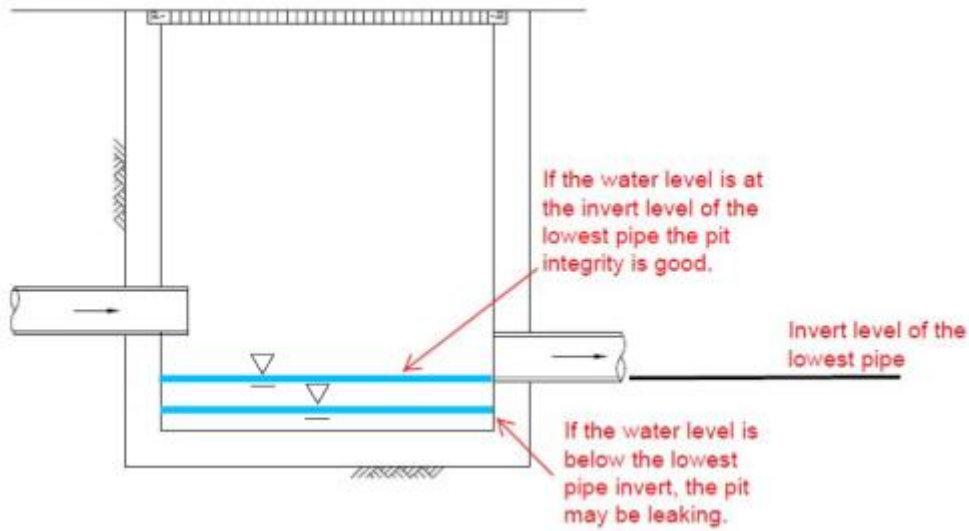


Figure 4: Pit Standard Operating Depth

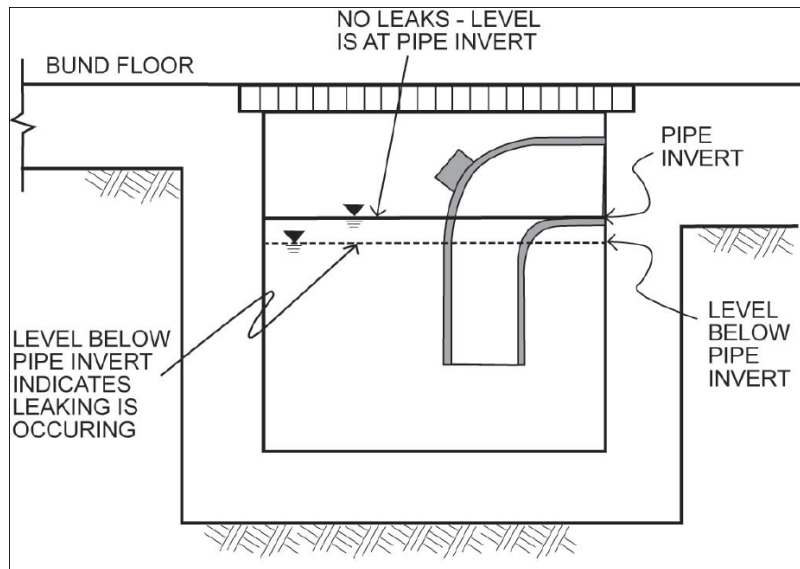


Figure 5: Typical Flame Trap Cross Section



Figure 6: Typical Flame Trap (grate removed for photo)

6.7 Pipes

6.7.1 General

All pipes must remain structurally stable, have hydraulic integrity, be free flowing and free of litter and debris.

The required frequency of inspections for various types of pipes is detailed in Section 7.

6.7.2 Buried pipes

Localised ground settlement and differential settlement in the vicinity of the oil containment drainage lines, excessive sediment in the oil containment tank or pits and low water flows to the oil containment tank all indicate the potential for buried pipes to be damaged. The build-up of sediment around pit entries can also suggest inadequate slopes on drainage surfaces.

It is important to conduct periodic inspections to minimise the potential risk of oil loss into the environment. The following inspection checks should be undertaken:

- a) Walk along the pipe route and look for surface irregularities such as holes or uneven surfaces. This may indicate underground soil erosion.
- b) Look at other structures on the site to ascertain whether there are any ground movement issues which may warrant further investigation. Check for:
 - Leaning lightning masts
 - Sunken slabs
 - Uneven concrete paving
 - Off-level yard equipment including transformer bases.
- c) Check for signs of soil in pits. This may be a sign that soil is entering the system through broken pipes.

