

No. 120 Survey of electrical equipment installed in hazardous areas on tankers

(June 2015)

1. Application

The recommendations in this document apply for survey of electrical installation in hazardous areas on tankers, both for new construction and ships in service.

2. General Requirements

2.1 Marking

The equipment marking is to be in accordance with IEC 60079 or the relevant standards to which it is constructed. Normally, all Ex equipment is to be marked with protection type, test institute and certificate number, maker, type, gas group and temperature class (if applicable). In case, this information is not possible to read on the equipment it will normally be considered as not suitable for hazardous areas.

2.2 Certificates

2.2.1 All electrical equipment constructed for use in Zone 0 and Zone 1 are to have a certificate from a recognised accredited test laboratory.

Note:

A list of organisations which have successfully completed the IECEx assessment process and are approved to operate within the IECEx Scheme can be found under <http://www.iecex.com/bodies.htm>

The Ex- protection and IP degree are to be suitable for the hazardous zone and the location, and special conditions are to be complied with.

Note:

Simple apparatus (thermocouples, photocells, junction boxes, etc.), as defined in IEC 60079-11, in intrinsically safe or energy-limited circuits do not require any of the evidence given above.

2.2.2 Electrical equipment for use in Zone 2 is to comply with one of the following:

- covered by an Ex certificate for Zone 2 (or 0 or 1), for acceptance criteria see 2.2.1 above, or
- have a manufacturer's conformity declaration, stating that the equipment is suitable for installation in Zone 2, declaring conformity with specified standard/standards such as IEC 60079-15, or
- be of a type designed to prevent spark and arcs and unacceptable surface temperatures (above the limits of the required temperature class) during its normal operation, or
- having enclosure of at least IP55 and acceptable surface temperature (within the limits of the required temperature class).

Simple apparatus (thermocouples, photocells, junction boxes, strain gauges, switching devices, etc.), as defined in IEC 60079-11, in intrinsically safe or energy-limited circuits do not require any of the evidence given above.

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Note: Information on the nameplate of equipment is to be consistent with information given in the manufacturer's conformity declaration or Ex certificate.

2.3 Modifications

Unauthorised modifications are not permitted. If equipment has been subjected to unauthorised modifications, it will be considered as not suitable for hazardous areas.

Note:

Some examples of unauthorised modifications are:

- *Additional holes drilled in an Ex-d enclosure.*
- *Gaskets fitted to enclosures not certified with it.*
- *Flame paths taped, painted or tighten by other means for preventing corrosion.*

Drawings (as mentioned in clause 3.1) are to be submitted to the Society for approval for new installations or conversion of electrical installations in hazardous areas, which may affect classification.

The modifications are to be carried out in accordance with IEC 60079.

2.4 Cable glands and plugs for Ex-d and Ex-e enclosures are marked and of same Ex type as the enclosure, unless certified for use of different type.

For Ex-d enclosures, the gas group is also stated on the gland. If this information is not readable on the equipment it will normally be considered as not suitable for hazardous areas. For Zone 1, glands with rubber seal can only be used for enclosure with internal volume less than 2 litres and gas group IIA & IIB.

Note: Cable glands are marked individually (IEC 60079-0 Appendix A.4.1). However, individual marking of cable glands is not required when the cable glands form an integral and permanently fixed part of the enclosure having been certified as one single unit.

2.5 Flame paths on Ex-d enclosures can be protected by the following:

- Suitable non-hardening grease.
- Gaskets, if the equipment has been certified with gaskets.
- One layer of soft tape, but not for gas group IIC (and not on threads).
- Maker's recommendation.

Cable glands are to be also Ex-d.

2.6 If a gasket is damaged and needs replacement, it is of the same type as originally fitted or another acceptable type as stated in the certificate. Any change of gaskets is typically an item that is to be recorded in the maintenance record onboard and thereby easy to identify.

2.7 Repair of equipment.

Minor Maintenance by shipboard personnel such as changing gaskets, covers for light fittings, etc. is permitted, but is to be recorded.

Major repairs such as the change of motor bearings, etc. are to be done by qualified personnel, and recorded and marked with the symbol:

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Note that the Flag state might have further requirements for repair of Ex equipment.

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2.8 Maintenance procedures and records for all electrical equipment located in hazardous areas are documented and kept onboard.

The record includes the following as a minimum:

- Date of inspection
- Identification of any maintenance found necessary
- Details of maintenance and date when it was completed
- Name of companies and persons who carried out the inspection and maintenance

3. Surveys on new construction

3.1 Documentation to be submitted:

3.1.1 The following plans and documents are to be submitted to the Society for approval before the new construction survey:

- a) Area classification drawing of the ship showing gas-dangerous zones and spaces. Spaces requiring over-pressure/under-pressure, ventilation openings, air-locks, etc. are to be indicated in the drawing or its attachments.
- b) Layout drawing of electrical equipment in hazardous areas.
- c) List of all electrical equipment in hazardous areas, including the following details:
 - Zone classification of location
 - Reference to equipment identification used on layout / area classification drawing
 - Type of equipment and manufacturer
 - Type of explosion protection
 - Apparatus group
 - Temperature class
 - Ingress Protection(IP) rating
 - Test authority and Ex-certificate number
 - Ambient temperature range for the equipment¹⁾

*Note*¹⁾

If ambient temperature is not stated it is to be understood as the temperature range as -20 deg to +40 deg, as per IEC 60079-14.

- d) Verification of the compatibility between the barrier and the field component for Intrinsically Safe (IS) circuits.

