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of Defence

Defence
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Inspection, Maintenance and Testing of Equipment Installed at Petroleum Installations on MOD Property

Technical Standard – Petroleum - 02



ESTATE MANAGEMENT

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FOREWORD

This Technical Standard (hereafter known as 'The Standard') is published by Defence Infrastructure Organisation (DIO) for application across all areas of the MOD and replaces Practitioner Guide 2018/01. The Standard is mandated for all contracts let after publication of this document. It is recommended for adoption into existing contracts; however, no work involving expenditure on any MOD account is to be undertaken without prior authority from the appropriate MOD officer for that location or facility.

The aim of the Standard is to provide procedural guidance for Practitioners to ensure consistency of approach to maintenance, inspection and testing of mechanical and electrical equipment on petroleum fuel installations.

DOCUMENT AIM

The aim of this Standard is to provide procedural guidance to personnel and organisations involved in the inspection, maintenance and testing of fixed mechanical and electrical equipment at petroleum installations on behalf of the Ministry of Defence (MOD).

DOCUMENT SYNOPSIS

This document provides procedural guidance on the maintenance, inspection and testing of fixed mechanical and electrical equipment installed at petroleum installations on the MOD estate. It is not a technical guide on the practical aspects of maintenance, inspection and testing of such installations, which is left to the professional skills and judgement of Competent Person(s) undertaking the work.

The "Practitioners" to whom this Standard relates are Defence Infrastructure Organisation (DIO) personnel and other individuals or organisations who, on behalf of DIO, have interest in the

installation, maintenance and operation of equipment installed at petroleum installations on the MOD estate.

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SECTION 1

1. INTRODUCTION

1.1 Aim

1.1.1 The aim of the Standard is to provide guidance and direction on the maintenance and inspection frequencies applicable to petroleum installation fixed equipment located within petroleum hazardous area and any associated distribution equipment that forms part of that petroleum installation. The information presented in this document is the basis for preparation of schedules for the maintenance of such equipment.

1.1.2 Maintenance frequencies outlined in this Standard are designed to help ensure that fuel installations are maintained in accordance with statutory and client requirements for:

- Regulatory compliance.
- Equipment reliability.
- Safety of operation.
- Environmental protection.

1.1.3 The aim of this Standard is to consolidate and present inspection, maintenance, and testing policy requirements in one document which:

- Are required by Ministry of Defence (MOD), North Atlantic Treaty Organization (NATO) for application to Bulk Petroleum Installations.
- Comply with the requirements of the relevant British Standards (BS) and other Approved Codes of Practice (ACOP).
- Form the basis for, and therefore facilitate the development of, an inspection and test programme for installations.
- Help ensure that installed mechanical and electrical equipment continues to function in a safe and satisfactory manner.
- Minimise the risk of ignition, in hazardous areas, caused by inadequately maintained equipment.
- Form the basis for the audit of maintenance activities.

1.1.4 This Standard does not include details of procedures or method statements for undertaking the inspection, maintenance or testing since these shall be specific to each site and item of equipment.

1.1.5 This is not a technical Standard on the practical aspects of maintenance, inspection and testing and certification of such installations, which is left to the professional skills and judgement of the Competent Person¹ undertaking the work.

1.2 Scope

1.2.1 This Standard is applicable to all flammable liquid bulk storage installations including:

- Aviation Fuelling and Distribution Installations.
- Marine Ship to Shore Fuelling.

¹**Competent Person** A person who possesses sufficient technical knowledge and experience for the nature of the mechanical and electrical work undertaken, and is able at all times to prevent danger, and where appropriate injury, to themselves and others.

- Petroleum Supply Depots.
- As articulated in 1.2.2.

1.2.2 These maintenance and inspection requirements can be utilised for use on Packed Stock Fuel Storage Facilities including Flammable Dangerous Goods Stores, associated waste product stores and ancillary installations supplying heating and generator plant where applicable.

1.2.3 This Standard does not apply to Mechanical Transport Fuelling Installations, mobile fuelling equipment or installations installed with non-European equipment.

1.3 Safety

1.3.1 All work is to be undertaken in accordance with the MOD Safety Rules and Procedures for Work on Petroleum Installations JSP 375 Part 2 Volume 3, Chapter 5.

1.3.2 The Authorised Person Petroleum, AP (Pet) who is responsible for the application of the MOD Safety Rules and Procedures, controls all work on fuel installations under the delegation of the Operating Authority. No inspection, maintenance or testing which could affect the petroleum installation shall be undertaken without first having been authorised to do so by the issue of either a permit to work or standing instruction by the AP (Pet).

1.3.3 Design, procedural changes, or equipment changes must not be initiated on any fuel facility without a recorded Hazards of Operation (HAZOP) review being undertaken. The HAZOP assessment is to be conducted by a multi-disciplinary team to ensure the HAZOP is completed correctly. This will consider the risks to operability, maintainability, loss of containment, accessibility, plant reliability and life expectancy, standard operating and emergency procedures that may be introduced by the change or the new procedure. Records of the change should be maintained for the life of the facility. Consideration must also be given to the update of the DSEAR risk assessment and Hazardous Area Classification Drawing (HAC). The responsibility for the management of the HAZOP process is the Head of Establishment or nominated deputy.

2. Application of the Standard Elsewhere

2.1 USVF Bases

2.1.1 The guidelines given in this Technical Standard are applicable to the full range of mechanical and electrical European standard equipment found on fuel installations on MOD Establishments occupied by the United States Visiting Forces (USVF).

2.1.2 Both in terms of quality and safety the standard of work undertaken on United States Visiting Forces (USVF) sites must not be inferior to those executed on the UK MOD sites.

2.2 Overseas Estates

2.2.1 The Secretary of State has stated² that; “Within the United Kingdom (UK) we comply with all applicable HS&EP legislation” and that “Overseas we apply our UK arrangements where reasonably practicable and, in addition, respond to host nation’s relevant HS&EP expectations”.

2.2.2 The estates occupied by BF(G) apply their own local (German) regulations. The competency of the contractor is to be established prior to contract let and local procedures apply to the selection and appointment of the Competent Person. For this reason, while the general principles mentioned in this Technical Standard may be applicable, the document will be of limited use to BF(G) staff.

2.3 Deployed Operating Bases

2.3.1 Where operational conditions permit the application of peacetime regulations and contractors are engaged on works services under CONDO³ the guidance given in this Standard should be

² Health, Safety and Environmental Protection in Defence, A Policy Statement by the Secretary of State for Defence, June 2013.

³ Contractors on Deployed Operations.

followed on permanent/semi-permanent deployed operating bases where practicable. The Standard is not applicable for installations designed, executed, and maintained by the Royal Engineers in an operational theatre designated as a Military Works Area⁴.

3. Maintenance Schedules and Frequencies

3.1 This Standard summarises the maintenance requirements on bulk fuel installations in line with statutory legislation and industry standards & guidelines. Where guidance exists for the inspection, maintenance, and testing activities, these are detailed.

3.2 The inspection, maintenance and testing frequencies given in section 2.0 Maintenance, Inspection and Testing Schedule are the expected minimum, but should not be considered prescriptive. More frequent and/or more detailed inspections will be necessary where there is a corrosive or other adverse atmospheric condition, a high risk of mechanical damage or vibration and where there are other onerous circumstances. The need for more frequent maintenance inspections may be determined by the manufacturer, equipment condition, process, and site/environmental conditions – this is a site-specific responsibility, advice may be gained from the DIO SME to aid in the most appropriate maintenance frequencies.

3.3 It is recognised that there may be sound engineering reasons to alter the maintenance scope or adjust the frequency of maintenance activities on specific plant. The overriding condition for such changes is that there will be no deterioration in safety, performance, reliability, or life expectancy of either the individual piece of equipment or its contribution to an overall system.

3.4 Such changes must be supported by a formal engineering review, based upon plant maintenance records and inspection reports. Changes must be fully documented and auditable and supported by the plant owner and the Authorising Engineer Petroleum.

3.5 A Planned Maintenance schedule and maintenance records shall be kept up to date to demonstrate due diligence.

3.6 All inspection, maintenance and testing tasks shall be recorded on appropriate forms detailing the work completed and shall be kept for the lifetime of the equipment. When testing equipment requiring the recording of test results, the test result data must be recorded to enable on-going analysis and identification of trends.

3.7 In the event of a change of maintenance organisation, the complete maintenance, inspection, and testing records must be handed over in their entirety to the new organisation.

3.8 Ownership of inspection, maintenance and test records remains with the MOD.

3.9 Where operational deficiencies, defective infrastructure or equipment is identified through the inspection, maintenance, and testing activities, these shall be relayed in writing to the Operating Authority.

3.10 Where defective equipment is identified as part of the inspection, maintenance and testing programme, suitable remedial work must be undertaken. Until the remedial action is executed the individual asset is to be isolated or/and removed from service.

3.11 Register, records, and corrective action.

3.11.1 A register of fixed equipment is to be maintained and managed by the Maintenance Management Organisation (MMO). This register shall include inspection, maintenance and testing for each establishment, complete with details of required frequencies. The register shall be compiled with due cognisance of this Technical Standard and:

- Manufacturers' recommendations.

⁴ Infrastructure Management on Joint Operations: Joint Warfare Publication 4-05.

- Systems designers' recommendations.
- Equipment maintenance manuals.
- National and International standards and codes of practice.
- Known equipment failure modes.
- Criticality of duty.
- Environmental and process conditions.
- Any MOD specific Requirements

3.11.2 The register should detail as a minimum, equipment identification numbers, description of the item, its location and required inspection interval.

3.11.3 The register should be used as the basis for a Pre-Planned Maintenance (PPM) schedule and for maintenance records that shall be kept up to date to demonstrate due diligence and compliance.

3.11.4 Where defective equipment is identified as part of the inspection, maintenance, and testing programme, it shall be required for the MMO to produce and manage a corrective action plan, detailing for each item:

- a definition of the problem.
- A Repair or replacement timeframe – with an estimated completion date.
- Who should be responsible for oversight.
- How the report was issued and to whom.
- Details of any regulatory requirements.
- A statement whether the repair or replacement necessitates a review as detailed in the section 1.3.3 of this Technical Standard.

This will also enable corrective action plans to be shared between authority, regulators, and Top-Level Budget holders.

4. Standards

4.1 The inspection, maintenance and testing of mechanical and electrical equipment installed at fuel storage installations shall be undertaken in accordance with this Technical Standard and the standards detailed within the Bibliography.

4.2 Where 'host country' regulations are more stringent, they shall apply.

5. Hazardous Area Classification (Petroleum)

5.1 The classification of the petroleum hazardous area is based upon the concept of dealing with the risk of fire and explosion by area classification. The area classification criteria are given in BS EN 60079 - 10.

5.2 The petroleum hazardous area classifications are:

- Zone 0 – Zone in which the explosive atmosphere is continuously present or present for long periods.
- Zone 1 – Zone in which an explosive atmosphere is likely to occur in normal operation.
- Zone 2 – Zone in which an explosive atmosphere is not likely to occur in normal operation, and if it occurs will exist only for a short time.

5.2 Hazardous area classification drawings, specific to each installation, shall be held by the Operating Authority and the Maintenance Management Organisation (MMO).

5.3 The hazardous area classification drawings must comply with DSEAR, the requirements of JSP 375 Part 1 Part 2, Vol 1, Chapter 9 and Joint Services Safety Regulations for the Storage and Handling of Fuels and Lubricants (JSP 317).

5.4 The hazardous area classification drawings shall be used in conjunction with this Standard to determine the inspection, maintenance requirements and frequencies of mechanical and electrical equipment and installations.

6. Electrical

6.1 The management of Electrical work and testing in petroleum hazardous areas is to be under the overall control of the AP Petroleum. The level of control shall be in accordance with JSP 375 Part 2 Volume 3 Chapter 5 Petroleum Installations and Chapter 3 Electricity.

6.2 The electrical installations in petroleum sites are within two areas, which are:

- Within the hazardous area as defined by the DSEAR zonal classification. The electrical installations within these areas shall be inspected, tested, and maintained in accordance with the requirements of BS EN 60079 part 17. For the purpose of this Standard, the whole of the circuit shall be considered from point of origin to final point of termination, whether this is fully within the zonal classification area or partly within the zonal classified area.
- Outside the hazardous area as defined by the DSEAR zonal classification, but still within the fenced area which defines the clients declared hazardous area. These installations shall be inspected, tested, and maintained in accordance with the requirements of BS7671 and the guidance given within Guidance Note 3.

6.3 Inspections, maintenance and testing in petroleum hazardous areas shall only be undertaken by competent personnel as defined in BSEN 60079-17:2014 Annex B – knowledge, skills and competencies of responsible persons, technical persons with executive function and operatives, who shall be able to demonstrate their competency and provide evidence of attaining the knowledge and skill requirements specified in relevance to the types of protection and / or types of equipment involved. They shall also be able to demonstrate their competency with documentary evidence and through questioning the following:

- Practical skills necessary for the inspection and maintenance of relevant concepts of protection.
- Understanding of the general principles of explosion protection.
- Understanding of the general principles of types of protection and marking.
- Understanding of those aspects of equipment design which affect the protection concept.
- Understanding of certification and relevant parts of this standard.
- Understanding of the additional importance of permit to work systems and safe isolation in relation to explosion protection.
- Familiarity with the techniques to be employed in the inspection and maintenance of equipment referred to in this standard.
- Comprehensive understanding of the selection and erection requirements of IEC 60079-14.
- General understanding of the repair and reclamation requirements of IEC 60079-19.
- Familiar with JSP 375, Part2, Volume 3, Chapter 5 Petroleum and Chapter 3 Electricity.

- Refer to PG 2017/01 - The Inspection, Testing, and Certification of Low Voltage Electrical Installations on the Defence Estate.

6.4 Records of Inspection, Maintenance and Test shall be kept for the life of the equipment and / or installation and shall be compared against the previously recorded values to identify any deterioration which is taking place.

6.5 A suitable database should be maintained to record details of installed equipment and to record the defects found during the inspection process. To enable the defects to be grouped and to enable the database to be interrogated by defect types, it is necessary to have a standard set of defect codes. This would also enable the database to be shared between authority and service providers.

Defect Code	Code Description
1	Ex electrical equipment not appropriate for hazardous area
2	Circuit identification not appropriate
3	Enclosure defective
4	Gaskets, seals defective
5	Unauthorised modification
6	Cable gland defect
7	Ex d flame path defective (this might also cover enclosure, glands, sealing etc.)
8	Lamp defect
9	Electrical connection defect
10	Cable, trunking, conduit
11	Earthing defect
12	Cable insulation defect
13	Equipment insulation defect
14	Overload, temperature protection device defective
15	Corrosion, weather, vibration defect
16	Dust or dirt defect
17	Ex p pressurisation or pre-start purge defect
18	Intrinsically safe earthing defect
19	Intrinsically safe printed circuit board defect
20	Intrinsically safe circuit defect, e.g. invasion of power circuit, point to point screen defect

6.6 The severity of the defects should be coded in accordance with the current edition of BS 7671 and which is detailed below:

- **Code C1** Danger present, risk of injury. **Urgent Immediate remedial action required.**
- **Code C2** Potentially dangerous. **Immediate remedial action required.**
- **Code C3** Improvement recommended.

See Appendix B - Quick Reference - Types of Defects and Classification Codes. ⁵

6.7 In all cases an initial detailed inspection of the equipment shall be completed before it is put into service, this includes items that have been removed for repair / overhaul. In the case of electric motors, the initial inspection applies to the termination boxes and inspection covers only as it is unreasonable, due to the potential damage that may be done, to strip and inspect the stator housings etc. Certificates of Conformity to the manufacturing standard shall be obtained and copies shall be stored with maintenance records. Subsequent inspections shall be carried out periodically and be of the appropriate grade:

Visual, an inspection that identifies defects without the use of access equipment or tools, those defects, such as missing bolts, which will be apparent to the naked eye. Binoculars and remote heat detecting equipment may be useful in some situations.

Close, an inspection which encompasses those aspects covered by visual inspection and in addition, identifies those defects (e.g. loose bolts), which will be apparent only by use of access equipment (e.g. ladders), and tools. Close inspections do not normally require the enclosure to be opened or equipment to be de-energised.

Detailed, an inspection which encompasses those aspects covered by close inspection and in addition, identifies those defects (e.g. loose terminations and ingress of water) which will only be apparent by opening the enclosure and using tools and test equipment.