Where requested by the designer, specific pipe test methods may be required to check for signs of differential settlement, excessive sediment build-up or blockages within pits, pipes and tanks. Refer to Clause 6.7.4.

Where pipe or other defects are identified on site, seek further advice from the designer. In this situation water flow checks, camera inspections or pressure tests may be required.

6.7.3 Exposed pipes in trenches

Exposed pipes that are laid in open trenches will minimise the risks of oil loss into the soil since the issues that cause buried pipes to break have been eliminated with these designs. Hence, the periodic inspection and maintenance requirements will be much reduced, but nevertheless should include:

- Walk along the pipe route and check for any oil staining or corrosion.
- Replace any damaged pipe sections.

6.7.4 Pipe tests

6.7.4.1 CCTV camera inspection

Pipeline CCTV cameras can be used to determine the condition of drainage lines. Camera inspections can identify cracking within the pipes, movement of joints and areas of debris accumulation. It may be necessary to undertake jet flushing prior to camera tests to allow the camera to pass through the drainage system.

6.7.4.2 Pressure tests

Pressure testing may need to be carried out and shall be in accordance with AS/NZS 3500 Plumbing and Drainage (Series).

6.7.4.3 Excavation

Excavating the drainage line will clearly show any damage. Excavation is a last resort and should only be used where all other options have been exercised.

6.7.5 Broken/faulty drainage pipes

Notify the designer for an assessment prior to the repair or replacement of broken pipes. All works must meet the requirements of NS189.

6.7.6 Blocked drainage pipes

High-pressure water jets or rods can be used to flush blocked drainage pipes. All relevant safety precautions must be addressed when undertaking this work and waste materials must be disposed of appropriately. Ensure that all debris and sediment is removed from the oil containment tank on completion of pipe cleaning work.

Small pipes (<100mm diameter) are more prone to blockages, especially if there is a high amount of deleterious material entering the system.

Repeatedly blocked drainage pipes may need to be replaced.

6.8 Oil containment tank

6.8.1 General

All oil containment tanks must be free flowing and contain minimal oil and sludge.

Note: Enhanced Gravity Oil and Water Separator (EGOWS) tanks are designed to hold back, or restrict, the discharge flow within the system. Hence, these units may initially appear to be not free flowing.

Operational works include:

- Inspecting and measuring oil and sludge depths.
- Inspecting for blocked outlets, low water levels and oil within the outlet chamber.
- Where required remove any oil and sludge.
- Clean and grease all access covers to ensure they do not seize in place before the next inspection.

Annexure A provides details of the operating and maintenance responsibilities for the oil containment tanks.

6.8.2 Maintenance frequency

The required frequency of maintenance for oil containment tanks is detailed in Section 7.

6.8.3 Determining sludge and oil depths

6.8.3.1 Measurement requirements

When inspecting the operation of an oil containment tank, measure oil depths and sludge depths.

Measurement will be required from the various chambers of an oil containment tank. Measurement requirements are outlined in Table 2 below:

Table 2: Measurement and waste collection points

Tank Type	Measurement Points
Enhanced Gravity Oil Water Separator (EGOWS)	One measurement point between the stainless steel baffles and end weir wall.
3 Stage	Three measurement points, one within each of the three chambers.
2 Stage	Two measurement points, one within each of the two chambers.
1 Stage	One measurement point within the tank

6.8.3.2 Contained oil

The following procedure should be used in determining oil depths using water finding paste (GILBARCO Water Finding Paste or approved equivalent):

- Paint the water finding paste onto a measure stick.
- The water finding paste changes from a green colour to pink when the water is reached.
- Ensure that all equipment is cleaned before further use or storage.

6.8.3.3 Sediment / Sludge

The depth of sludge can be measured within the tank using a Sludge Judge (or approved equivalent).

The Sludge Judge consists of a plastic tube with a valve system that allows the sediment column to be collected from within the oil containment tank.

The following procedure should be followed when using the Sludge Judge:

1. Slowly lower the Sludge Judge to the bottom of the tank.

Note: The Sludge Judge must be lowered slowly and not plunged to the bottom of the tank. Plunging the unit will result in an inaccurate reading and possible damage to the bottom valve
2. When the bottom of the tank has been reached or the pipe has filled to the desired level, tug slightly on the rope as you begin to raise the unit. This will seat the check valve, trapping the column of sludge and water in the Sludge Judge.
3. Raise the unit. After looking at the sample through one-foot markers, empty the tube before further use.

Note: Care must be taken when raising the unit up, keep it as vertical as possible. Do not allow the unit to bend or bounce while it is full of water.
4. To empty the tube, touch the pin extending from the bottom section against a hard surface. This opens the check valve to drain the liquid and sludge

When extending the unit longer than 5 metres, a stiffener may be needed to reduce excessive bending. An aluminium channel can be secured to the unit for this purpose.

Store this unit where it cannot be damaged, especially by foot traffic, doors, or machinery. Do not leave it exposed to the sun.

The unit may be cleaned with hot water and a mild soap or vinegar.

6.8.4 Oil removal

Accumulated oil shall be removed from the oil containment tank when oil volumes exceed the relevant criteria given in Table 3.

The oil removal requirements will be dependent on the type of oil containment tank as detailed in Table 3 below.

Table 3: Oil removal requirements

Tank Type	Oil Removal Requirements
Enhanced Gravity Oil Water Separator (EGOWS)	Accumulated oil shall be removed from the main chamber: <ul style="list-style-type: none"> • when the oil depth exceeds 60mm, or • when the oil depth exceeds 30mm, and historical records indicate that it will exceed 60mm at the next scheduled service, or • when the oil depth exceeds 30mm, and there are no reliable historical records available. One removal point between the stainless steel baffles and end weir wall.
3 Stage	Accumulated oil shall be removed from all chambers: <ul style="list-style-type: none"> • at 12 month inspections, and • when the oil depth exceeds 10mm in any chamber. Three removal points, one within each of the three chambers.
2 Stage	Accumulated oil shall be removed from all chambers: <ul style="list-style-type: none"> • at 12 month inspections, and • when the oil depth exceeds 10mm in any chamber. Two removal points, one within each of the two chambers.
1 Stage	Accumulated oil shall be removed: <ul style="list-style-type: none"> • at 12 month inspections, and • when the oil depth exceeds 10mm in the chamber. One removal point within the tank
Holding Tanks and Hybrid Tanks	Accumulated oil shall be removed: <ul style="list-style-type: none"> • at 12 month inspections. One removal point within the tank

6.8.5 Sludge and sediment removal

Where sludge removal is required, the sludge can be removed by mixing the contents of the oil containment tank and removing the entire contents of the tank as liquid waste. Alternatively the sludge can be removed manually after the oil and water components within the tank are removed.

For all oil containment tank types, the sludge and sediment should be removed as soon as its average depth exceeds 75mm in the tank. The sludge and sediment removal points are the same as those indicated for oil in Table 3.

6.8.6 Blocked outlet pipe

Where it is found that an oil containment tank has a blocked outlet pipe, the sludge or sediment at the base of the oil containment tank may be blocking the pipe entrance. Measure the sludge or sediment depths using a sludge judge (Refer to Clause 6.8.3).

Where an inspection demonstrates that the outlet is blocked, notify the designer prior to removal of the sludge or sediment within the tank.

Note that a blocked outlet pipe may lead to oil being discharged through the tank access covers.

6.8.7 Low water level

Where it is found that the operating level of an oil containment tank is below the invert of the outlet pipe, the tank may have been pumped out recently or the tank may be damaged.

Where maintenance records indicate that the tank had not recently been pumped out, fill the tank with water to a nominated level and monitor the water depth over a 2-week period. Any decrease in water level will indicate structural damage within the tank. Refer to Figure 9.

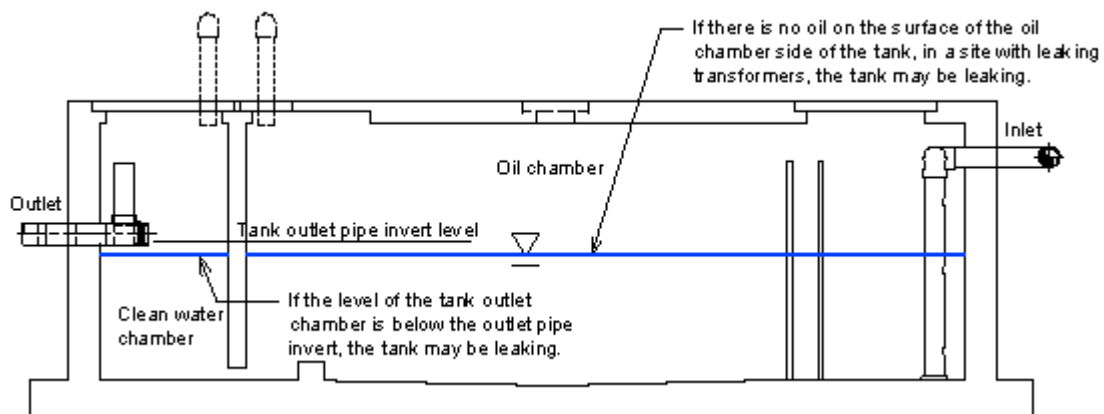


Figure 9: Oil Containment Tank - Low Water Level

Notify the designer prior to pumping out the tank or arranging to undertake a structural inspection.