6.8 Inspection Grades and Intervals:

YEAR	GRADE	PROPORTION	GRADE	PROPORTION
1	Visual	50%/100% of Equipment	Close	50%/100% of Equipment
2	Visual	50%/100% of Equipment	Close	50%100% of Equipment
3	Detailed	100% of Equipment		

During Year 1 – 50% of the installed hazardous area assets shall be Visually and Close inspected as a minimum. 100% should be considered for small installations.

During Year 2 – The remaining 50% of the installed hazardous area assets shall be Visually and Close inspected or a further 100% completed.

During Year 3 – 100% of the installed hazardous area assets shall be Detailed inspected. For large installations, this can be programmed over a three-year period.

Once the above inspection regime has been completed then the cycle shall be repeated.

6.9 In accordance with BS EN 60079 part 17, the results of the inspections and comments of the inspector shall be reviewed by MMO to determine if a more frequent inspection regime is required.

6.10 Detailed Inspections require electrical testing to take place. Conducting these tests may introduce a spark and an electric shock hazard into the workplace which shall be controlled in accordance with the requirements of JSP 375 Part 2 Volume 3 Chapters 3 and 5 and a specific Method Statement and specific Task Risk Assessment detailing the safety steps to be taken.

6.11 To determine the safe working practice the following shall be considered when conducting these tests:

1. Isolation of the circuit (for cathodic protection circuits this shall be 24 hours prior to work).
2. The location, including that of any interconnected cables or equipment, potential for explosive atmospheres and any concurrent works.

⁵ The types of defects and classification codes is not a complete list and should be used as guidance only.

3. Tests shall be carried out after inspection of terminations to establish that all relevant earth connections are in good order (earth connections made onto rusty surfaces may flash due to the presence of the oxide).
4. As long as existing Intrinsically Safe instruments, in accordance with the requirements of BS EN 60079 are within calibration they can be used (Intrinsically Safe instruments certified to BS 1259 are no longer available in part due Dangerous Substances and Explosive Areas Regulations (DSEAR)).
5. These tests may result in energy being stored in the circuit under test which shall be discharged in a safe manner, normally through the test instrument.
6. Tests of circuits within EEx'd' or FLP enclosures should be conducted with the enclosures closed and all securing fixings correctly in place.
7. Earth fault loop impedance measurements, high current continuity tests and prospective short circuit current measurements should only be undertaken in hazardous areas in gas free atmospheres and is to be controlled in accordance with the requirements of JSP 375 Part 2 Volume 3 Chapters 3 & 5. It is imperative that since these tests can introduce current and/or voltages in parts of the installation where they might not be expected, due to bonding of extraneous conductive parts and lightning protection systems, that the whole installation be taken into account in the risk assessment as these tests could result in incendive sparking in areas or parts of the installation not covered by the Permit to Work.
8. Electronic equipment can be damaged by certain electrical tests and therefore such equipment must be identified and isolated where required by the manufacturers.
9. Manufacturers' recommended isolation procedures are to be followed prior to testing being undertaken.

6.12 Where inspection, maintenance or testing identifies deterioration that may affect the ability of the equipment or installation to perform safely in a hazardous area, appropriate remedial measures should be taken.

6.13 Replacement equipment shall comply with BS EN 60079 and shall be ATEX certified in accordance with the requirements of DSEAR. For Non-EU locations please see section 2.2 of this document.

6.14 Alarm and Shutdown testing.

Control and instrumentation equipment installed in bulk fuel installations and on associated pipelines should be periodically tested to prove that they will effectively prevent risk of danger to:

- People.
- Plant.
- The Environment.

All protective devices should be tested so that the complete shutdown loop is proven. For example, a test should verify that when a high-pressure switch exceeds its set point, the pump set shuts down and the associated valves close to prevent the risk of danger or damage. This shall be achieved by use of calibrated, traceable to national standards, test equipment, i.e. standard test gauges, hydraulic pressure pump and Multimeters for pressure switches and transmitters.

6.15 The frequency of these tests would normally be determined at the design or when installation is altered or set by a Regulatory Authority known as the Integrity Levels. Integrity levels for safety related systems may be determined from the hazard and risk analysis of the equipment under control. Several different methodologies are available, but the process includes identification of hazards and the mechanisms which can initiate them, risk estimation (likelihood of occurrence),

and risk evaluation (overall risk based on likelihood and consequences). The risk estimation provides a measure of the risk reduction required to reduce the risk to a tolerable level.

Hazard identification results in the identification of safety functions which are required to control the risk.

For each system providing a safety function, a failure rate measure can be assigned which in turn determines the integrity required of the system. Alternatively, a qualitative approach (based on the likelihood and consequence of the hazard, and the frequency and level of exposure and avoid ability) may be used to define the required integrity as stated in IEC 61511.

6.16 Where the electrical installation is outside the hazardous area as defined by the DSEAR zonal classification and provided the circuit under test does not supply equipment with the hazardous area as defined by the DSEAR zonal classification. Then the electrical installation shall be in accordance with the current edition of BS 7671 Guidance Note 3. The results of the inspections and comments of the inspector should be reviewed to determine if a more frequent inspection regime is required.

6.17 The following tests shall be carried out (guidance on carrying out these tests is given in BS 7671 Guidance Note 3):

- Continuity Testing of Protective Conductors, Main and Supplementary Bonding.
- Continuity of Ring Final Circuit Conductors.
- Insulation Resistance Tests.
- Site Applied Insulation.
- Separation of Circuits.
- Barriers and Enclosures.
- Correct Polarity.
- Earth Electrode Resistance(s) Testing excluding Lightning Protection.
- Earth Loop Impedance Measurements.
- Residual current Devices (RCDs).
- Circuit Breakers, Isolators and Switching Devices.

The following tests shall be carried out to BSEN 62305:

- Lightning Protection Systems.

7. Withdrawal from service

7.1 If it is necessary for maintenance / repair purposes to withdraw equipment, etc., from service, the exposed conductors shall be:

- a. correctly terminated in an appropriate enclosure, or
- b. isolated from all sources of power supply and insulated, or
- c. isolated from all sources of power supply and earthed
- d. it shall be recorded that the item has been removed from service.

7.2 If individual items of equipment are to be permanently removed the associated wiring shall be isolated from all sources of power supply and shall be:

- a. removed, or
- b. correctly terminated in an appropriate enclosure / abandonment kit, or
- c. earthed at one end only and the other end of the cable shall be insulated by a secure means (e.g. heat shrink seals)
- d. it shall be recorded that the item has been removed from service.

8. Portable equipment

8.1 Portable electrical equipment (hand-held, portable, and transportable) is particularly prone to damage or misuse and therefore the interval between periodic inspections may need to be reduced.

The interval between periodic inspections shall not exceed the following without seeking expert advice from DIO Principal Electrical Engineer.

8.1.1 Hand-held and portable equipment shall be visually checked by the user, before each use, to ensure that the equipment is not obviously damaged.

8.1.2 All equipment shall be submitted to a close inspection at least every 12 months.

8.1.3 Enclosures which are frequently opened (such as battery housings) shall be given a detailed inspection at least every 6 months. The basis for changing the inspection period shall be documented.

9. Technical Authority

9.1 Technical advice and assistance on petroleum infrastructure matters can be obtained from DIO. Approaches may be made through local DIO offices or directly to the petroleum Technical Authority:

Principal Mechanical Engineer
Head of Mechanical and Fuels Infrastructure
Engineering & Construction
Technical Services,
Defence Infrastructure Organisation
RAF Mildenhall,
Building 680,
Bury St Edmunds,
Suffolk,
IP28 8NF
Tel: 01638 54 5835 MOD telephone: 9205 314 238 5835

This Technical Standard, Inspection, Maintenance and Testing of Equipment Installed at Petroleum Installations – Mechanical and Electrical, has been devised for use of the Crown and its contractors in the execution of contracts for the Crown and, subject to the Unfair Contracts Terms Act 1977, the Crown will not be liable in any way whatever including but without limited negligence on the part of the Crown its servants or agents) where the specification is used for other purposes.

Section 2

10. Inspection, Maintenance and Testing Index

10.1 Mechanical Works

Job No	Description of Job and Criteria
1.0	Petroleum Installations (General)
1.1	Valve pits, ducts, chambers, equipment buildings, access ways, bunds.
1.2	Mechanical equipment, fittings, pipework
2.0	Storage Tanks
2.1	General
2.2	Above ground tanks
2.3	Below ground tanks
3.0	Tank Ancillary Equipment
3.1	Low level – alarm/control
3.2	High level shut off valve – alarm/control
3.3	Contents gauges
3.4	Foot valves and strainers
3.5	Internal coils and heaters
3.6	Swing arm and floating suction units
3.7	Tank fire/dump valves
4.0	Environmental Containment
4.1	Tank bunds and equipment catchment areas
4.2	Oil interceptors and drain tanks
5.0	Pipelines and Pipework
5.1	Above ground pipework
5.2	Below ground pipework
6.0	Valves
6.1	Pressure relief/vacuum valves
6.2	Manually operated valves
6.3	Automatic valves
7.0	Monitoring Equipment
7.1	Maintenance of flow meters
7.2	Accuracy testing of meters
7.3	Pressure (and differential pressure) gauges
7.4	Leak detection equipment
7.5	Additive injection equipment

Job No	Description of Job and Criteria
8.0	Mechanical Equipment
8.1	Pumps and drivers.
8.2	Filters and strainers.
9.0	Fuelling Equipment
9.1	Fuel hoses and couplings.
9.2	Hydrant pit couplings and valves.
9.3	Loading arms and pantographs.
10.0	Marine Facilities
10.1	Off-shore unloading facilities.
10.2	Shore facilities – jetties, docks etc.
10.3	Floating and submarine hoses – sacrificial anodes.
10.4	Records.
11.0	Cathodic Protection
11.1	Maintenance of cathodic protection equipment.

10.2 Electrical Works

Job No	Description of Job and Criteria
	Within DSEAR Zonal Area
12.0	Visual Inspection - Equipment certified EEx'd'/FLP, EEx 'e - ATEX Category II (2G), or EEx 'n' (or variants) - ATEX Category II (3G).
13.0	Visual Inspection - Equipment certified EEx'i' (or variants) ATEX Category II 1G.
14.0	Visual Inspection - Equipment certified EEx'p' Equipment. Or ATEX Category II 2G.
15.0	Close Inspection - Equipment certified EEx'd'/FLP, EEx 'e - ATEX Category II (2G), or EEx 'n' (or variants) - ATEX Category II (3G).
16.0	Close Inspection - Equipment certified EEx'i' (or variants) ATEX Category II 1G.
17.0	Close Inspection - Equipment certified EEx'p' Equipment. Or ATEX Category II 2G.
18.0	Initial / Detailed Inspection of Electrical Equipment Certified EEx'd. Or ATEX Category II 2G.
19.0	Initial / Detailed Inspection of Electrical Equipment Certified EEx'e. Or ATEX Category II 2G.
20.0	Initial / Detailed Inspection of Electrical Equipment Certified EEx'i'. Or ATEX Category II 1G.
21.0	Initial / Detailed Inspection of Electrical Equipment Certified EEx'p'. Or ATEX Category II 2G.
22.0	Initial / Detailed Inspection of Electrical Equipment Certified EEx'n'. Or ATEX Category II 3G.
23.0	Inspection of Certified Electric Motors EEx'd /EEx'e/EEx'n' (or variant) ATEX Category II (2G) and (3G).
	All petroleum installations
24.0	Safety Signs and Notices.
25.0	Earthing.
26.0	Alarm and Shutdown Testing.
	Outside DSEAR Zonal Area
27.0	Continuity Testing of Protective Conductors, Main and Supplementary Bonding.
28.0	Continuity of Ring Final Circuits.
29.0	Insulation Resistance Tests.
30.0	Site applied Insulation.
31.0	Separation of Circuits.
32.0	Barriers and Enclosures.
33.0	Correct Polarity.
34.0	Earth Electrode(s) Resistance excluding Lightning Protection.
35.0	Earth Fault Loop Impedance.
36.0	Residual current Devices (RCDs).

Job No	Description of Job and Criteria
37.0	All petroleum installations Lightning Protection Systems.

11. Maintenance, Inspection and Testing Schedule

11.1 Mechanical Works

Job No	Description of Job and Criteria	Interval
1.0	Petroleum Installations (General)	
1.1	<p>All working areas (valve pits, ducts, chambers equipment buildings), access ways and bunds shall be inspected and where necessary items / products removed to ensure they are:</p> <ul style="list-style-type: none"> a) Clear of combustible materials, explosive hazards, loose equipment, standing water/oil and materials. b) Monitored for corrosion or damage to their integrity. c) All access ways are free from obstructions. 	3 Monthly
1.2	<p>All mechanical equipment, fittings and pipework shall be visually inspected for:</p> <ul style="list-style-type: none"> a) Fuel leaks. b) Coating defects and deterioration. c) Mechanical damage. <p>This Technical Standard does not cover inspection and maintenance of buildings at petroleum installations. However, any defects identified during inspections that could pose a possible threat to building or equipment integrity should be reported to the Operating Authority.</p>	3 Monthly
2.0	Storage tanks	
2.1	<p>General.</p> <p>Records of all tank inspections, tests, repairs, and any other remedial actions are to be maintained for the operational life of the tank.</p> <p>Where installed, cathodic protection on tanks should be maintained in accordance with Job No 11.1 and in accordance with the manufacturer's recommendations.</p>	
2.2	Above ground tanks	
2.2.1	<p>Internal tank cleaning.</p> <p>Internal tank cleaning is to be undertaken prior to any of the following operations:</p> <ul style="list-style-type: none"> a) Internal tank inspection. b) Clearing of accumulated solid matter, silt or wax on the tank floor and fittings. c) Performance of maintenance and repairs inside tank. d) A change of product to be stored is required by the Operating Authority. e) The tank is being taken out of commission. 	

Job No	Description of Job and Criteria	Interval
2.2.2	<p>Tank cleaning is to be undertaken by competent contractors or depot personnel (experienced in working in confined spaces) in accordance with JSP 375 Part 2 Volume 3 Chapter 5 Petroleum and the requirements of EI/JIG 1530.</p> <p>External inspection.</p> <p>The exterior of above ground storage tanks shall be visually inspected for:</p> <ul style="list-style-type: none"> a) Signs of leaks, drips, or spills. b) Tank (or support) settlement. Ensure rainwater is being diverted away from base and check for leakage from tank base. c) Mechanical damage or corrosion on shell and roof plates (deformations, dents, warping, laminations). d) Where tank bottom can be viewed inspect for damage and corrosion, particularly on supports or saddles. e) Cracks and signs of stress, deterioration or leakage from manways, nozzles and reinforcing plates. f) External protection/coating damage on tank roof/shell and associated appurtenances. g) Integrity of steelwork and corrosion/damage to wind girder and access stairways/ladders. h) Correct operation and condition of pipework and ancillary equipment (as Job No 3). i) On floating roof / pontoon type tanks inspect roof seal systems (refer EEMUA 159 section 12.3 – Roof Seals). j) Inspect wire gauze, hoods and flame arrestors fitted to free vents in tank roof to ensure free from dirt and debris. <p>Special attention should be given to vulnerable areas such as welded or riveted seams, saddles, water ingress or lodgement which could lead to corrosion (e.g. tank toe sealing).</p>	3 Monthly
2.2.3	<p>Internal Inspection.</p> <p>Internal tank inspection shall be undertaken to determine the:</p> <ul style="list-style-type: none"> a) Condition of the internal tank lining. b) Mechanical integrity of the storage tank and its internal mechanical component. 	Ref Job No. 2.2.4

Job No	Description of Job and Criteria	Interval		
2.2.4	<p>All surfaces and seams shall be inspected for signs of leaks, corrosion, pitted plates and breakdown or damage to lining material.</p> <p>Internal tank equipment shall be inspected in accordance with the requirements of Job Nos. 3.1 to 3.7 inclusive.</p> <p>For detailed procedures and inspection scope refer to API standard 653 and EEMUA 159 – Tank Inspection, Repair, Alteration and Reconstruction.</p> <p>After inspection and completion of any other necessary internal works, the manholes shall be replaced (using new gaskets with cleaned and greased bolts).</p> <p>The following information shall be stencilled on the manhole cover in 25mm letters:</p> <ul style="list-style-type: none"> a) Date of inspection and/or cleaning. b) Carried out by. c) Date of next inspection/clean. <p>Tank Internal Inspection Frequency.</p> <p>The frequencies provided below are for aviation fuel tanks. The frequency of inspection for other fuel tanks should be determined by the Inspector undertaking the Professional Inspection of Petroleum Installations and Flammable Dangerous Goods Stores in accordance with extant Practitioner Guide.</p> <p>Internal inspection of steel tanks shall take place in accordance with the schedule below, unless previous inspection reports indicate that a shorter frequency is required.</p>			
	Tank Interior Uncoated	Tank Interior Coated		
Tank type	Without inlet filter/ separator	With inlet filter/ separator	Without inlet filter/ separator	With inlet filter/ separator
Operating Tanks (i.e. tanks which directly serve refuelling vehicles or hydrant systems)	3 years	5 years	5 years	8 years. 5 years **
Bulk Storage or buffer tanks	4 years	6 years * 5 years **	6 years 5 years **	8 years 5 years **
Bulk Storage (barge or tanker delivery)	3 years	5 years *	5 years	8 years 5 years **
Drain Tanks (fuel recovery unit)	Normally inspected and cleaned concurrently with the inspection/cleaning of operating storage tank (this does not apply to small drain or slop tanks with limited access.)			

Job No	Description of Job and Criteria	Interval
<p>2.3.2</p> <p>2.3.3</p> <p>2.3.4</p>	<p>e) Composite – double skin.</p> <p>External inspection.</p> <p>In general, it is not possible to carry out a full external inspection of buried or mounded tanks.</p> <p>Where tell-tales have been installed beneath the tank bases, these should be monitored to check for product leaks.</p> <p>Internal inspection.</p> <p>Where internal access to the tank is possible, inspection should be in accordance with 2.2.3.</p> <p>Tank Non-Destructive Testing (NDT).</p> <p>Single skin tanks.</p> <p>Where neither internal nor external inspection of buried or mounded tanks can be undertaken, they should be subjected to a precision tightness test in years 20, 25, 30 and every 2 (two) years from 30 - 35 years thereafter annually, unless the underground tank assessment in accordance with the extant version of the Technical Standard for the Inspection of Petroleum Installations and Flammable Dangerous Goods Stores indicates a shorter period is required.</p> <p>Where internal access to the tank is possible, NDT shall be carried out as determined by the professional inspection in accordance with the extant Technical Standard for the Inspection of Petroleum Installations and Flammable Dangerous Goods Stores.</p> <p>The data from the test results shall be used to determine the tank life expectancy and the date of the next inspection.</p> <p>Double skin tanks.</p> <p>Double skin tanks do not need to be tightness tested, provided the tank is fitted with an automatic interstitial leak detection facility.</p> <p>If a leak detection facility has not been fitted the tank should be tested as a single skin tank.</p>	<p>Monthly</p>
<p>3</p> <p>3.1</p>	<p>Tank ancillary equipment</p> <p>Where an Automated Tank Gauging system is installed this shall be maintained in accordance with manufacturers recommendations.</p> <p>Low level – alarm/control.</p> <p>Check the operation of low-level alarm/control when the tank is being emptied (or by manual over-ride).</p>	<p>As Required</p> <p>12 Monthly when tank is being emptied</p>

Job No	Description of Job and Criteria	Interval
3.2	<p>Ensure pump stops and alarm is given when the liquid level drops to the desired cut-off level, or the pump loses suction.</p> <p>Maintain the equipment in accordance with the manufacturer's recommendations.</p> <p>High level shut-off valve – alarm/control.</p> <p>When tank is empty inspect the float mechanism (or other high level shut off/alarm mechanism) for:</p> <ul style="list-style-type: none"> a) Ease of operation. b) Corrosion and or deterioration. c) Fuel in float chamber. <p>When tank is being filled (or by manual override) check:</p> <ul style="list-style-type: none"> a) The high level shut off control valve (or alarm) operates and shuts off fuel into the tank. b) The high and high/high level alarms operate, and relay signals as required. <p>Maintain the equipment in accordance with the manufacturer's recommendations.</p>	<p>12 Monthly when tank is empty</p> <p>12 Monthly</p>
3.3	<p>Contents gauge:</p> <ul style="list-style-type: none"> a) Inspect sensing heads, probes, floats, wires, and other contents gauge components b) Check working isolations on external contents gauges and condition of sight glass. <p>Maintain in accordance with manufacturers recommendations.</p>	<p>Internal when empty</p> <p>External Equipment 12 Monthly</p>
3.4	<p>Foot valves and strainers.</p> <p>Inspect foot valves and strainers ensuring they are:</p> <p>Clean and free from sludge.</p> <p>Operate freely and seat/seal correctly.</p> <p>Maintain in accordance with the manufacturer's recommendations.</p>	<p>Following internal tank cleaning or inspection</p>
3.5	<p>Internal coils and heaters.</p> <p>Inspect coils and heaters for:</p> <ul style="list-style-type: none"> a) Mechanical damage. b) Evidence of corrosion. c) Security of fixing. <p>The coils should be pressure tested to 150% of normal working pressure.</p>	<p>Following internal tank cleaning or inspection</p> <p>36 Months</p>
3.6	<p>Swing arm and floating suction units.</p> <p>Inspect and test units for:</p>	<p>External equipment –12 Monthly</p>

Job No	Description of Job and Criteria	Interval
<p>3.7</p> <p>4.0</p> <p>4.1</p> <p>4.2</p>	<p>a) Mechanical damage and corrosion.</p> <p>b) Fuel in floats.</p> <p>c) Ease of operation.</p> <p>d) Integrity of winch rope and anchorages.</p> <p>e) Safe operation of winch.</p>	Internal equipment following emptying/cleaning
	<p>Replace seals on swing arm units.</p>	As manufacturers recommendations
	<p>Tank fire/dump valves.</p> <p>a) Inspect and test for correct operation.</p>	12 Monthly
	<p>4.0 Environmental containment</p>	
	<p>4.1 Secondary containment tank bunds and equipment catchment areas.</p>	
	<p>Visually inspect and check the following items:</p>	
	<p>a) Bunds (including equipment catchment areas) and their sumps shall be checked for (construction and expansion) joint integrity, spalling or cracking of concrete.</p>	3 Monthly
	<p>b) Check integrity of seals for pipework passing through concrete bund walls (pipework for draining water from the bund shall not pass through the bund wall).</p>	3 Monthly
	<p>c) Check for correct operation of level alarms in bund and catchment area sumps (where installed).</p>	3 Monthly
	<p>d) Ensure integrity of any drainage pipe or channel (where installed) between tank bund or catchment area and interceptor.</p>	3 Monthly
	<p>e) Where practicable, conduct bund integrity test (water tightness test).</p> <p>Quantities of water required to conduct a water tightness test on bunds for tanks of 500,000 litres or greater may be impractical. Where this is the case, a detailed visual inspection of the bund should be completed instead of the water tightness test. This inspection should comprise of a visual inspection of bund construction and associated joints, assessing any deterioration, cracks in concrete and inspect the condition of the sealant. The inspection should be completed by a suitably qualified and experienced person. Photographic evidence of any defects should be recorded, and details of any remedial action specified.</p>	36 Months
	<p>4.2 Oil interceptors and drain tanks.</p> <p>Oil interceptors and drain tanks to be maintained in accordance with the manufacturer's recommendations.</p> <p>This to include:</p> <p>a) Visual check on interceptor outflow for signs of petroleum product</p>	Weekly
	<p>b) Check levels of petroleum product within interceptor. Excessive levels require investigation</p>	Weekly
	<p>c) Check for damage, leakage, or malfunction</p>	3 Monthly
	<p>d) Check for sludge and debris</p>	3 Monthly

Job No	Description of Job and Criteria	Interval
<p>5.0</p> <p>5.1</p> <p>5.2</p>	<ul style="list-style-type: none"> e) Check correct operation of gauges and high-level alarms f) Sample outflow for hydrocarbons g) Clean when required 	<p>3 Monthly</p> <p>3 Monthly</p> <p>As Required</p>
	<p>Pipelines and Pipework</p>	
	<p>Above ground pipework.</p>	
	<p>The following shall be visually inspected on all above ground pipework:</p>	
	<ul style="list-style-type: none"> a) Check for leaks from pipework and joints, with the system under highest working pressure. 	<p>3 Monthly</p>
	<ul style="list-style-type: none"> b) Inspect pipework for signs of mechanical damage or movement. 	<p>3 Monthly</p>
	<ul style="list-style-type: none"> c) Inspect pipe supports and anchors. 	<p>3 Monthly</p>
	<ul style="list-style-type: none"> d) Visually inspect the pipework for deterioration/corrosion and damage to coating/wrap material. 	<p>3 Monthly</p>
	<ul style="list-style-type: none"> e) Check bonding/grounding. 	<p>6 Monthly</p>
	<ul style="list-style-type: none"> f) Check to ensure isolation from buried cathodic protection systems. 	<p>6 Monthly</p>
<ul style="list-style-type: none"> g) The following detailed inspection shall also be undertaken. 	<p>12 Monthly</p>	
<p>Perform UT (ultrasonic test) on pipework at 12, 3, 6, and 9 o'clock positions to confirm residual wall thickness. The position of testing points along the pipeline length should include those areas likely to be affected by high corrosion. e.g. road crossing, culverts, and low points.</p>		
<p>The locations and results of UT inspections shall be recorded, and repeat measurements taken during subsequent inspections, to allow rate of deterioration and residual life to be assessed.</p>	<p>Up to 36 Months</p>	
<p>Once trends can be established, and deterioration and residual life assessed, consideration can be given to extending the frequency up to 36 months.</p>		
<p>Following UT inspections, should the results give concerns on the condition of the pipework, consideration should be given to completion of an LRUT survey to determine a more detailed report on the condition of the pipework.</p>	<p>As Required</p>	
<p>Below ground pipework.</p>		
<p>The following checks/inspections should be undertaken:</p>		
<ul style="list-style-type: none"> a) Ground above buried pipelines/pipework should be checked for signs of leakage, for example dead vegetation etc. 	<p>3 Monthly</p>	
<ul style="list-style-type: none"> b) Pipework within culverts should be inspected for signs of leakage. 	<p>6 Monthly</p>	
<ul style="list-style-type: none"> c) All single skin pipelines/pipework designed to ANSE B31.3 shall be pressure tested at a minimum of 12 Bar for a period of 1 hour. 	<p>36 Months</p>	
<p>Where applicable pressure testing is to be undertaken in accordance with Technical Standard for Specialist Works on Petroleum Installations – Mechanical.</p>		
<ul style="list-style-type: none"> d) Where pipework does not have Cathodic Protection a coating survey is required to determine condition of the steel pipeline. 	<p>36 Months</p>	
	<ul style="list-style-type: none"> e) Testing of un-monitored twin wall buried pipework is to be carried out for proof of soundness. 	<p>6 Monthly</p>

Job No	Description of Job and Criteria	Interval
	<p>f) Non-destructive inspection of Cross Base Pipelines and sub-sea pipelines (PRE to PLEM). The technique to be used for the inspection shall be agreed in consultation with the Technical Authority. Typically, this shall be through techniques such as Intelligent Pigging or Long-Range Ultrasonic Thickness Testing.</p> <p>The frequency of this task shall be conducted every nine years, unless the results of the previous inspections indicate more frequent intervals are required.</p> <p>For cross base pipelines, in years when this task is due, it is not necessary to complete the pressure test specified in task (c).</p> <p>For sub-sea pipelines, it may be beneficial to tie this task in with the out of water inspection and testing of sub-sea hoses (3 yearly cycle).</p>	9 Yearly
6.0	Valves	
6.1	<p>Pressure/Vacuum valves.</p> <p>Test pressure relief and vacuum valve operation under simulated pressure and vacuum conditions. Maintain in accordance with manufacturers recommendations. This should include maintenance of the flame arrestor where fitted.</p>	24 months or as recommended by valve manufacturer if sooner
6.2	<p>Manually operated valves.</p> <p>Manually operated valves (including vent and drain valves) shall be maintained in accordance with the manufacturer's recommendations. This shall include:</p> <ul style="list-style-type: none"> a) Examination for leaks. b) Checks for deterioration and corrosion. c) Manually operate valve to check for ease of operation. d) Lubrication and repacking. 	<p>3 Monthly</p> <p>3 Monthly</p> <p>3 Monthly</p> <p>As required</p>
6.3	<p>Automatic Valves.</p> <p>Automatic valves (as detailed below) and including control valves are to be maintained in accordance with the manufacturer's recommendations. This shall include checks for:</p> <ul style="list-style-type: none"> 1. Fuel leaks. 2. Deterioration and corrosion on external casing. 3. Correct operation of valve. For example, simulate the required conditions to evaluate if the valves operate within the prescribed criteria. <ul style="list-style-type: none"> a) Pressure reducing. <p>Ensure a constant pre-set pressure in accordance with the operating criteria is maintained regardless of flow.</p> b) Flow control. <p>Ensure the pre-set rate of product flow is achieved in accordance with the operating criteria regardless of the line pressure at the valve inlet</p> <ul style="list-style-type: none"> c) Surge arrestor. <p>Ensure the downstream pressure will rise to no more than 110% of the normal operating pressure.</p>	<p>3 Monthly</p> <p>3 Monthly</p> <p>12 Monthly</p>

Job No	Description of Job and Criteria	Interval
	<p>The unit charge pressure should be checked in accordance with the manufacturer's recommendations.</p> <p>d) Shut off.</p> <p>Ensure 'full flow' and 'shut off' and that the surge pressure is limited to not more than 10% above the safe working pressure of the system.</p>	
<p>7.0</p> <p>7.1</p>	<p>e) Check valve.</p> <p>Ensure the valve closes against reverse flow.</p> <p>f) Overfill protection valves.</p> <p>Ensure valve operates at the pre-set level of fuel in tank.</p> <p>g) Air eliminators.</p> <p>Ensure air is vented during filling operation and check no product leakage when vessel is full.</p> <p>h) Thermal and Pressure Relief</p> <p>Conduct a visual inspection of thermal and pressure relief valves.</p> <p>4. Thermal and Pressure Relief.</p> <p>Thermal Relief Valves shall be maintained as per API 576 and should undergo a thorough overhaul as per the below requirements:</p> <ul style="list-style-type: none"> • As-received Pop Pressure – the inlet pressure should be slowly increased. The pressure at which the valve relieves should be recorded. • Inspection – Following the pressure test, the valve should be dismantled, and the internal parts assessed. • Repair - Parts that are worn beyond tolerance or damaged should be replaced or reconditioned and the valve rebuilt. • Setting Test – The spring should be adjusted and the pressure under the valve raised to ensure the valve will relieve at the correct pressure relieves. • Check Test – Following any adjustment, the valve should be popped at least once to prove the accuracy of the setting. The deviation of the pop pressure from the set pressure should not exceed 3% for set pressures over 4.8 Bar. • Testing of pressure relief devices should be done by a certified body, the organisations ISO 9001 certification should cover relief valves and testing. A certificate should also be issued for each valve, detailing the results of the examination. <p>5. Control Valves</p> <p>Inspect internal components of all control valves for deterioration and replace as required</p> <p>The method of test and the results are to be recorded and compared with historic data to identify trends.</p> <p>Where correct operation of automatic valves is not proven, repair or replacement should be undertaken in accordance with the manufacturer's recommendations</p>	<p>5 Yearly</p> <p>10 Yearly</p>