New oil containment tanks are fitted with an internal gauge that identifies the tank's steady state level when there is no flow. If the operating level falls below the minimum gauge height, further investigation work is required. Seek advice from the designer.

6.8.8 Oil in the outlet chamber

Where it is found that there is oil in the end chamber of a three stage tank or an EGOWS, the end baffle may be damaged or the oil storage capacity of the tank has been exceeded. The following steps should be carried out:

- Determine oil depth within the middle chamber.
- Report oil depth within the oil containment tank and obtain advice from the designer.

Any oil observed in the outlet chamber of an EGOWS shall be reported to Environmental Services. For other types of oil tanks, a visible oil sheen at the outlet point is not unusual, but more significant oil discharges shall be reported.

6.8.9 Removal of entire contents of tank

Following an incident, a major oil spill, or when requested by the designer or by Environmental Services, the following steps should be carried out when emptying the contents of an oil containment tank.

- Open all tank covers, allow ventilation and make safe.
- Implement confined space procedures.
- The entire contents of the tank shall be appropriately waste classified, transported and disposed of by appropriately licensed contractors.
- Remove the contents of the tank. Wherever possible the volume of waste should be minimised by segregating wastes. Ensure water level is recharged in accordance with operating procedures for the facility.
- When required, manually clean the inside of the tank, removing all sediment and oil absorbed to the tank walls and floors. Ensure that the sediment/sludge/oil removed from the tank associated with tank cleaning are disposed of in the appropriate manner.
- Where required or clogged clean the internal structures associated with the oil containment tank. These may include inlet pipes, outlet pipes, siphon and baffles. Refer to site specific drawings for details.
- Check for cracks and other defects when tank walls are clean.
- Ensure that all internal structures such as baffles and siphons are securely fixed.
- In all separator types ensure the water level is 100mm above the level of the bottom of the outlet pipe, or 100mm above the level of the underflow weir, as illustrated by Figures 10 and 11.

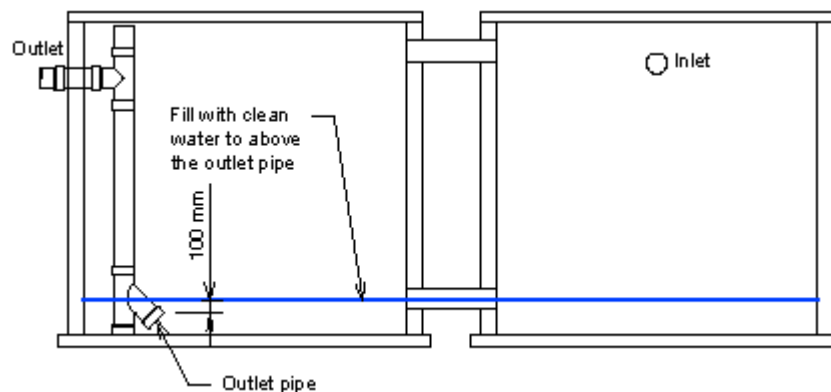


Figure 10: Minimum Oil Containment Tank Operating Depth (Typical)