Job No	Description of Job and Criteria	Interval
7.2	<p>Flow meters shall be maintained in accordance with the manufacturer's recommendations. This shall include:</p> <ul style="list-style-type: none"> a) Check for leaks and inspect for deterioration and corrosion b) Legibility of register c) Lubrication <p>Accuracy testing of meters</p> <p>The meter is to be tested using a master meter connected in series. Certificate of accuracy should be available for the master meter together with correction factors for flow, pressure, and viscosity.</p> <ul style="list-style-type: none"> a) The test conditions i.e. flow, and pressure shall be similar to normal operating conditions. b) Test quantity shall be 4 (four) times the maximum rated capacity of the meter. c) Aviation bulk meters are to be accurate to +/- 0.1% at the test flow rate. d) The following records shall be maintained at individual establishments: <ul style="list-style-type: none"> • Date of test. • Serial number of the meter under test. • Serial number of master meter including copy of calibration certificate • Rate of flow and pressure during test. 	<p>3 Monthly</p> <p>3 Monthly</p> <p>As required</p> <p>12 Monthly</p>
7.3	<ul style="list-style-type: none"> • Master meter reading and test meter reading after test. • Tester's details. • Any remedial actions required <p>Pressure (and differential pressure) gauges and transmitters:</p> <ul style="list-style-type: none"> a) Pressure gauges shall be calibrated over their full working range against an approved master meter or with a suitable test rig. Deviations between the gauge under test and the master meter are to be noted and repair/replacement undertaken as required <p>The maximum permissible error on differential gauges is +/- 0.5 psi.</p> <ul style="list-style-type: none"> b) Correct function of transmitters shall be checked 	<p>12 Monthly</p> <p>12 Monthly</p>
7.4	<p>Leak detection equipment.</p> <p>Leak detection equipment shall be maintained in accordance with the manufacturer's recommendations. This shall include:</p> <ul style="list-style-type: none"> a) Inspection for leaks. <p>Leaks are to be simulated on monitored pipework, tanks, or equipment to check correct operation of the leak detection system (within its designated sensitivity).</p> <ul style="list-style-type: none"> b) Check for deterioration and corrosion. 	<p>3 Monthly</p> <p>3 Monthly</p>
7.5	<p>Additive injection equipment.</p> <p>Additive injection equipment shall be maintained in accordance with the manufacturer's recommendations. This shall include:</p>	

Job No	Description of Job and Criteria	Interval
<p>8.0</p> <p>8.1</p>	<p>a) Inspection for leaks and checks for deterioration and corrosion.</p> <p>b) Calibration of injection equipment with checks to ensure correct dosing rates.</p> <p>Mechanical Equipment</p> <p>Pumps and drivers.</p> <p>Pumps and their drivers shall be maintained in accordance with the manufacturer's recommendations.</p> <p>1. Maintenance activities shall include:</p> <p>a) Lubrication of bearings, seals, and glands. Levels of oil/lubricant/coolant to be checked.</p> <p>b) Check pump coupling alignment and bolt torque settings.</p> <p>c) Check pump primer unit and air relief valves for correct operation.</p> <p>d) Check correct operation of by-pass valve positive displacement pumps.</p> <p>e) Check operation of centrifugal pumps for product circulation.</p> <p>2. Check correct operation of pumps and drivers, noting:</p> <p>a) Any leaks.</p> <p>b) Excessive vibration.</p>	<p>3 Monthly</p> <p>12 Monthly</p> <p>3 Monthly or as required by maintenance guidelines</p> <p>6 Monthly</p>
<p>8.2</p>	<p>c) High bearing temperature.</p> <p>d) Operating pressure and flow.</p> <p>e) Lubricant levels.</p> <p>Ensure correct operation of pump/driver monitoring systems (high temperature, vibration, over-speed protection etc).</p> <p>Filters and strainers (inc. filter water separators fuel monitors and pre-coat filters).</p> <p>Performance requirement and test methods for filter water separators, gasoline and kerosene fuels are detailed in Defence Standard 49 – 3.</p> <p>Filter water separators, fuel monitors and pre-coat filters shall be maintained in accordance with the manufacturer's recommendations. This shall include:</p> <p>a) Inspect unit for leaks, mechanical damage, and corrosion.</p> <p>b) Ensuring correct operation of unit.</p> <p>c) Test automatic water drains (where fitted) in accordance with manufacturers approved original test procedure.</p> <p>d) Filter Water Separator.</p> <p>Replace/clean Elements when differential pressure across the filter exceeds 1 Bar (15 PSI) at (or corrected to) the maximum operating flow rate through the filter vessel or at 36 months, for the coalescer, whichever occurs soonest.</p> <p>It should be noted that media filters may not require changing at 36 months. The requirement for changing these filters should be assessed when changing coalescer filters. Elements should comply with EI 1581. Filter data plates shall comply with the requirements of EI 1596.</p> <p>e) Pre-Coat Filter.</p>	<p>6 Monthly</p> <p>6 Monthly</p> <p>6 Monthly</p> <p>As Required</p>

Job No	Description of Job and Criteria	Interval
<p>9.0</p> <p>9.1</p>	<p>Replace filter media. The criteria for replacing the filter media will be advised by the Fuels Operating Authority.</p> <p>f) Filter Vessels.</p> <p>Test the earth bonding of all metal internal components of filter vessels during the replacement of filter elements. Resistance between each metal component shall be 10 ohms or less. Testing to be in accordance with API/EI 1550.2007 annex L.</p> <p>g) Ancillary equipment on the units (air eliminators, test drain valves, differential pressure gauges and pressure relief valves) shall be maintained in accordance with the relevant sections of this Technical Standard.</p> <p>Details of inspections and tests undertaken should be recorded in the maintenance register, together with dates of cartridge replacement – which should also be stencilled on the outside of the unit.</p> <p>An approved procedure for isolation, drain down and refill of the unit, must be followed.</p> <p>Fuelling Equipment</p> <p>Fuel hoses and couplings.</p> <p>Hoses and their couplings shall be maintained in accordance with the manufacturer's recommendations. This shall include:</p>	<p>As Required</p> <p>6 Monthly</p>
<p>9.2</p> <p>9.3</p>	<p>a) Visual inspection to check for any damage to hose or couplings.</p> <p>b) Check screw threads and coupling mating surfaces for cracks, mechanical damage or corrosion and ensure they are clean and that the seals are in good condition.</p> <p>c) Check dry break couplings function correctly.</p> <p>d) Lubricate and maintain couplings.</p> <p>e) Electrical continuity test of hose.</p> <p>f) Pressure testing of hose assembly. Testing to be in accordance with manufactures recommendations.</p> <p>g) Hoses should be replaced at 10 years old.</p> <p>Hydrant pit couplings and valves.</p> <p>Hydrant pit coupling/valves shall be maintained in accordance with the manufacturer's recommendations. This shall include:</p> <p>a) Pit box inspection, checking for water/fuel, condition of lining and pit lid seal.</p> <p>b) Check valve and components are free from leaks.</p> <p>c) Inspection of operating handles and associated cables/connections.</p> <p>d) Manually determine integrity of the main valve seal.</p> <p>e) Test closure time of valve is between 2 and 5 seconds.</p> <p>Loading arms and fixed pantographs.</p> <p>Loading and pantographs shall be maintained in accordance with the manufacturer's recommendations. This shall include:</p>	<p>3 Monthly</p> <p>3 Monthly</p> <p>3 Monthly</p> <p>As Required</p> <p>6 Monthly</p> <p>12 Monthly</p> <p>10 Yearly</p> <p>Monthly</p> <p>Monthly</p> <p>Monthly</p> <p>Monthly</p> <p>3 Monthly (without dead man's handle)</p> <p>6 Monthly (with dead man's handle)</p>

Job No	Description of Job and Criteria	Interval
	<ul style="list-style-type: none"> a) Inspection for mechanical damage and corrosion. b) Check for any leaks. c) Check operation is free in action. d) Lubrication as required. e) Pressure test to 150% of normal working pressure. 	<ul style="list-style-type: none"> 3 Monthly 3 Monthly 6 Monthly As Required 12 Monthly
10.0	Marine Facilities	
10.1	<p>Off-shore unloading facilities.</p> <p>The following inspections should be undertaken:</p> <ul style="list-style-type: none"> a) Offshore flexible hoses shall be maintained in accordance with the manufacture's recommendation and OCIMF Single Point Mooring Maintenance & Operation Guide 3rd edition (SMOG). This should also include inspection and testing of critical spare hoses held on site. Also included is the requirement to inspect and test hoses prior to taking into service as part of the existing hose string. b) Inspect navigation aids and mooring buoys for correct operation and for evidence of damage and/or possible movement/dragging by vessels, currents, or winds. c) After every storm, floating hose 'strings' should be inspected for damage. d) Mark wrecks or other navigational hazards and initiate action for their removal. e) Inspect mooring hawsers, lines, deck hoses, chains, flange adaptors, gaskets and any other gear used in the mooring of vessels and in the connecting tanker, unloading hoses to the side of tanker or to the tanker's manifold. f) Divers should inspect tanker offloading hoses, navigational and mooring buoys and their mooring chains, shackles, and anchors for signs of developing failures or signs of rapid wear of parts subject to wave motion or abrasion on the ocean floor. g) Divers should inspect subsea pipeline end manifolds for damages and leaks. Manual valves should be operated, and any debris cleared. h) Hydrostatically test the entire unloading system to 150% of normal working pressure. i) Damage found on hoses by inspections, should be repaired in accordance with the manufacturers recommendations or the hose be replaced. j) All lifting equipment including pickup buoys, pick up chains and snubbing chain are to be inspected and maintained in accordance with Lifting Operations and Lifting Equipment Regulations (LOLER). k) Maintain the breakaway safety coupling to include refurbishment and renewal of load certification. Where manufacturers recommendations detail a more frequent requirement than 36 months, this should be followed. 	<ul style="list-style-type: none"> As Required 3 Monthly As Required As Required At Each Use 12 Monthly 12 Monthly 36 Months As Required 12 Monthly 36 Months
10.2	Shore facilities – jetties, docks etc.	

Job No	Description of Job and Criteria	Interval
10.3	<ul style="list-style-type: none"> a) Inspect pipelines, valves, and dock/jetty hoses for signs of mechanical damage, deterioration, or corrosion. b) Inspect all mooring lines, cleats, bollards, bits, pulley blocks and steel wire ropes and winches for signs of damage. c) Inspect dock/jetty for signs of serious damage. d) Hydrostatically test the entire unloading system to 150% of maximum working pressure. <p>Floating and submarine hoses – sacrificial anodes.</p> <p>Sacrificial anodes, attached to flanged joints in the ‘hose string’, shall be checked for degradation during any routine inspection.</p>	<p>3 Monthly</p> <p>3 Monthly</p> <p>3 Monthly</p> <p>36 Months</p> <p>As Required</p>
10.4	<p>Records.</p> <p>Record cards should be kept for each individual hose (submerged or floating) giving the following details:</p> <ul style="list-style-type: none"> a) Hose reference number. b) Initial test date and pressure. c) Date installed. d) Hose position in the ‘string’. 	<p>As Required</p>
11.0	<ul style="list-style-type: none"> e) In-situ test dates and pressures. f) Extension at test. g) Details and date of any repairs undertaken. h) Date removed from service. <p>Cathodic Protection</p>	
11.1	<p>Maintenance of cathodic protection equipment.</p> <p>Cathodic protection equipment shall be maintained in accordance with the designers/manufacturers recommendations. This shall include as a minimum</p> <ul style="list-style-type: none"> a) Check power source for supply. b) Inspect rectifier/anodes for signs of damage. c) Record voltage and ampere measurements. d) Undertake a potential measurement survey e) Check correct function of isolating flanges and joints 	<p>6 Monthly</p> <p>6 Monthly</p> <p>6 Monthly</p> <p>12 Monthly</p> <p>6 Monthly</p>

11.2 Electrical Works

Hazardous Area installed equipment

Job No	Description of Job and Criteria	Interval
12.0	<p>Visual Inspection</p> <p>Equipment certified EEx'd'/FLP, EEx 'e - ATEX Category II (2G), or EEx 'n' (or variants) - ATEX Category II (3G).</p> <p>This inspection shall be carried out in accordance with BS EN 60079 Part 17.</p> <p>Check that:</p> <ul style="list-style-type: none"> a) Equipment certification details meet the minimum requirement of Hazardous Area Classification Drawing. b) Cable entry devices, adapters and stop plugs are compatible with the enclosure certification, (no more than one adapter per gland), and are fitted correctly. c) Enclosure, glasses, and glass/metal seals are satisfactory. d) All cover bolts are fitted, tight and of the correct type (visual check only). e) The sealing of trunking, ducts, pipes and or conduits is satisfactory (visual check only). f) Proximity of surfaces to flange faces > 10 mm for IIA subgroup (Ex'd' only). g) No visible unauthorised modifications have taken place. h) Earthing and any supplementary bonds are satisfactory (visual only). i) Check that there is no obvious damage to cables, cable sheaths or cable glands. j) Check protection against the weather and corrosion is adequate. k) Check that there is no undue accumulation of dust and dirt. <p>Record findings on the 'Visual Inspection Checklist for EX'd' or Ex'e' or Ex'n' Equipment as appropriate.</p> <p>Check cable markers, equipment ID and certification labels are correct, legible and in place, correct as necessary.</p> <p>All non-conformities with the above should be recorded on the checklist. If the integrity of the method of protection has been affected rectification works should be undertaken immediately.</p>	As detailed in para 6.8
13.0	<p>Visual Inspection: Equipment certified EEx'i' (ATEX Category II 1G)</p> <p>This inspection shall be carried out in accordance with BS EN 60079 Part 17.</p> <p>SAFETY</p> <p>Visual Inspection may be carried out on live equipment/circuits. Only Intrinsically Safe certified test equipment to BS EN 5501 may be used on the hazardous side of any safety barrier or energy limiting device. Any circuit disconnected from the specified safety barrier is no longer Intrinsically Safe unless it is connected to Intrinsically Safe earth.</p>	As detailed in para 6.8
	<p>Defects should be rectified during the inspection if practicable and recorded on the inspection sheet, where the defect materially affects type of protection and cannot be rectified immediately the equipment should be removed from service.</p>	

Job No	Description of Job and Criteria	Interval
14.0	<p>EQUIPMENT</p> <p>1. Documentation. The following documentation is required as a minimum. (Specified in BS EN 60079-17 5.3).</p> <ul style="list-style-type: none"> a) Circuit safety documents, where appropriate; manufacturer, equipment type, and certificate numbers, category, equipment group and temperature class. b) Where appropriate, electrical parameters such as capacitances and inductances, length, type, and route of cables. c) Special requirements of the equipment certificate, and detailed methods by which such requirements are met in the installation. d) Physical location of each item of plant. <p>2. Unauthorised modifications.</p> <ul style="list-style-type: none"> a) Check that no visible unauthorised modification has taken place. b) Electronic equipment shall only be repaired by OEM apart from dry joints. <p>3. Safety Barrier Units.</p> <ul style="list-style-type: none"> a) Safety barrier units, relays and other energy limiting devices are to be of the approved type, installed in accordance with the certification requirements and securely earthed where required. <p>INSTALLATION</p> <p>1. Cables.</p> <ul style="list-style-type: none"> a) Check that there is no obvious damage to cables. b) Check that the sealing of trunking, ducts, pipes and or conduits is satisfactory. c) Check that cables not in use are correctly terminated. <p>2. Check that earthing conductors maintain the type of protection.</p> <p>3. Check that separation is maintained between intrinsically safe and non-intrinsically safe circuits in common distribution boxes or relay cubicles.</p> <p>4. Check that equipment is adequately protected against weather, corrosion, vibration, and other adverse factors.</p> <p>5. Check that there is no undue external accumulation of dust and dirt.</p> <p>Visual Inspection: Equipment Certified EEx'p' (ATEX Category II 2G) This inspection shall be carried out in accordance with BS EN 60079 Part 17. All interconnected equipment shall be inspected together. The inspection of each item shall be appropriate to its type of protection. Where the type of protection certificate number has an X as a suffix the special condition of use should be referred to, prior to commencing inspection.</p>	As detailed in para 6.8
	<p>Motors are not covered by this job.</p> <p>Any enclosure opened to adjust or calibrate or to investigate a defect shall be inspected against the detailed checklist.</p> <p>EQUIPMENT</p>	

Job No	Description of Job and Criteria	Interval
15.0	<p>Check that:</p> <ul style="list-style-type: none"> a) Equipment is certificated appropriate to area classification. b) Equipment certification is available. c) Enclosure, glass parts and glass to metal sealing is in good condition. d) There are no visible unauthorised modifications. <p>INSTALLATION</p> <p>Check that:</p> <ul style="list-style-type: none"> a) The cable is not obviously damaged. b) Earthing connections, including any supplementary earthing connections are satisfactory, visual only. c) Ducts, pipes, and enclosures are in good condition. d) Protective gas is substantially free from contaminants. e) Protective gas pressure and or flow is adequate. <p>ENVIRONMENT</p> <p>Check that:</p> <ul style="list-style-type: none"> a) Equipment is adequately protected against corrosion, weather, vibration, and other adverse factors. b) There is no undue accumulation of dust and dirt. <p>Close Inspection of Equipment certified EEx'd'/FLP, EEx 'e' - ATEX Category II (2G), or EEx 'n' (or variants) - ATEX Category II (3G)</p> <p>This does not require isolation or the opening of the enclosures (this schedule is does not apply to motors).</p> <p>Check that:</p> <ul style="list-style-type: none"> a) Equipment certification details meet the minimum requirement of gas subgroup IIB, temperature classification T3 or better. b) Cable glands, adapters and stop plugs are of appropriate type, (no more than one adapter per gland), and are fitted correctly. c) Enclosure, glasses, and glass/metal seals are satisfactory. d) All cover bolts are fitted, tight and of the correct type. e) The sealing of trunking, ducts, pipes and or conduits is satisfactory. f) Flange gap dimensions are < maximum allowed (Ex'd' only). g) Proximity of surfaces to flange faces > 10 mm for IIA subgroup (Ex'd' only). 	As detailed in para 6.8
	<ul style="list-style-type: none"> h) No visible unauthorised modifications have taken place. i) Earthing and any supplementary bonds are satisfactory (visual only). j) Check that there is no obvious damage to cables, cable sheaths or cable glands. k) Check protection against the weather and corrosion adequate. l) Check that there is no undue accumulation of dust and dirt. 	

Job No	Description of Job and Criteria	Interval
16.0	<p>Record findings on the 'Close Inspection Checklist for Ex'd' or Ex'e' or Ex'n' Equipment as appropriate.</p> <p>Check cable markers, equipment ID and certification labels are correct, legible and in place, correct as necessary.</p> <p>All non-conformities with the above should be recorded on the checklist. If the integrity of the method of protection has been affected rectification works should be undertaken immediately.</p> <p>Close Inspection: Equipment certified EEx'i' (ATEX Category II 1G)</p> <p>This inspection shall be carried out in accordance with BS EN 60079 Part 17.</p> <p>SAFETY</p> <p>Close Visual Inspection may be carried out on live equipment/circuits. Only Intrinsically Safe certified test equipment may be used on the hazardous side of any safety barrier or energy limiting device. Any circuit disconnected from the specified safety barrier is no longer Intrinsically Safe unless it is connected to Intrinsically Safe earth.</p> <p>Defects should be rectified during the inspection if practicable and recorded on the inspection sheet, where the defect materially affects type of protection and cannot be rectified immediately the equipment should be removed from service.</p> <p>EQUIPMENT</p> <p>1. Documentation.</p> <p>The following documentation is required as a minimum (specified in BS EN 60079-17 5.3).</p> <ul style="list-style-type: none"> a) Circuit safety documents, where appropriate. b) Manufacturer, equipment type, and certificate numbers, category, equipment group and temperature class. c) Where appropriate, electrical parameters such as capacitances and inductances, length, type, and route of cables. d) Special requirements of the equipment certificate, and detailed methods by which such requirements are met in the installation. <p>2. Physical location of each item of plant.</p> <p>Check that:</p> <ul style="list-style-type: none"> a) Equipment installed is that specified in the documentation – fixed equipment only. 	As detailed in para 6.8
	<ul style="list-style-type: none"> b) The circuit and or equipment category and group and temperature class are correct. c) Labels are legible and correspond to the circuit documents at all location. d) No visible unauthorised modification has taken place. Electronic equipment shall only be repaired by the OEM apart from dry joints. e) Safety barrier units, relays and other energy limiting devices are of the approved type, installed in accordance with the certification requirements and securely earthed where required. <p>INSTALLATION</p> <p>1. Cables.</p>	

Job No	Description of Job and Criteria	Interval
17.0	<p>a) Check that there is no obvious damage to cables.</p> <p>b) Check that the sealing of trunking, ducts, pipes and or conduits is satisfactory.</p> <p>c) Check that cables not in use are correctly terminated.</p> <p>2. Check that earthing conductors maintain the type of protection.</p> <p>3. Check that separation is maintained between intrinsically safe and non-intrinsically safe circuits in common distribution boxes or relay cubicles.</p> <p>4. Check that equipment is adequately protected against weather, corrosion, vibration, and other adverse factors.</p> <p>5. Check that there is no undue external accumulation of dust and dirt.</p> <p>Close Inspection Schedule for EEx'p' (ATEX Category II 2G) Equipment</p> <p>This inspection shall be carried out in accordance with BS EN 60079 Part 17.</p> <p>All interconnected equipment shall be inspected together. The inspection of each item shall be appropriate to its type of protection.</p> <p>Where the type of protection certificate number has an X as a suffix the special condition of use should be referred to, prior to commencing inspection.</p> <p>Motors are not covered by this job.</p> <p>Any enclosure opened to adjust or calibrate or to investigate a defect shall be inspected against the detailed checklist.</p> <p>All installed equipment shall be Inspected as detailed below.</p> <p>EQUIPMENT</p> <p>Check that:</p> <p>a) Equipment is certificated appropriate to area classification.</p> <p>b) Enclosure, glass parts and glass to metal sealing is in good condition.</p> <p>c) There are no visible unauthorised modifications.</p>	As detailed in para 6.8
18.0	<p>INSTALLATION</p> <p>Check that:</p> <p>a) The cable is not obviously damaged.</p> <p>b) Earthing connections, including any supplementary earthing connections are satisfactory, visual only.</p> <p>c) Ducts pipes and enclosures are in good condition.</p> <p>d) Protective gas is substantially free from contaminants.</p> <p>e) Protective gas pressure and or flow is adequate.</p> <p>ENVIRONMENT</p> <p>Check that:</p> <p>a) Equipment is adequately protected against corrosion, weather, vibration, and other adverse factors.</p> <p>b) There is no undue accumulation of dust and dirt.</p> <p>Detailed Inspection of Electrical Equipment Certified EEx'd' (ATEX Category II 2G</p>	As detailed in para 6.8

Job No	Description of Job and Criteria	Interval
	<p>This inspection shall be carried out in accordance with BS EN 60079 Part 17.</p> <p>All interconnected equipment shall be inspected together. The inspection of each item shall be appropriate to its type of protection.</p> <p>Where the type of protection certificate number has an X as a suffix the special condition of use should be referred to, prior to commencing inspection.</p> <p>Motors are not included in this job.</p> <p>If at any intermediate time any enclosure is opened to adjust or calibrate or to investigate a defect it shall be inspected against the detailed checklist. Only flame paths disturbed need be inspected.</p> <p>SAFETY</p> <p>Securely isolate all electrical supplies before removing any covers.</p> <p>Insulation tests shall only be undertaken with all covers correctly fitted.</p> <p>Allow sufficient time to elapse following isolation for any charges and internal temperature to fall below that which is required to prevent ignition.</p> <p>Defects should be rectified during the inspection if practicable and recorded on the inspection sheet, where the defect materially affects type of protection and cannot be rectified immediately the equipment should be removed from service.</p> <p>EQUIPMENT</p> <p>All installed equipment shall be Inspected as detailed below.</p> <ol style="list-style-type: none"> 1. Cables (appropriate checks are made at the safe area terminals also). <ol style="list-style-type: none"> a) Check all cables are of the correct specification for their duty. 	
	<ol style="list-style-type: none"> <li value="2">b) Inspect all cable entry devices; check certification is compatible with the enclosure and that they are correctly installed. Only one adapter per gland is allowed, all conduits should have suitable stopping devices fitted and direct entry equipment have barrier glands fitted where required. c) Check the cable type is appropriate, that all cores, including those not in use, are terminated correctly, connections are tight, and that there is no sign of overheating, no visible damage to core insulation and the insulation is clean and dry. d) From the safe area, carryout insulation measurements core to core and core to earth. Where necessary, temporarily interconnect cables to enable readings to be taken. e) Prove the integrity of Phase Conductors and ensure correct connection/polarity. f) Earth Loop Impedance should be measured as R_1+R_2 with a suitable test instrument after ensuring satisfactory earthing visibly in place. <p>Note:</p> <p>Disconnect electronic equipment before carrying out insulation tests.</p> <p>Charges injected by insulation test may be retained and all cores should be earthed prior to reopening the enclosure.</p> <p>Earth loop impedance testers are not to be used for measurements in or into hazardous areas. It should be noted that for supplies with a capacity exceeding</p>	

Job No	Description of Job and Criteria	Interval
	<p>100 amps that these instruments may give inaccurate results and that calculation should be used. Where the supply is taken from a 3rd party transformer the Earth Loop Impedance should be obtained from the 3rd party as they may make changes to the supply arrangement which alters the fault capacity of the supply adversely affecting the type of protection being used.</p> <p>COMPONENTS</p> <p>Check:</p> <ul style="list-style-type: none"> a) The condition, type, and rating of all components. <ul style="list-style-type: none"> b) The mechanical operation of all devices and if wear is excessive replace/repair (only components detailed as part of the equipment certificate may be used). c) For signs of overheating and investigate if found. d) That lamp rating, type and position are correct. <p>ENCLOSURE</p> <p>Check:</p> <ul style="list-style-type: none"> a) Certification details are appropriate for the area in which the equipment is installed (e.g., IIB, >= T3 for location). b) Circuit Identification is correct. c) All flame paths are clean and undamaged. d) All flame path dimensions are within limits. 	
	<ul style="list-style-type: none"> e) Operating shafts and spindles operate freely. f) No unauthorised modifications have been carried out. g) That no obstructions within the enclosure are present which could cause pressure piling i.e. silica gel packs. h) That the enclosure is free from corrosion and clean/remove any dirt, paying particular attention to the prevention of cooling paths becoming obstructed. i) All cover bolts and fixing threads are clean and sound. Blind threaded holes should not have grease packed into them as this could cause hydraulic fractures of the enclosure. j) Sealing gaskets are correctly fitted and in good condition. Only manufacturer's gaskets/seals are allowed. <p>Dimensions of small shafts and spigots do not normally require checking if they are undamaged.</p> <p>Note:</p> <ol style="list-style-type: none"> 1. One wrap of DENSO tape is allowed. 2. Enclosures fitted with glass windows have compound seals, which should not have deteriorated/cracked. Refer to manufacturers for advice. <p>Apply approved grease to flame paths to protect against water ingress (i.e. copper grease).</p> <p>Check that no surface adjacent to the flame paths, other than those which the equipment design allows, has a proximity of > 30mm. For IIB subgroup.</p>	

Job No	Description of Job and Criteria	Interval
19.0	<p>Check that earthing connections are satisfactory (e.g. connections are clean, tight, and greased and conductors are of adequate cross section).</p> <p>Check circuit protection devices are as specified in the site drawings (operation of automatic protection devices is covered by other schedules).</p> <p>Detailed Inspection Schedule for Ex'e' (ATEX Category II 2G) Equipment.</p> <p>This inspection shall be carried out in accordance with BS EN 60079 Part 17.</p> <p>All interconnected equipment shall be inspected together. The inspection of each item shall be appropriate to its type of protection.</p> <p>Where the type of protection certificate number has an X as a suffix the special condition of use should be referred to, prior to commencing inspection.</p> <p>Motors are not covered by this job.</p> <p>Any enclosure opened to adjust or calibrate or to investigate a defect shall be inspected against the detailed checklist.</p> <p>SAFETY</p> <p>Securely isolate all electrical supplies before removing any covers.</p> <p>Insulation tests shall only be undertaken with all covers correctly fitted</p> <p>Allow sufficient time to elapse following isolation for any charges and internal temperature to fall below that which is required to prevent ignition.</p>	As detailed in para 6.8
	<p>Defects should be rectified during the inspection if practicable and recorded on the inspection sheet, where the defect materially affects type of protection and cannot be rectified immediately the equipment should be removed from service.</p> <p>EQUIPMENT</p> <p>All installed equipment shall be Inspected as detailed below.</p> <p>1. Cables (appropriate checks are to be made at the safe area terminals also).</p> <ol style="list-style-type: none"> a) Check all cables are of the correct specification for their duty. Nominally current density is restricted to 4A/mm². b) Inspect all cable entry devices; check certification is compatible with the enclosure and that they are correctly installed. Only one adapter per gland is allowed, all conduits should have suitable stopping devices fitted and where required direct entry equipment have barrier glands fitted. c) Check the cable type is appropriate, that all cores are terminated correctly; connections are tight, that there is no sign of overheating; no visible damage to core insulation and the insulation is clean. All cores should be terminated. d) From the safe area, carryout insulation measurements core to core and core to earth. Where necessary, temporarily interconnect cables to enable readings to be taken. <p>Note:</p> <p>Disconnect electronic equipment before carrying out insulation tests.</p> <p>Charges injected by insulation test may be retained. All cores should be earthed prior to reopening enclosure.</p>	

Job No	Description of Job and Criteria	Interval
	<p>Earth loop impedance testers are not to be used for measurements in or into hazardous areas. It should be noted that for supplies with a capacity exceeding 100 amps that these instruments may give inaccurate results and that calculation should be used. Where the supply is taken from a 3rd party transformer the Earth Loop Impedance should be obtained from the 3rd party as they may make changes to the supply arrangement which alters the fault capacity of the supply adversely affecting the type of protection being used.</p> <p>COMPONENTS</p> <p>Check:</p> <ul style="list-style-type: none"> a) The condition, type and rating of all components, only certified components should be found and only an approved supplier can add components to an enclosure. b) Mechanical operation of all devices and if wear is excessive replace/repair. Direct replacement only. c) For signs of overheating and investigate if found. d) To confirm lamp rating, type and position is correct. 	
20.0	<p>ENCLOSURE</p> <p>Check:</p> <ul style="list-style-type: none"> a) Certification details are appropriate for the area in which the equipment is installed. b) Circuit identification is correct. c) That no unauthorised modifications have been carried. d) That the enclosure is free from corrosion, clean and remove any dirt, paying particular attention to the prevention of cooling paths becoming obstructed. e) All cover bolts and fixing threads are clean and sound. Blind threaded holes should not have grease packed into them as this could cause hydraulic fractures of the enclosure. f) Sealing gaskets are correctly fitted and in good condition. Only manufacturer's gaskets/seals are allowed. g) Enclosures fitted with glass windows have compound seals, which should not have deteriorated/cracked. Refer to manufacturers for advice. h) Earthing connections are satisfactory (e.g. connections are clean, tight, and greased and conductors are of adequate cross section). i) Circuit protection devices are as specified in the site drawings (operation of automatic protection devices is covered by other schedules). <p>Detailed Inspection Schedule for EEx'n' (ATEX Category II 3G) Equipment</p> <p>This inspection shall be carried out in accordance with BS EN 60079 Part 17.</p> <p>All interconnected equipment shall be inspected together. The inspection of each item shall be appropriate to its type of protection.</p> <p>Where the type of protection certificate number has an X as a suffix the special condition of use should be referred to, prior to commencing inspection.</p>	As detailed in para 6.8

Job No	Description of Job and Criteria	Interval
	<p>Motors are not covered by this job.</p> <p>Any enclosure opened to adjust or calibrate or to investigate a defect shall be inspected against the detailed checklist.</p> <p>SAFETY</p> <p>Securely isolate all electrical supplies before removing any covers.</p> <p>Insulation tests shall only be undertaken with all covers correctly fitted.</p> <p>Allow sufficient time to elapse following isolation for any charges and internal temperature to fall below that which is required to prevent ignition.</p> <p>Defects should be rectified during the inspection if practicable and recorded on the inspection sheet, where the defect materially affects type of protection and cannot be rectified immediately the equipment should be removed from service.</p>	
	<p>EQUIPMENT</p> <p>All installed equipment shall be Inspected as detailed below.</p> <p>1. Cables (appropriate checks are to be made at the safe area terminals also).</p> <p>a) Check all cables are of the correct specification for their duty.</p> <p>b) Check all cable entry devices; check certification is compatible with the enclosure and that they are correctly installed. Only one adapter per gland is allowed, all conduits should have suitable stopping devices fitted and where required direct entry equipment have barrier glands fitted.</p> <p>c) Check that the cable type is appropriate, that all cores are terminated correctly, connections are tight, that there is no sign of overheating, no visible damage to core insulation and the insulation is clean. All cores should be terminated.</p> <p>d) From the safe area, carryout insulation measurements core to core and core to earth. Where necessary, temporarily interconnect cables to enable readings to be taken.</p> <p>Note:</p> <p>Electronic equipment is only exempt from insulation tests. Charges injected by insulation tests may be retained; all cores should be earthed prior to reopening enclosure.</p> <p>COMPONENTS</p> <p>Check:</p> <p>a) The condition, type, and rating of all components.</p> <p>b) For signs of overheating and investigate if found.</p> <p>c) To confirm lamp rating, type and position is correct.</p> <p>d) The condition of any hermetically sealed components.</p> <p>ENCLOSURE</p> <p>Check:</p> <p>a) Certification details are appropriate for the area in which the equipment is installed. This equipment should only be installed in a Zone 2 area.</p> <p>b) Circuit identification is correct.</p> <p>c) That no unauthorised modifications have been carried out.</p>	