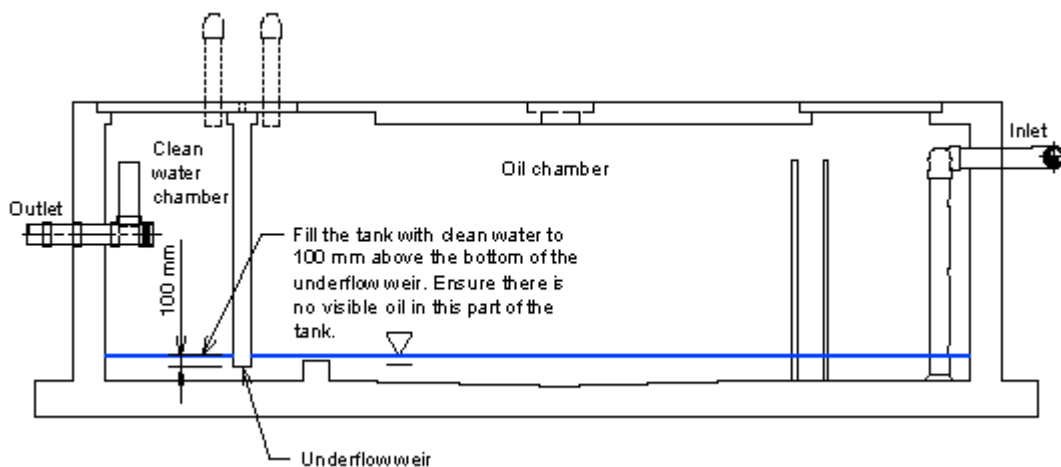


Figure 11: Minimum EGOWS Tank Operating Depth

6.9 Other structures in zone and sub-transmission substations

6.9.1 Cable pits and cable trenches

In some instances these structures drain to the oil containment system. Where required, check for silt, leaf litter, rubbish and debris that may be blocking the outlets.

6.9.2 Valves

6.9.2.1 Typical valves

Ausgrid oil containment systems may contain reflux, butterfly or knife gate valves. Refer to the manufacturer's manuals for specific details on these items. Figure 12 shows typical valves in-situ.



Figure 12: Butterfly, Knife Gate and Reflux Valves (left to right)

6.9.2.2 Reflux, non-return or flap valve

Generally ensure that sediment or debris is not restricting the operation of the flap. Ensure that flap can be easily moved and has not seized shut or open. Check for any damage on the flap itself.

6.9.2.3 Butterfly valves

Butterfly valves are generally housed within a sealed unit and inspection and maintenance must be in accordance with the manufacturer's manuals. Operation of the valve should be able to be undertaken manually. Check that the valve can be easily opened or closed. Water should not be able to pass through the valve in the closed position.

6.9.2.4 Knife gate valve

Generally ensure that sediment or debris is not restricting the operation of the valve. Ensure that the valve can be easily moved and has not seized shut or open. Check for any damage on the valve itself. Water should not be able to pass through the valve in the closed position.

6.9.3 Sediment traps and gas seals

Inspect sediment levels and water levels within the structures to ensure adequate operation of the system. Sediment traps and gas seals are typically installed where direct connections have been made to Sydney Water or Hunter Water drainage channels or sewer.

These structures are typically precast units. Refer to as-built drawings for documentation of the system installed. Refer to the manufacturer's manuals for specific details on these items.

6.10 Parallel plate separators (PPS)

6.10.1 General

Ausgrid's major substations use Parallel Plate Separators (PPS) typically as shown in Figure 13. Refer to the manufacturer's manuals for specific operating details.

NS189 Oil Containment for Major Substations requires that these units are correctly installed and fully commissioned on site with a minimum 12 month defects liability period for a new unit. Limited recourse to the installation contractor may be available during this period if operational problems are evident that cannot be easily remedied.

NS189 also outlines the requirements for the effective handover of the PPS equipment and provides a commissioning checklist and procedure to ensure the unit has been correctly installed prior to acceptance.

Annexure A provides details of the operating and maintenance responsibilities for the PPS systems.

6.10.2 Maintenance frequency

The required frequency of maintenance for these PPS units following the warranty period is detailed in Section 7.



Figure 13: Typical Parallel Plate Separator

6.11 Site completion

At completion of site inspection or works the following must be undertaken:

- Ensure all valves and float switches are returned to the operating position.
- Check all pumps are ready for operation.
- Ensure all appropriate alarms are in service.

7.0 MAINTENANCE FREQUENCY

7.1 General

Note: This Section is due for review and will form the basis of a Maintenance Requirements Analysis (MRA) to be completed prior to end of FY 17/18.

The required frequency of inspection and maintenance for the various types of oil containment systems and their components is summarised in Table 4 below.

The frequency of maintenance for oil containment / separation systems may differ due to site specific conditions, age and climatic factors. The Services Maintenance Group shall be advised of all site locations which may require a higher level of maintenance.

For Ausgrid installations, the Default Maintenance Periods shown in Table 4 are currently applicable after the conclusion of the manufacturer's warranty period.

The required Ausgrid maintenance procedures and inspection frequencies for the various oil containment / separation systems are outlined in more detail in the relevant Technical Maintenance Plans (TMPs). Where a conflict occurs with Table 4 below, the requirements of the current TMPs shall prevail. Refer also to Clause 6.1.