Job No	Description of Job and Criteria	Interval
	<p>d) That the enclosure is free from corrosion, clean and remove any dirt, paying particular attention to the prevention of cooling paths becoming obstructed.</p> <p>e) That all cover bolts and fixing threads are clean and sound. Blind threaded holes should not have grease packed into them as this could cause hydraulic fractures of the enclosure.</p> <p>f) Sealing gaskets are correctly fitted and in good condition. Only manufacturer's gaskets/seals are allowed.</p>	
21.0	<p>g) Enclosures fitted with glasses have compound seals, which should not have deteriorated/cracked. Refer to manufacturers for advice.</p> <p>h) That earthing connections are satisfactory (e.g. connections are clean, tight, and greased and conductors are of adequate cross section).</p> <p>i) Circuit identification and protection devices are as specified in the site drawings.</p> <p>j) That restricted breathing enclosures are satisfactory (refer to manufactures instructions).</p> <p>Detailed Inspection Schedule for Ex'i' (ATEX Category II 1G) Equipment.</p> <p>This inspection shall be carried out in accordance with BS EN 60079 Part 17.</p> <p>All interconnected equipment shall be inspected together. The inspection of each item shall be appropriate to its type of protection.</p> <p>Where the type of protection certificate number has an X as a suffix the special condition of use should be referred to, prior to commencing inspection.</p> <p>After any enclosure is opened to adjust, calibrate or to investigate a defect, it shall be ensured that upon closure the type of protection is maintained.</p> <p>SAFETY</p> <p>Before the disconnection of any Intrinsic Safety earth all circuits shall be electrically isolated.</p> <p>All circuits within a multicore cable shall be inspected at the same time.</p> <p>Insulation tests shall be undertaken to demonstrate the connection/isolation to/from earth as required in the circuit documentation.</p> <p>Visual Inspection may be carried out on live equipment/circuits. Only Intrinsically Safe certified test equipment to BS EN 5501 may be used on the hazardous side of any safety barrier or energy limiting device.</p> <p>Any circuit disconnected from the specified safety barrier is no longer Intrinsically Safe unless it is connected to Intrinsically Safe earth.</p> <p>Defects should be rectified during the inspection if practicable and recorded on the inspection sheet, where the defect materially affects type of protection and cannot be rectified immediately the equipment should be removed from service.</p> <p>All installed equipment shall be Inspected as detailed below.</p> <p>EQUIPMENT</p> <p>1. Documentation</p> <p>The following documentation is required as a minimum (specified in BS EN 60079-17 5.3).</p>	As detailed in para 6.8

Job No	Description of Job and Criteria	Interval
	<p>a) Circuit safety documents, where appropriate. Manufacturer, equipment type, and certificate numbers, category, equipment group and temperature class.</p> <p>b) Where appropriate, electrical parameters such as capacitances and inductances, length, type, and route of cables.</p>	
	<p>c) Special requirements of the equipment certificate, and detailed methods by which such requirements are met in the installation.</p> <p>d) Physical location of each item of plant.</p> <p>2. Installation. Check that the equipment which is installed is that specified in the documentation – fixed equipment only.</p> <p>3. Certification. Check that the circuit and or equipment category and group and temperature class, are correct.</p> <p>4. Labelling. Labels shall be legible and correspond to the circuit documents at all location.</p> <p>5. Unauthorised modifications. Check that no unauthorised modification has taken place. Electronic equipment shall only be repaired by OEM apart from dry joints.</p> <p>6. Safety Barrier Units. Check that safety barrier units, relays and other energy limiting devices are of the approved type, installed in accordance with the certification requirements and securely earthed where required.</p> <p>7. Connections. Check all electrical connections are tight.</p> <p>8. Printed circuit boards Check that printed circuit boards, where they are designed for user inspection, are clean and undamaged.</p> <p>INSTALLATION</p> <p>1. Cables:</p> <p>a) Check that cables are installed in accordance with the documentation. Cable entry devices shall maintain the IPXX rating of the enclosure. If Ex'd'/Ex'e' glands are fitted they shall be installed as per manufacturer's instructions, only one adapter per gland is allowed. All conduits should have suitable stopping devices fitted and direct entry equipment have barrier glands fitted where required.</p> <p>b) Check the cable type is appropriate, that all cores, including those not in use, are terminated correctly, connections are tight, and that there is no sign of overheating, no visible damage to core insulation and the insulation is clean and dry.</p> <p>c) Cable screens shall only be connected to earth at one location, usually in the safe area. Care is required to ensure that the hazardous area connection is correctly isolated from earth.</p>	

Job No	Description of Job and Criteria	Interval
22.0	<p>d) Carryout insulation measurements core to core and core to earth include all equipment apart from electronic devices, which should be disconnected.</p> <p>Note:</p> <p>DO NOT interconnect cables to enable readings to be taken. Charges injected by insulation test may be retained and all cores should be earthed prior to reopening enclosure</p> <ol style="list-style-type: none"> 1. Earthing. <p>Check that earth connections are clean and tight, and that CSA of bonding conductors is adequate. Earthing conductors maintain the type of protection.</p> <ol style="list-style-type: none"> 2. Separation. <p>Check that separation is maintained between intrinsically safe and non-intrinsically safe circuits in common distribution boxes or relay cubicles.</p> <ol style="list-style-type: none"> 3. Power supply electrical protection. <p>As applicable, short-circuit protection of the power supply is in accordance with the documentation.</p> <ol style="list-style-type: none"> 4. Special condition of use. <p>Check that any special condition of use is being complied with.</p> <ol style="list-style-type: none"> 5. Environment. <p>Check that equipment is adequately protected against weather, corrosion, vibration, and other adverse factors. No undue external accumulation of dust and dirt.</p> <p>Detailed Inspection Schedule for EEx'p' (ATEX Category II 2G) Equipment.</p> <p>This inspection shall be carried out in accordance with BS EN 60079 Part 17.</p> <p>All interconnected equipment shall be inspected together. The inspection of each item shall be appropriate to its type of protection.</p> <p>Where the type of protection certificate number has an X as a suffix the special condition of use should be referred to, prior to commencing inspection.</p> <p>Motors are not covered by this job.</p> <p>Any enclosure opened to adjust or calibrate or to investigate a defect shall be inspected against the detailed checklist.</p> <p>All installed equipment shall be Inspected as detailed below:</p> <p>EQUIPMENT</p> <p>Check:</p> <ol style="list-style-type: none"> a) Equipment is certificated appropriate to area classification. b) Enclosure, glass parts and glass to metal sealing is in good condition. c) There are no unauthorised modifications. d) Lamp rating type and positions are correct. 	As detailed in para 6.8
	INSTALLATION	

Job No	Description of Job and Criteria	Interval
23.0	<p>Check:</p> <ul style="list-style-type: none"> a) Type of cable is correct and undamaged. b) Earthing connections, including any supplementary earthing connections are satisfactory. c) Earth Fault Loop Impedance is satisfactory, measured as $R_1 + R_2$. d) Automatic electrical protective devices are set and operate correctly. e) Protective gas inlet temperature is below maximum specified. f) Ducts pipes and enclosures are in good condition. g) Protective gas is substantially free from contaminants. h) Protective gas pressure and or flow is adequate. i) Pressure and or flow indicators and interlocks function correctly. j) Pre-energizing purge period is adequate. k) That the condition of spark and particle barriers of ducts for exhausting the gas in hazardous area is satisfactory. l) Special conditions of use (if applicable) are complied with. <p>ENVIRONMENT</p> <p>Check:</p> <ul style="list-style-type: none"> a) Equipment is adequately protected against corrosion, weather, vibration, and other adverse factors. b) That there is no undue accumulation of dust and dirt. <p>Inspection of Certified EEx'd'/FLP, EEx 'e - ATEX Category II (2G), or EEx 'n' (or variants) - ATEX Category II (3G) Equipment (motors).</p> <p>This inspection shall be carried out in accordance with IEC 60079 Part 19.</p> <p>SAFETY</p> <p>As necessary isolate all electrical supplies before opening any enclosure not certified as EEx'i' (heaters, instruments etc.).</p> <p>The motor may be caused to rotate by process flow if valves are open/opened.</p> <p>Ensure Power Factor Correction systems are fully discharged. Rotation shall be checked whenever the machine has been disconnected.</p>	As detailed in para 6.8
23.1	<p>CABLES AND TERMINATION ENCLOSURES</p> <p>Inspection as per equivalently certified equipment in Job No. 20 – 22.</p>	See Job No. 20 - 22
23.2	<p>MOTORS WITH CONDITION MONITORING FITTED</p> <p>Record Vibration and Operating Temperatures and compare results. Any step change should be investigated; together with any gradual increase (note greasing bearings will normally result in increased levels immediately after application).</p>	Monthly
23.3	<p>MOTORS WITHOUT CONDITION MONITORING FITTED</p> <p>Vibration and temperature and current readings should be taken with suitably certified and calibrated handheld equipment. Any step change should be investigated; together with any gradual increase (greasing bearings will normally result in increased levels immediately after application).</p>	6 Monthly

Job No	Description of Job and Criteria	Interval
23.4	<p>MOTOR BEARINGS</p> <p>When bearings are overhauled/replaced etc., care should be taken to ensure any insulation in the form of gaskets, shims etc are replaced to prevent circulating currents.</p> <p>Vibration condition monitoring and manufacturer's instructions shall be used to determine the frequency of replacement of bearings, normally this requires the removal of the machine to an external facility at which time a detailed inspection of the machine will take place.</p>	10 Yearly
23.5	<p>MOTOR STATOR WINDINGS</p> <p>Insulation Resistance measurement shall be undertaken, with all covers correctly fitted, from the safe area where practicable. The applied voltage shall be as per manufacturer's instructions. Trend analysis shall be carried out on the values measured. Motors which have not been run for a time and are in damp environments may give earthy values minimum values given in relevant BSI standards should be followed in deciding when IR values require further investigation. Low IR values on warm machines should be investigated further immediately.</p> <p>Partial Discharge Monitoring techniques for High Voltage motors is now possible and should be considered as part of the integrity monitoring program.</p>	When motor becomes available as per para 6.8
23.6	<p>MOTOR PROTECTION SYSTEMS</p> <p>Periodic testing of motor overload, motor stall and non-fuse-based overcurrent protection shall be undertaken. This shall be carried out by secondary injection testing methods with the results being verified against required disconnection times and manufacturers provided time curves.</p> <p>EExe certified motors conditions of use specified by the manufactures shall be complied with.</p> <p>No adjustment shall be made without written authorisation.</p>	5 Yearly
23.7	<p>MOTOR OVERHAUL/INSPECTION</p> <p>All overhauls of certified motors shall be undertaken by competent persons trained and in compliance with BS IEC 60079 – 19.</p> <p>Frequency of overhauls shall be determined as a result of a risk assessment taking into account conditions of bearings, IR results of stator windings and manufactures recommendations.</p> <p>Motors shall also be overhauled whenever faults such as bearings requiring replacing.</p>	10 Yearly
24.0	<p>SAFETY SIGNS AND NOTICES</p> <p>Check safety signs, labels, notices, and posters fixed on or adjacent to electrical equipment and appliances are:</p>	12 Monthly
	<ul style="list-style-type: none"> a) Securely fixed. b) Clearly readable at normal operating or maintenance positions and correctly identify the equipment or appliance and/or its purpose. c) In accordance with BS 7671, are fitted to equipment within which a voltage exceeding 250 volts and where a voltage exceeding 250 volts exists in separate enclosures which, although separated, are simultaneously accessible. 	

Job No	Description of Job and Criteria	Interval
25.0	<p>d) In accordance with BS 7671, are fitted at the point of connection of every earthing conductor and earth electrode, the main equipotential bonding, and the points of connection of every bonding conductor to extraneous conductive part.</p> <p>e) Prominently displayed as specified in JSP 375 Part 2 Volume 3 Chapter 3 Electricity.</p> <p>EARTHING SYSTEMS</p> <p>SAFETY</p> <p>The connection, disconnection, testing or modification of any earthing system or component may result in sparks or hazardous voltages appearing. These tasks shall only be undertaken as appropriate when:</p> <ul style="list-style-type: none"> a) Electrical systems are isolated and/or. b) Supplementary earthing is provided. <p>Earthing Systems should not be worked upon during electrical storms.</p> <p>It is good practice to ensure earthing Systems can be tested by isolating individual components without affecting the system integrity.</p> <p>Internal cable/equipment protective conductors are tested with the equipment to which they are connected.</p> <p>All extraneous metal work within touching distance of electrical equipment shall be earthed / equipotential bonded.</p> <p>Where measurements are undertaken in hazardous areas, an environment that is less than 1% of the Lower Explosive Limit is required.</p> <p>INTRINSIC SAFETY SYSTEMS EARTHS</p> <p>See Job 26.</p> <p>STATIC ELECTRICITY EARTHING</p> <p>All above ground pipework shall maintain a connection to earth of less than 10 ohms.</p> <p>Inspect all static earth bonds to ensure they are:</p> <ul style="list-style-type: none"> a) Free from corrosion. b) Tight. c) Adequately sized. d) Free from damage. 	11 Monthly
	<p>Flexible hoses used within petroleum systems should maintain earth continuity. They shall be inspected at regular intervals.</p> <p>LIGHTNING PROTECTION EARTHING SYSTEMS</p> <p>To be carried out at commissioning, where applicable and thereafter at the intervals indicated.</p> <p>The testing of a lightning protection system shall not be undertaken when a thunderstorm warning is in place or lightning activity is observed.</p> <p>Before disconnecting the lightning protection earth, it should be tested to ensure that it is not "live" using an Intrinsically Safe non-contact voltage testing device.</p> <p>SYSTEM SCHEMATIC DIAGRAM</p>	

Job No	Description of Job and Criteria	Interval
	<p>A simple schematic diagram shall be included clearly showing the lightning protection system with all test points clearly labelled.</p> <p>VISUAL INSPECTION</p> <p>The lightning protection systems shall be subject to a visual inspection to check:</p> <ul style="list-style-type: none"> a) The fixings of conductors and components for security. b) That there are no loose connections. c) For damage, deterioration, and corrosion. d) That there are no visual indications of damage to surge suppression devices where they are installed. e) That the metallic sheath/armouring of the supply cable(s), metallic pipes, rails, and guides entering an explosive building are bonded to the lightning protection installation at the point of entry above the test clamps. f) That there are no additions or alterations to the structure that would require additional protection, or any added services or metallic objects added that would require bonding to the existing lightning protection system. g) That the labels required by BS EN 62305 are in place. <p>Results of the visual inspection are to be recorded on an appropriate test sheet.</p> <p>TEST REQUIREMENTS</p> <p>The lightning protection systems are to be tested for compliance with the requirements of BS EN 62305 and BS7671.</p> <p>Testing is to follow the procedures detailed below and results documented on the test record sheets at the rear of this document.</p> <p>Inaccessible Joints and Bonds.</p> <p>All joints and bonds which cannot be accessed for inspection purposes shall be tested to ensure adequate continuity. A maximum resistance of 0.5 ohms shall be allowed across each bond or joint.</p>	
	<p>EARTH ELECTRODES</p> <p>Earth electrode resistance should be measured as described in BS 7671 Guidance Note 3. Note the safety requirements above (e.g. an Intrinsically Safe System is not certified if its earth is disconnected).</p> <p>The value of each electrode should be noted, and the overall system values calculated. Remedial action is required when system values exceed those recommended by national standards. Measurements should be taken when the ground conditions would be at their least advantageous i.e. dry, as electrical protection devices should operate correctly with the highest earth loop impedance encountered.</p>	

Job No	Description of Job and Criteria	Interval										
	<table border="1" data-bbox="240 304 1402 676"> <thead> <tr> <th colspan="2" data-bbox="240 304 1402 369">Typical values of earth electrode resistance</th> </tr> </thead> <tbody> <tr> <td data-bbox="240 369 665 421">Intrinsically Safe</td> <td data-bbox="665 369 1402 421">< 1 ohm.</td> </tr> <tr> <td data-bbox="240 421 665 508">Lightning Protection Systems</td> <td data-bbox="665 421 1402 508"><10 ohms, with individual electrode no more than 10 x the No. of electrodes.</td> </tr> <tr> <td data-bbox="240 508 665 560">Static Earthing Systems</td> <td data-bbox="665 508 1402 560">< 10 ohms.</td> </tr> <tr> <td data-bbox="240 560 665 676">Power Earthing Systems</td> <td data-bbox="665 560 1402 676">< 4 ohms, though as low as practicable is desired to ensure protection devices work within required times. Maximums can be found in relevant standards.</td> </tr> </tbody> </table> <p data-bbox="264 725 1225 855">Bonding of different earthing system should be risk assessed and would normally only take place at main earth bars where any potential rise due to a fault in one system will have minimum impact on others. On large, geographically disparate sites, sub-systems should be considered based on location.</p> <p data-bbox="264 875 1209 902">EXTERNAL PROTECTIVE AND EQUIPOTENTIAL BONDING CONDUCTORS</p> <p data-bbox="264 925 815 952">Inspect all connections to ensure that they are:</p> <ul style="list-style-type: none"> <li data-bbox="341 976 619 1003">a) Free from corrosion. <li data-bbox="341 1025 448 1052">b) Tight. <li data-bbox="341 1075 592 1102">c) Adequately sized. <li data-bbox="341 1124 608 1151">d) Free from damage. <li data-bbox="341 1173 539 1200">e) Identification. <p data-bbox="264 1225 1235 1420">On live petroleum sites, it is normal to measure the earth resistance of extraneous conductors, metal work etc. by using a wandering lead with reference to the main earth bar. This should be undertaken in a gas free environment or using a certified and approved Intrinsically Safe low ohm meter. Compare results to those previously obtained and those limiting values given in BS 7671 or applicable standards.</p>	Typical values of earth electrode resistance		Intrinsically Safe	< 1 ohm.	Lightning Protection Systems	<10 ohms, with individual electrode no more than 10 x the No. of electrodes.	Static Earthing Systems	< 10 ohms.	Power Earthing Systems	< 4 ohms, though as low as practicable is desired to ensure protection devices work within required times. Maximums can be found in relevant standards.	
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	<p data-bbox="264 1462 655 1489">1. System Testing in Isolation.</p> <p data-bbox="264 1512 1197 1673">This is a test of the lightning protection system in isolation with all equipotential bonding to other facility earthing systems removed. With all earth electrodes connected to the system measure the resistance to earth of a system at points approximately equidistant between earth electrodes, the measured resistance shall not exceed 10 ohms</p> <p data-bbox="264 1695 930 1722">2. System Testing with Equipotential Bonding in Place</p> <p data-bbox="264 1744 1230 1870">This is a test of the lightning protection system with all equipotential bonding to other facility earthing systems in place. With all earth electrodes connected to the system measure the resistance to earth of a system at random points on the system; the measured resistance shall not exceed 10 ohms.</p> <p data-bbox="264 1892 1225 2013">During acceptance testing, the earth termination network is to be isolated from all other paths. All disconnections are to be recorded and checked off on reconnection after testing to ensure that they are correctly restored. This is only required at commissioning.</p> <p data-bbox="264 2036 328 2063">Note:</p>											

Job No	Description of Job and Criteria	Interval
26.0	<p>1) Normally, these measurements will be conducted at points outside the Petroleum Hazardous Area.</p> <p>2) Record the test results and investigate any significant changes from those obtained from the previous inspections.</p> <p>3) The inspection, testing and maintenance schedules must be carried out in conjunction with safe working requirements.</p> <p>Alarm and Shutdown Testing</p> <p>All protective devices shall be tested so that the complete shutdown loop is proven. This shall be achieved by use of calibrated, traceable to national standards, test equipment. I.e. standard test gauges, hydraulic pressure pump and multi-meter for pressure switches and transmitters.</p> <p>The testing regime should be compliant with IEC 61511 functional safety.</p> <p>It should be proven that when a high-pressure switch exceeds its set point the pump set/valve is stopped/closed to prevent risk of danger/damage.</p> <p>The following list is not exhaustive, and devices not listed should be assessed and scheduled appropriately.</p>	
26.1	<p><u>Float switches or SIL Rated Electronic Equivalent</u></p> <p>a) Tank and/or Sump High or High-High Level Trip.</p> <p>b) Tank Low Level (suction protection).</p> <p>c) Pump Seal Leakage.</p>	3 Monthly
26.2	<p><u>Pressure Switches</u></p> <p>a) Terminal Pressure High.</p> <p>b) Pipeline Ultimate High Pressure.</p> <p>c) Pump Case High Pressure.</p> <p>d) Pump Suction Pressure Low.</p> <p>e) Hydraulic Power Pac Low Pressure</p>	6 Monthly
26.3	<p><u>Flow Switches</u></p> <p>a) Pump Low Flow.</p>	3 Monthly
26.4	<p><u>Site Oil Interceptors</u></p> <p>a) Oil detectors.</p> <p>b) Fire Alarm Shutdowns.</p>	3 Monthly
26.5	<p><u>Process Interlocks</u></p> <p>a) Such as filter valve positions indication (to prevent excess flushing) etc.</p>	12 Monthly
26.6	<p><u>Pressure Control Systems</u></p> <p>Control valve performance is nominally monitored through its operation. The associated pressure transducers should be calibrated to ensure optimum operation.</p> <p>Where the transducers are also tied into shutdown systems the set point operation should be loop checked as per pressure switches.</p>	6 Monthly
26.7	<p><u>Process Critical Devices</u></p>	6 Monthly

Job No	Description of Job and Criteria	Interval
27.0	<p>Such as:</p> <ul style="list-style-type: none"> • Valve position interlocks. • Automatic body bleed monitors. • Temperature transmitters. • Density transmitters. • Solid separators. • Colour and opacity Instruments. <p>Continuity Testing of Protective Conductors Including Main and Supplementary Bonding.</p> <p>To be carried out at commissioning, where applicable and thereafter at the intervals indicated.</p> <p>Test Requirements:</p> <ol style="list-style-type: none"> 1. Check and test the protective conductors and main and supplementary bonding to verify that they are electrically sound and correctly connected in accordance with BS 7671. 2. Care must be taken to make an assessment of possible parallel paths which may affect the result. <p>Testing:</p> <ol style="list-style-type: none"> 1. Test the installation in accordance with BS 7671. 2. Record the results of the inspection and tests. 3. Compare the resistance test results with those obtained from previous tests and investigate any significant changes. 	36 Monthly
28.0	<p>Note:</p> <ol style="list-style-type: none"> 1) The inspection, testing and maintenance schedules must be carried out in conjunction with safe working requirements. <p>Continuity of Ring (and Radial) Final Circuit Conductors</p> <p>(To be carried out at commissioning (where applicable) and thereafter at the intervals indicated).</p> <p>Test Requirement:</p> <ol style="list-style-type: none"> 1. Check and test the continuity of each conductor including the protective conductor of every final (or radial) circuit in accordance with BS 7671. <p>Testing:</p> <ol style="list-style-type: none"> 1. Test the installation in accordance with BS 7671. 2. Record the results of the checks and tests. 3. Compare the resistance test results with those obtained from previous tests and investigate any significant changes. <p>Note:</p> <ol style="list-style-type: none"> 1)The inspection, testing and maintenance schedules must be carried out in conjunction with safe working requirements. 	36 Monthly

Job No	Description of Job and Criteria	Interval
29.0	<p>Insulation Tests</p> <p>(To be carried out at commissioning (where applicable) and thereafter at the intervals indicated).</p> <p>Test Requirements:</p> <ol style="list-style-type: none"> 1. The insulation resistance to earth and between conductors shall be not less than 2M ohm. <p>Testing:</p> <ol style="list-style-type: none"> 1. Check the insulation of the installation for overheating, deterioration, and damage. 2. Test the insulation of conductors and fixed equipment for compliance with BS 7671 and prove that electrical conductors are adequately insulated from each other and from earth and/or protective conductors. This test is to ensure that the electrical integrity of each electrical conductor and each item of equipment under test meets its stated criteria. Tests should cover all permutations between each conductor, screen, metallic sheath, armour, and earth. 3. Record the lowest insulation resistance on Inspection and test record sheet. 4. Record the results of the tests and compare with any previous tests and investigate any significant changes. <p>Note:</p> <ol style="list-style-type: none"> 1) The inspection, testing and maintenance schedules must be carried out in conjunction with safe working requirements. 	36 Monthly
30.0	<p>Site Applied Insulation</p> <p>To be carried out at commissioning, where applicable and thereafter at the intervals indicated.</p> <p>Test Requirements:</p> <ol style="list-style-type: none"> 1. These tests are applicable to insulation applied during installation and repair. 2. Record the results of the inspection and tests. 3. Compare the resistance test results with those obtained from previous tests and investigate any significant changes. 4. Where heat shrink sleeving is applied in accordance with manufacturer's instructions and the manufacturer has quoted electrical properties of the sleeving, only a visual inspection is required to ensure compliance with the installation instruction and the absence of any mechanical damage. An insulation test need only be carried out on new installations. The standard insulation test will be sufficient for subsequent tests. <p>Note:</p> <ol style="list-style-type: none"> 1) The inspection, testing and maintenance schedules must be carried out in conjunction with safe working requirements. 	36 Monthly
31.0	<p>Separation of circuits</p>	36 Monthly

Job No	Description of Job and Criteria	Interval
32.0	<p>To be carried out at commissioning, where applicable and thereafter at the intervals indicated.</p> <p>Where protection is provided by separation of circuits, inspection and testing to verify compliance with BS 7671 for the following cases is required:</p> <ul style="list-style-type: none"> a) Where protection is provided by SELV and PELV. b) For SELV circuits, note that although Part 6 of the Wiring Regulations does not require specific tests for SELV circuits, tests should be performed to confirm compliance with the Regulations c) Where protection is provided by only electrical separation of circuits. <p>Record the results of the inspection and tests.</p> <p>Note:</p> <p>1) The inspection, testing and maintenance schedules must be carried out in conjunction with safe working requirements.</p> <p>Barriers and Enclosures</p> <p>To be carried out at commissioning, where applicable and thereafter at the intervals indicated.</p> <p>Visually check the barriers and enclosures for deterioration, damage, and security of fixings. If the barriers or enclosures have been modified since the last inspection, confirm compliance with BS 7671. This test is not generally required for unmodified factory-built equipment.</p> <p>Record the results of the inspection.</p>	36 Monthly
33.0	<p>Note:</p> <p>1) The inspection, testing and maintenance schedules must be carried out in conjunction with safe working requirements.</p> <p>Correct Polarity</p> <p>To be carried out at commissioning, where applicable and thereafter at the intervals indicated.</p> <p>Test the polarity of all circuits to verify that:</p> <ul style="list-style-type: none"> a) Every fuse and single pole control and protective device is connected in the phase conductor only. b) Centre-contact bayonet and Edison screw lamp holders to BS 6776 in circuits having an earthed neutral conductor have the outer or screwed contacts connected to the neutral conductor. c) Wiring has been correctly connected to socket outlets and similar accessories. <p>Record the results of the tests.</p> <p>Note:</p> <p>1) The inspection, testing and maintenance schedules must be carried out in conjunction with safe working requirements.</p>	36 Monthly
34.0	<p>Earthed Electrode(s) Testing excluding Lightning Protection</p>	11 Monthly

Job No	Description of Job and Criteria	Interval
35.0	<p>To be carried out at commissioning, where applicable and thereafter at the intervals indicated.</p> <p>Test Requirement:</p> <ol style="list-style-type: none"> 1. Measure the earth electrode resistance to the general mass earth. <p>Testing:</p> <ol style="list-style-type: none"> 1. Each earth electrode (or group of electrodes) must be disconnected before testing. 2. Record the test results. 3. Compare the resistance measured with previous resistance tests. Any significant changes in earth electrode resistance are to be investigated. <p>Note:</p> <ol style="list-style-type: none"> 1) This measurement will generally be done at a point outside the explosives facility. The instrument used may generate dangerous voltages and currents within an explosives area. Therefore, the location of the test position should be agreed with the Site Safety Officer in advance. 2) The inspection, testing and maintenance schedules must be carried out in conjunction with safe working requirements. <p>Earth Fault Loop Impedance Measurements</p> <p>To be carried out at commissioning, where applicable and thereafter at the intervals indicated.</p>	36 Monthly
	<p>Test instruments of the current impulse type shall have an impulse duration not greater than 40 ms and shall give an indication of polarity and protective conductor continuity before the impulse is applied.</p> <p>The line/earth fault loop impedance shall be measured at the following locations as appropriate:</p> <ol style="list-style-type: none"> a) The origin of the installation. b) Sub main distribution boards. c) Final circuit distribution boards. d) Socket outlet circuits. Test at a random selection of socket outlets with a minimum of two per circuit or which one shall be the socket outlet which is electrically most remote from the distribution board. e) Each lighting circuit. f) Isolation switches/control devices for fixed appliances. g) Exposed conductive parts of fixed appliances. <p>In addition, for ring final circuits, measure the neutral/earth fault loop impedance.</p> <p>The total earth loop impedance Z_s shall be measured.</p> <p>Measure the earth fault loop impedance using conventional techniques.</p> <p>Record the results of the tests.</p> <p>Compare with the previous test results. Any significant changes in impedance values should be reported and recorded for investigation and remedial action.</p>	

Job No	Description of Job and Criteria	Interval
36.0	<p>Note:</p> <p>1) The inspection, testing and maintenance schedules must be carried out in conjunction with safe working requirements.</p> <p>Residual Current Devices (RCDs)</p> <p>To be carried out at commissioning, where applicable and thereafter at the intervals indicated.</p> <p>Test the tripping operation of RCDs in accordance with the requirements of BS 7671.</p> <p>On completion of the tests, operate the test push button or other test facility integral with the circuit breaker to test the effectiveness of the integral testing device.</p> <p>Record the results of the tests and any defects noted.</p>	12 Monthly
37.0	<p>Note:</p> <p>1) The inspection, testing and maintenance schedules must be carried out in conjunction with safe working requirements.</p> <p>Circuit Breakers, Isolators and Switching Devices</p> <p>To be carried out at commissioning, where applicable and thereafter at the intervals indicated.</p> <p>Manually operate all devices to ensure that they disconnect the supply.</p>	36 Monthly

APPENDIX A: Quick Reference Frequency Schedule

Frequency	Job No	Description of Job and Criteria
Weekly	4.2	Oil interceptors and drain tanks - Items (a), (b)
Monthly	2.3.2	Below ground tanks – inspect tell tales beneath tank bases
	9.2	Hydrant pits – couplings/valves – items (a) to (d)
3 Monthly	23.2	Motors with Condition Monitoring Fitted
	1.1	Clear working areas of debris, materials etc.
	1.2	Mechanical equipment – check for damage, leaks etc.
	2.2.2	Tanks – external inspection – items (a) to (k)
	4.1	Tank bunds and equipment catchment areas - Items (a) to (d)
	4.2	Oil interceptors and drain tanks – items (c) to (f)
	5.1	Above ground pipework – items (a) to (d)
	5.2	Below ground pipework – item (a)
	6.2	Manual valves – items (a) to (c)
	6.3	Automatic valves – (1) check for fuel leaks and (2) deterioration and corrosion
	7.1	Maintenance of flow meters – items (a), (b)
	7.4	Leak detection equipment – items (a), (b)
	7.5	Additive injection equipment – item (a)
	8.1	Pumps and drivers – item (1) (a) to (e)
	8.2	Filters and strainers – item 9a)
	9.1	Fuelling equipment – items (a to (c)
	9.2	Hydrant pit couplings and valves – item (e)
	9.3	Loading arms and pantographs – item (a), (b)
	10.1	Off-shore unloading facilities – items (b), (d)
	10.2	Shore facilities – jetties, docks etc. items (a) to (c)
	26.1	Float switches or SIL rated electronic equivalent – items (a) to (c)
	26.3	Flow switches – item (a)
	26.4	Site oil interceptors – items (a) and (b)
6 Monthly	5.1	Above ground pipework – items (e) and (f)
	5.2	Below ground pipework – item (b) and (e)
	6.3	Automatic valves – charge pressure items (d) to (i)
	8.1	Pumps and drivers – item (2) (a) to (f)
	8.2	Filters and strainers – items (b) to (c) and (g)
	9.1	Fuel hoses and couplings – item (e)
	9.2	Hydrant pit couplings and valves – item (e)
	9.3	Loading arms and pantographs – item (c)