Table 4: Oil containment system maintenance frequency

Oil Separator Type or Component	Default Maintenance Period	Comments
Parallel Plate Separators	Three (3) months	Refer to Clause 7.3
Oil Containment Tanks (1, 2, and 3 Stage and EGOWS)	One (1) year Routine	Accumulation of excessive oil, sludge and sediment may require more frequent maintenance. Refer to Clause 6.8
	Five (5) years Safety / Structural	Clean, inspect and report. Refer to Clause 6.8
Holding Tanks and Hybrid Tanks	One (1) year	
Pits and Flame Traps	One (1) year	Refer to Clause 6.6
Pipes	Five (5) years	CCTV inspection for pipes as required. Project works on site to allow for pipe inspections as part of project scope. Refer to Clause 6.7
Valves	One (1) year	Check operation and lubricate as required.

7.2 Oil containment tanks

Oil containment tanks should be inspected periodically for safety, serviceability and durability. Inspections should occur at maximum five yearly intervals as indicated in Table 4, or more frequently where site conditions require. Records and results of inspections shall be provided to the designer for review.

7.3 Parallel plate separators (PPS)

Parallel Plate Separators (PPS) units are designed for a specific flow rate over a defined period of time, after which, the discharge is less likely to be compliant with the criteria of free of visible oils and grease (i.e. 10 ppm). The maintenance period is defined by the need to maintain this discharge compliance.

Adjustments to the maintenance frequency can be made through robust sampling and testing. These adjustments may mean reduced maintenance for some sites where the work rate of a PPS is minimal. At other sites where oil leakage is significant, more frequent maintenance will be required.

7.4 Bunds, pits, flame traps and pipes

The cleaning of bunds, pits, flame traps and pipes at some locations may require the use of a high pressure cleaner (e.g. Gernie 15A) in order to be effective.

Bunds, pits and flame traps shall be cleaned free of oil and sludge and other deleterious materials. Pits and flame traps are to be re-charged with water on completion. Where float switches are used, they shall be checked to ensure they are operating correctly.

8.0 REFURBISHMENT AND REPLACEMENT

8.1 Parallel plate separator (PPS)

A Parallel Plate Separator (PPS) can be deemed to have reached the end of its serviceable life when:

- the unit has faults which may cause harm to personnel.
- the unit can no longer be cost effectively maintained.
- the unit cannot be made to comply with environmental discharge limits.
- there is significant leakage (e.g. a continuous stream) from the body of the unit which cannot be locally repaired (pipe connections should be adjusted or repaired to stop leaks).

The appearance of rust on welds or panels is not normally sufficient justification for replacement, unless one of the above conditions also applies. A PPS system would typically be considered as serviceable if the discharge oil concentration can be maintained within the specified performance criteria, and the unit is able to operate automatically as originally intended.

The designer shall be notified whenever the replacement of a PPS unit is proposed.

8.2 Oil containment tank

Oil containment tanks that routinely have water levels below the outlet invert may be leaking and will require further investigation. Potentially, remedial works may be necessary to prevent further leaks.

The designer and Environmental Services shall be notified of any instances where the oil containment tank level is below the outlet invert level.

8.3 Gravity pipework

8.3.1 Buried pipes

Any buried pipe that is identified as cracked or damaged (e.g. by CCTV investigations) shall be referred to the designer for assessment prior to repair or replacement.

Buried pipes should be surveyed at the intervals identified in Table 4, or when pipe damage is suspected. Surveys of pipework should use CCTV or other suitable methods.

8.3.2 Exposed pipes

Pipes that are exposed (e.g. in an open pipe trench) do not require regular internal investigations. Any sections of pipe that are leaking should be repaired or replaced, and the designer notified of the defects. Leaking pipe joints should be adjusted or the Nitrile rubber seals replaced.

9.0 AUTHORITIES AND RESPONSIBILITIES

For this Network Standard the authorities and responsibilities of Ausgrid employees and managers in relation to content, management and document control can be obtained from the Company Procedure (Network) – Production/Review of Network Standards. The responsibilities of persons for the design or construction work detailed in this Network Standard are identified throughout this standard in the context of the requirements to which they apply.

10.0 RECORDKEEPING

The table below identifies the types of records relating to the process, their storage location and retention period.

Table 5 – Recordkeeping

Type of Record	Storage Location	Retention Period*
Approved copy of the network standard	BMS Network sub process Standard – Company	Unlimited
Draft Copies of the network standard during amendment/creation	TRIM Work Folder for Network Standards (Trim ref. 2014/21250/217)	Unlimited
Working documents (emails, memos, impact assessment reports, etc.)	TRIM Work Folder for Network Standards (Trim ref. 2014/21250/217)	Unlimited

* The following retention periods are subject to change eg if the records are required for legal matters or legislative changes. Before disposal, retention periods should be checked and authorised by the Records Manager.