Frequency	Job No	Description of Job and Criteria
11 monthly	11.1	Maintenance of cathodic protection equipment – items (a), (b), (c), (e)
	23.3	Motors without condition monitoring fitted
	26.2	Pressure switches – items (a) to (e)
	26.6	Pressure control systems
	26.7	Process critical devices
	25.0	Earthing systems
	34.0	Earthed electrode(s) testing excluding lightning protection
12 monthly	3.1	Low level alarm/control – check operation of equipment
	3.2	High level shut off valve – items (a) to (e)
	3.3	Contents gauges – item (b)
	3.6	Swing arms and floating suction units – inspect and test external equipment
	3.7	Tank fire/dump valves Inspect and test for correct operation – item (a)
	5.1	Above ground pipework UT inspection – item (g)
	6.3	Automatic valves – correct operation of valves – item (3) (a) to (i)
	7.2	Accuracy testing of meters – items (a) to (d)
	7.3	Pressure and differential pressure gauges – items (a) and (b)
	7.5	Additive injection equipment – item (b)
	9.1	Fuel hoses and couplings – items (f)
	9.3	Loading arms and pantographs – item (e)
	10.1	Off-shore unloading facilities – items (e), (f) and (g)
	11.1	Maintenance of cathodic protection equipment – item (d)
	12.0	Visual Inspection – Equipment certified EEx'd/FLP, EEx 'e', or EEx 'n' or variants
	13.0	Visual Inspection – Equipment certified EEx 'I' (or variants)
	14.0	Visual Inspection – Equipment Certified EEx'p' Apparatus
	15.0	Close Inspection - Equipment certified EEx'd/FLP, EEx 'e', or EEx 'n' or variants
	16.0	Close Inspection - Equipment certified EEx 'I' (or variants)
	17.0	Close Inspection - Equipment Certified EEx'p' Apparatus
	18.0	Initial / Detailed Inspection of Electrical Apparatus certified EEx'd
	19.0	Initial / Detailed Inspection of Electrical Apparatus certified EEx'e'
	20.0	Initial / Detailed Inspection of Electrical Apparatus certified EEx'n''
21.0	Initial / Detailed Inspection of Electrical Apparatus certified EEx'I''	
22.0	Initial / Detailed Inspection of Electrical Apparatus certified EEx'p'	
23.5	Motor Stator Windings	
24.0	Safety Signs and Notices – item (a) to (e)	
26.5	Process interlocks – item (a)	
36.0	Residual current devices	
24 Months	6.1	Pressure/Vacuum Valves

Frequency	Job No	Description of Job and Criteria
36 Months	3.5	Internal coils and heaters
	4.1	Tank Bunds and equipment catchment areas – items (e) to (d)
	5.2	Below Ground Pipework – item (c) and (d)
	10.2	Shore facilities – item (d)
	27.0	Continuity testing of protective conductors including main and supplementary bonding
	28.0	Continuity of ring (and radial) final circuit conductors
	29.0	Insulation tests
	30.0	Site applied insulation
	31.0	Separation of circuits
	32.0	Barriers and enclosures
	33.0	Correct polarity
	35.0	Earth fault loop impedance measurements
	37.0	Circuit breakers, isolators and switching devices
	23.6	Motor Protection systems
	5 Yearly	6.3
9 Yearly	5.2	Non-destructive inspection of Cross Base Pipelines Item (f)
10 Yearly	6.3	Automatic Valves Item (5)
	23.4	Motor Bearings
	23.7	Motor Overhaul/Inspection
	9.1	Fuelling equipment Item (g)

APPENDIX B: Quick Reference - Types of Defects and Classification

Protection Concept	Possible Types of Defect Warranting C1
EEx d / EEx e	Cable Damaged - Cert. Concern
EEx d / EEx e	Cable Entry - Open or Incorr. Sealed
EEx d / EEx e	Gland - Not Certified
EEx d / EEx e	Gland SWA or Braid – Defective
EEx d	Gland Inner Seal - Missing or Sliced
EEx d / EEx e	Adapter or Reducer – Flame path Def.
EEx d	Adapter – Multiple
EEx d / EEx e	Blanking Plug - Installation Defective
EEx d / EEx e	Blanking Plug - Cert. Concern
EEx d / EEx e	Stopper Boxes - Leaking or Unfilled
EEx d / EEx e	Enclosure - Unauthorised Mod.
EEx d / EEx e	Enclosure Damaged - Cert. Concern
EEx d / EEx e	Enc. Cert. - Incorrect for Area Class.
EEx d / EEx e	Enc. Cover Screws - Loose or Missing
EEx d / EEx e	Enc. Cover Screws - Incorrect Type
EEx d	Enc. flame path - Excessive Gap
EEx d	Enc. flarepath - Damaged or Pitted
EEx d	Enc. Seals or Cement – Deteriorated
EEx d	Enc. flame path IIC - Denso Taped
EEx d	Enc. Temp. Rating – Defective
EEx d	Enc. Lamp or Fuse Rating – Incorrect
EEx d	Enclosure - Water Ingress
EEx d	Enc. (> 50 V ac) Earth Bond - Missing
EEx d / EEx e	Terminals - Arcing Damage
EEx d / EEx e	Electrical Protection – Defective
EEx d / EEx e	Protection Relay - Fault Indication
EEx d / EEx e	Motor Fan or Couplings – Defective
EEx d	Mtr. Shaft Labyrinth flame path - Def.
EEx d / EEx e	HV Motor NDE Ins. Bearing – Def.
EEx e	Gland IP Washer – Missing or Def.
EEx e	Enc. (> 50 V ac) Earth Bond – Missing
EEx e	Enc. I.P. Rating – Defective
EEx e	Enc. Gaskets – Missing or Deteriorated

Protection Concept	Possible Types of Defect Warranting C1
EEx e	Enc. Temperature Rating – Defective
EEx e	Enc. Lamp Rating – Incorrect to Cert.
EEx e	Enclosure – Water Ingress
EEx I – Safe Area	Barrier – Defective
EEx I – Safe Area	Barrier Mounting - Defective
EEx I – Safe Area	Cable Cores – Segregation. Not to Spec.
EEx I – Safe Area	Cable Induct. And or Cap. – Not to Spec.
EEx I – Safe Area	I.S. Earth System – Not to Specification
EEx I – Safe Area	I.S. Terminals – Not to Specification
EEx I – Safe Area	Spare Cores – Not Earthed
EEx I – Safe Area	Screen Terminations – Not to Spec.
EEx I – Safe Area	I.S. & Non I.S. Comp. - < 50 mm Segregation.
EEx I – Safe Area	I.S. System Cert. – Incorrect for Location
EEx I – Safe Area	I.S. System – Unauthorised Mod.
EEx I – Hazardous Area	Cable Damage – Certification Concern
EEx I – Hazardous Area	Gland SWA or Braid – Defective
EEx I – Hazardous Area	Enclosure Dam. – Certification Concern
EEx I – Hazardous Area	Enclosure – Water Ingress
EEx I – Hazardous Area	Spare Cores – Not Earthed
EEx I – Hazardous Area	C. Core to Earth or Sc. Insul.. - < 1 Mohm
EEx I – Hazardous Area	Screen Terminations – Not to I.S. Spec.
EEx I – Hazardous Area	I.S. Terminations – Not to I.S. Spec.
EEx I – Hazardous Area	Screen(s) Insulation – Not to I.S. Spec.
EEx I – Hazardous Area	I. S. Earth System – Not to I.S. Spec.
EEx I – Hazardous Area	Protective or Power Earth – Not to Spec.
EEx n	Cable Damage - Certification Concern
EEx n	Enc. Cable Entry – Open or Incorr. Sealed
EEx n	Gland Outer Seal - Defective
EEx n	Gland SWA or Braid – Defective
EEx n	Gland Sealing Washer. - Missing or Def.
EEx n	Blanking Plug - Installation Defective
EEx n	Stopper Boxes - Leaking or Unfilled
EEx n	Enclosure - Unauthorised Modification
EEx n	Enc. Damaged - Certification Concern

Protection Concept	Possible Types of Defect Warranting C1
EEx n	Enc. Cert. - Incorrect for Area Class.
EEx n	Enc. Cover Screws - Loose or Missing
EEx n	Enclosure IP Sealing – Defective
EEx n	Restricted Breathing Seals – Defective
EEx n	Enclosure Temperature Rating – Defective
EEx n	Lamp Rating - Incorrect to Certification
EEx n	Enc. (> 50 V ac) Earth Bond – Missing
EEx n	Hermetically Sealed Device – Defective
EEx n	Enclosed Break Device – Defective
EEx n	Enclosure - Water Ingress
EEx n	Spare Cores - Not Terminated or Earthed
EEx n	Terminations - Loose or Damaged
EEx n	Terminals - Not to Specification
EEx n	Electrical Protection – Defective
EEx n	Protection Relay - Fault Indication
EEx n	Motor Fan or Couplings - Defective
EEx n	Motor Air Gaps – Not to Specification
EEx n	HV Motor NDE Ins. Bearing – Def.

Protection Concept	Possible Types of Defect	Classification Coding
EEx d / EEx e	Cable Identification - Missing	C3
EEx d / EEx e	Cable Support – Inadequate	C3
EEx d	Gland Outer Seal – Missing	C2
EEx d / EEx e	Gland SWA or Braid - Minor Corrosion	C3
EEx d	Gaskets - Missing or Deteriorated	C2
EEx d	IP Washer (if applicable) - Missing or Dam.	C2
EEx d	Adapter or Reducer – Corroded	C3
EEx d	Adapter or Reducer – Uncertified	C2
EEx d / EEx e	Blanking Plug – Corroded	C2
EEx d / EEx e	Blanking Plug – Uncertified	C2
EEx d / EEx e	Enclosure Identification – Missing	C3
EEx d / EEx e	Enclosure Support – Inadequate	C3
EEx d / EEx e	Enclosure Certification Details – Missing	C3
EEx d / EEx e	Enclosure Damaged - Not a Cert. Concern	C3
EEx d / EEx e	Enclosure outer – Corroded	C3
EEx d / EEx e	Enclosure - Accumulation of Dust and Dirt	C3
EEx d / EEx e	Enclosure - Internal Corrosion	C2
EEx d	Enc. flame path – Obstructed	C2
EEx d	Enc. flame path - Minor Corrosion	C3
EEx d / EEx e	Earthing - Not to Company Standard	C2
EEx d / EEx e	Cable Cores Identification – Missing	C3
EEx d / EEx e	Spare Cores - Not Terminated or Earthed	C2
EEx d / EEx e	Terminations - Loose	C2
EEx d / EEx e	Terminals – Damaged	C2
EEx d / EEx e	Electrical Protection PMRs – Outstanding	C2
EEx d / EEx e	Gland (Brass / Metalled) - Oxidisation	C2
EEx d / EEx e	MICC Pot and or Seal– Not to Specification	C2
EEx d / EEx e	MICC Sleeving – Not to Specification	C2
EEx I – Safe Area	Barrier Identification – Missing	C3
EEx I – Safe Area	I.S. Earth Identification – Missing	C3
EEx I – Safe Area	I.S. / Non I.S. Cable Looms Segregation. – Untidy	C3
EEx I – Hazardous Area	Cable Identification – Missing	C3

Protection Concept	Possible Types of Defect	Classification Coding
EEx I – Hazardous Area	Cable Damage – Operational Concern	C2
EEx I – Hazardous Area	Cable Support – Inadequate	C3
EEx I – Hazardous Area	Enc. Cable Entry – Open or Incorr. Sealed	C2
I.S. Enclosure	Identification – Missing	C3
I.S. Enclosure	Enclosure Support – Inadequate	C3
I.S. Enclosure	Enclosure Damage – Operational Concern	C3
I.S. Enclosure	IP Standard – Defective	C2
EEx I – Hazardous Area	Gland Make Up – Defective	C2
EEx I – Hazardous Area	Gland SWA or Braid – Minor Corrosion	C3
EEx I – Hazardous Area	I.S. Enclosure Identification – Missing	C3
EEx I – Hazardous Area	Enclosure Support – Inadequate	C3
EEx I – Hazardous Area	Enclosure Damage – Operational Concern	C2
EEx I – Hazardous Area	IP Standard – Defective	C2
EEx I – Hazardous Area	Enclosure – Accumulation of Dust or Dirt	C3
EEx I – Hazardous Area	Enclosure – Internal Corrosion	C3
EEx I – Hazardous Area	Cable Cores Identification – Missing	C3
EEx I – Hazardous Area	C. Core to Earth or Sc. Insul. – 1 to 10 MΩ	C2
EEx I – Hazardous Area	Gland (Brass / Metalled) - Oxidisation	C2
EEx I – Hazardous Area	Enclosure Damage – Operational Concern	C2
EEx I – Hazardous Area	IP Standard – Defective	C2
EEx n	Cable Identification – Missing	C3
EEx n	Cable Support – Inadequate	C3
EEx n	Gland SWA or Braid - Minor Corrosion	C3
EEx n	Blanking Plug – Corroded	C3
EEx n	Enclosure Identification – Missing	C3
EEx n	Enclosure Support – Inadequate	C3
EEx n	Enclosure Certification Details – Missing	C3
EEx n	Enclosure Damaged - Not a Cert. Concern	C3
EEx n	Enclosure - Accumulation of Dust or Dirt	C3
EEx n	Enclosure - Corroded	C3
EEx n	Earthing - Not to the Company Standard	C3
EEx n	Enclosure - Internal Corrosion	C3
EEx n	Cable Cores Identification – Missing	C3
EEx n	Electrical Protection PMRs – Outstanding	C3

Protection Concept	Possible Types of Defect	Classification Coding
EEx n	Cable Identification – Missing	C3

Bibliography

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SI 2954*	SI 2001 No 2954 Control of Pollution (Oil Storage) (England) Regulations 2001
SSI 133	SSI 2006 No 133 The Water Environment (Oil Storage) (Scotland) Regulations 2006
	Petroleum (Consolidation) Act and Regulations made thereunder
EEMUA 159	Inspection, Maintenance and Repair of Above Ground Vertical Cylindrical Storage Tanks
Technical Standard Petroleum - 01	Specification for Specialist Works on Petroleum Installations
Technical Standard Petroleum - 03	Professional Inspection of Fuel Infrastructure and Flammable Dangerous Goods Stores
PG 02/17	The Inspection, Testing, and Certification of Low Voltage Electrical Installations on the Defence Estate.
DWFS 031	Internal Cleaning of Fuel Tanks
<u>DSA 02</u>	DSLRL Fuel and Gas Safety and Environmental Regulations
<u>DSA 03</u>	DSLRL Fuel and Gas Safety and Environmental Regulations – Defence Code of Practice (DCOP)
JSP 317	The Storage & Handling of Fuels & Lubricants
Safety	
HSW	Health and Safety at Work etc. Act 1974
JSP 375 Vol 3	Chapter 3.MOD Safety Rules and Procedures - Electricity
JSP 375 Vol 3	Chapter 5.MOD Safety Rules and Procedures - Petroleum
DSEAR	Dangerous Substances and Explosive Atmosphere Regulations (2002)
Electrical	
BS 7671	Requirements for Electrical Installations, IEE Wiring Regulations and IEE Guidance Note No 3 Inspection and Testing
BSEN 60079	Electrical Equipment for Explosive Gas Atmospheres – Part 17, Inspection and Maintenance of Electrical Installations in Hazardous Areas
BSEN 60079	Electrical Equipment for Explosive Gas Atmospheres – Part 19 Repairs & overhaul for equipment used in explosive atmosphere

Reference	Title
BSEN 60079	Electrical Equipment for Explosive Gas Atmospheres – Part 14 Electrical installation design selection and erection
BSEN 62305	Protection against Lightning
IEC 61511	Functional safety
EEMUA 186	Practitioner handbook, Electrical Installation, Inspection and Maintenance in Potentially Explosive Atmospheres
IP	Institute of Petroleum Model Code of Practice – Part 1 Electrical Safety Code
EI	Guidelines for managing inspection of Ex electrical equipment ignition risk in support of IEC 60079 Part 17
API/EI 1550	Aviation Handbook 2007
BS 7430	Code of Practice for Earthing
EAW	The Electricity at Works Regulations 1989
<u>ESQCR 2002</u>	The Electricity Safety Quality and Continuity Regulations 2002 (Amendment) 2006