11.0 DOCUMENT CONTROL

Content Coordinator : Manager – Trans and Dist Subs Engineering

Distribution Coordinator : Snr Engineer Guidelines Policies and Standards

Annexure A – Oil Separator Operation and Maintenance Requirements

A1 Introduction

The design, installation and operation of an oil containment system requires the coordination of a number of functional groups within Ausgrid. A fully compliant system requires the timely input of various design, environmental, procurement, construction and operational personnel in order to achieve a satisfactory outcome.

Table A1 provides an outline of the key roles and responsibilities within Ausgrid during the design, operation and maintenance phases.

A2 Key O&M responsibilities

A2.1 Parallel Plate Separator (PPS) systems

There are a number of manufacturers and types of PPS oil containment systems. The PPS unit currently being installed in major substations for Ausgrid is the Ovivo EnviroSEP OS7500 Oil Separator.

The key roles and responsibilities within Ausgrid for the PPS oil containment systems are as follows:

- The design, installation and commissioning responsibilities are as identified in Annexure B of NS 189 Oil Containment for Major Substations. The commissioning checklist and procedure are also contained in NS189.
- The operation and maintenance functions are to be carried out by the **Services Maintenance Group**, with technical advice as required from Project Development Group and Environmental Services.

The PPS oil containment system shall be correctly installed and fully commissioned on site with a minimum 12 months defects liability period to ensure effective long term operation of the system. Refer to Annexure B of NS189.

A2.2 Oil containment tank systems

The key roles and responsibilities within Ausgrid for the oil containment tank systems are as follows:

- The design, installation and commissioning responsibilities are as identified in Annexure B of NS189.
- **The** operation and maintenance of the oil containment system including flame traps, pipes, valves and the oil containment tank is the responsibility of the **Services Maintenance Group**, with technical advice as required from Project Development Group and Environmental Services.
- Any modification or upgrade of the oil containment tank system is the responsibility of the Project Development Group, in consultation with the **Services Maintenance Group**.

Table A1 - Oil containment systems – Design, operation and maintenance responsibilities

Division or Branch	Section	Design of System	Set Maintenance Guidelines	Develop maintenance detailed check sheets	Maintain system as designed	Recording of maintenance issues	Alter Maintenance Guidelines from feedback received (MRA)	Project Management (minor or corrective work)
GM / Asset Mgmt and Operations				A	A	A	I	A
Project Development	Development Services	A / R	C	C	C	I	C	C
Contracted Services	Services Maintenance	C	C	R	R	R	C	R
Asset Strategy, Perform. & Innov.	Asset Risk Engineering		A	C	C	I	A	I
Asset Engineering, Policy & Standards	Environmental Services	C	C	C		I	C	C

R - Responsible: person who performs an activity or does the work.
A - Accountable: person who is ultimately accountable and has Yes/No/Veto.
C - Consulted: person that needs to feedback and contribute to the activity.
I - Informed: person that needs to know of the decision or action.

Annexure B – Oil Separator Sampling Requirements

B1 General

Sampling shall be undertaken prior to any maintenance or disturbance of the oil separator.

B2 Sampling frequency

B2.1 Parallel Plate Separator (PPS) systems

Quarterly sampling of the discharge from PPS systems is required to confirm compliance of the oil separator with the operational performance criteria given in Clause 6.3 (Table 1).

B2.2 Oil containment tank systems

Annual sampling of the discharge from oil containment tank systems is required to confirm compliance of the oil separator with operational performance criteria given in Clause 6.3 (Table 1).

B3 Sampling procedure

The laboratory used for analysing samples shall be NATA accredited to undertake the specific analysis. Use sample bottles prepared by the laboratory and ensure sampling and preservation of samples is in accordance with the laboratory's requirements.

Sampling shall be undertaken in a manner that ensures a representative sample is obtained.

Sample collection is to be carried out as follows:

1. Run a hose at maximum flow over the bund such that the pick-up of any oil is maximised. For example, maximise the distance the water must travel over the bund prior to entering the sump, ensure it runs over the most soiled section of the bund etc.
2. Allow a minimum of 5 minutes of discharge through the oil separator prior to taking a sample.
3. Collect samples in clean collection jars from the discharge point of the oil separator.

Note: Where it is not possible to collect a sample from the discharge point, collect the sample in accordance with Table B1 and indicate this departure on the Chain of Custody Form.
4. Fill the laboratory sample bottles from the collection jars promptly so that any contaminants in the collected liquid do not separate.
5. Complete the Chain of Custody Form as required.

Table B1 – Sampling Points and Collection Methods (where discharge point is not accessible)

Oil Separator Type	Sampling Point	Sample Collection Method
PPS	Final chamber of the oil separator	Mix the surface layer of the outlet chamber and plunge a collection jar below the surface and pull it up quickly.
EGOWS	Immediately prior to the outlet	Mix the surface layer of the sampling point and plunge a jar about 300mm below the surface and pull it up quickly.
3 Stage	Final stage	
2 Stage and 1 Stage	Do not collect a sample	N/A

B4 Records

Results of sampling are to be recorded in a suitable format to enable future reference and analysis.

Annexure C – Sample Compliance Checklist



Network Standard Checklist Form

NS190 Oil Containment Operational Requirements for Major Substations

Project Identification:	
Prepared by: <Name & Position Title>	Date:

This checklist is for internal Ausgrid use only and does not apply to ASPs or contractors who have specific compliance requirements in relation to Contestable project works. The checklist is unique for each network standard and is available within BALIN and the BMS as a separate form that can be amended as required, completed and saved in TRIM with the other project documentation.

This section is used to identify compliance checks that when applied to the work associated with this Network Standard will satisfy an audit process to establish that the requirements of the standard have been followed. It is expected that applicable items would normally be checked as Comply (Yes) as non-compliance is generally not tolerated.

Where non-compliance is the result of specific site conditions or design decisions this needs to be identified in the notes section of the form for each non-compliance and approval sought from an appropriately authorised Ausgrid manager responsible for design approval per NS261 Compliance Framework for Network Standards.

Should additional information be available to document non-compliance decisions, these can be attached to the checklist form. The checklist and any attached explanatory notes should be saved in the project document repository.

Item	Description	Refer Clause	Completed/ Actioned
	Scope		
	Details the general requirements for the operation of oil containment systems at major substations.		
	Operational Requirements – Procedures, Bunds, Pits		
1	Technical Maintenance Plans implemented in conjunction with the requirements of this standard.	6.1.1	Yes/No/NA
2	Surfactants not used	6.1.2	Yes/No/NA
3	Complied with Confined Spaces requirements.	6.1.3	Yes/No/NA
4	Safety and PPE requirements of SWMS followed.	6.1.4	Yes/No/NA
5	Oil handling methods followed as outlined in NUS 174 Environmental procedures	6.2	Yes/No/NA
6	Oil containment system performance complies with operational performance criteria.	6.3	Yes/No/NA
7	Sampling frequency and procedure in accordance with Annexure B of this standard	6.4	Yes/No/NA
8	Bunds maintained as required	6.5.1	Yes/No/NA
9	Gravel beds remain free draining	6.5.2	Yes/No/NA

Item	Description	Refer Clause	Completed/ Actioned
10	Pits and Flame Traps maintained as required	6.6	Yes/No/NA
11	Pits and Flame Traps have required periodic structural and hydraulic integrity checks	6.6.3	Yes/No/NA
Operational Requirements – Pipes, Tanks			
12	Buried pipes remain clear and undamaged	6.7	Yes/No/NA
13	Yard surfaces inspected for indicators of sub-soil movement	6.7.2	Yes/No/NA
14	Exposed pipes checked for leaks and visible damage	6.7.3	Yes/No/NA
15	Pipe repairs meet requirements of NS189 Oil Containment in Major Substations	6.7.5	Yes/No/NA
16	Oil containment tanks maintained in accordance with requirements Annexure A	6.8	Yes/No/NA
17	Accumulated oil removed in accordance with requirements of Table 3	6.8.4	Yes/No/NA
18	Sludge and sediment removal in accordance with requirements.	6.8.5	Yes/No/NA
19	Low water levels used as indicator of tank damage triggering water level tests	6.8.7	Yes/No/NA
20	Oil detected in outlet chamber is reported to Environmental Services	6.8.8	Yes/No/NA
21	Removal of entire tank contents is conducted according to required procedure.	6.8.9	Yes/No/NA
22	Valves inspected and maintained as required.	6.9	Yes/No/NA
23	Parallel Plate Separator systems maintained in accordance Annexure A	6.10	Yes/No/NA
Maintenance Frequency & Refurbishment			
24	Maintenance procedures and inspections conducted as required in Table 4.	7.1	Yes/No/NA
25	Proposed refurbishment and replacement reviewed by designer	8.0	Yes/No/NA

Notes:

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