3.1.2 The documentation as per 3.1.1 is to be available and approved. The actual installation is to be compared with relevant approved drawings. Manufacturer's declarations and certificates for certified Ex equipment are to be delivered with the vessel. All nameplates on equipment are to be consistent with the certificate or declaration.

3.2 Survey of Installation

The installation of electrical equipment in hazardous area is to be verified in accordance with approved drawings.

All equipment is subject to survey, including the checking of connections, conditions and functions and the opening of enclosures by appropriate tools. Proper electrical installation and compliance with possible special conditions from the Ex-certificate are to be verified.

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It is to be verified that:

3.2.1 Cables are properly fixed and mechanically protected. The type of cable is appropriate for the hazardous area (screened or armoured) or has been installed in a pipe.

3.2.2 There is no obvious damage to cables. There are normally no cable joints in hazardous areas, but for repairs this may be acceptable provided the continuity of the cable is maintained. Except for intrinsically safe circuits, cable joints are not accepted in Zone 0.

3.2.3 There is no undue accumulation of dust and dirt.

3.2.4 Earth fault monitoring devices are in normal operation and no active alarm due to abnormal low level of insulation resistance or high level of leakage current.

3.2.5 Measurement of insulation resistance: All applicable electrical equipment are able to read minimum 1 MΩ. Confirm that earthing and bonding are made with proper resistance to earth.

Note: The measurement of insulation resistance for IS equipment is to be carried out only after isolating the circuitry, where otherwise damage to the equipment may result.

3.2.6 The hazardous area end of spare cables / cores are connected to earth or spare terminals suitable for the zone. Insulation by tape alone is not permitted on spare cable / cable pairs. Cables containing IS circuits are marked to identify them as being part of IS circuit.

3.2.7 Intrinsically safe cable and non-intrinsically safe cable are not laid in the same cable bunch or pipe unless provided with an earthed metal partition. Ex-ia circuits and Ex-ib circuits are not to be run in the same cable.
Terminals for intrinsically safe circuits and terminals for non-intrinsically safe circuits are separated by a physical distance of 50 mm or a separating panel. Terminals for intrinsically safe circuits are marked as such.

3.2.8 Sealing of gas tight cable penetrations separating hazardous and non-hazardous area are satisfactory.

3.2.9 Earthing of cable braiding or other metallic coverings. Power and lighting circuits are earthed in both ends. Single core cables above 20 A in one end only, preferable in hazardous area.

3.2.10 Drainage of cable pipes are arranged and located at the lowest part of the pipe.

3.2.11 There are no obstructions adjacent to flameproof flanged joints.
Minimum clearance:

- 10 mm IIA
- 30mm IIB
- 40mm IIC

3.2.12 For spaces in which ventilation is required, e.g. cargo pump room, cargo compressor room, etc., the ventilation capacity on the fans nameplate is to be verified according to the approved ventilation capacity to ensure that a sufficient number of air changes are provided. Ventilation failure is to be alarmed.

Purging time of spaces protected by overpressure is to be determined or verified according to approved drawings.

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3.2.13 For spaces protected by over-pressure, actions upon the loss of pressure are to be verified according to approved drawings. These may be automatic or manual disconnections depending on the type of Ex- protection used and audible and visual alarms. Alarms are to be given at a manned station.

Note: Loss of overpressure means less than 0.25mbar in the protected area.

3.2.14 Setting of overload or thermal protection for Ex-e motor is in accordance with approved drawings.

3.2.15 The flame path protection of Ex-d equipment is to comply with 2.5. Corrosion or paint blocking the path is not accepted.

3.2.16 Condition of equipment is such that it allows safe operation.

Corrosion damages are not acceptable as these can cause Ex equipment to lose its protective function and its watertight integrity.

The protective gas pressure and flow for Ex-p equipment is according to design and flow is adequate.

The resin for Ex-m equipment in the enclosure is not damaged.

A suitable safety barrier/isolator is provided for Ex-ia/-ib equipment.

4. Surveys on ships in service

4.1 General

The maintenance record, as per 2.8, is to be reviewed for updates carried out the last 12 months. Repaired or replaced Ex equipment is to be surveyed by checking connections, conditions and function including opening enclosures by appropriate tools, including updated document (Refer IEC 60079-17).

4.1.1 Electrical equipment in gas-dangerous spaces and zones are to be examined with respect to:

- The enclosure is in satisfactory condition.
- No unauthorised modifications
- Bolts of the enclosure are tight and in satisfactory condition.
- There are no strains, poor insulation /or loosen connection to the electrical equipment in the enclosure.
- Cable glands are tight and in good condition.
- Gasket is in good condition.
- Equipment marking in order
- Equipment earthing / bonding in order
- Cables in good condition

Specific for protection type:

- Ex-d: The flame path is in satisfactory condition.
- Ex-p: The protective gas pressure and flow are adequate.
- Ex-m: The resin in the enclosure is not damaged.

Areas protected by overpressure:

- Test audible and visual alarm in manned station upon loss of pressure.
- Check automatic or manual disconnection. Ref. 3.2.13

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4.2 Annual Surveys

Visual inspection of installations and spot-checking of equipment is to be carried out. In case of any findings, the surveyor may extend the survey as deemed necessary, requiring the examination of covering connections, conditions and functions including opening enclosures by appropriate tools.

4.3 Special Surveys

The following items are to be checked for satisfactory condition during special surveys in addition to 4.2:

- Scope is as for Annual Survey. Surveyor may ask for function testing if defects are found or suspected.
- Insulation monitoring with alarm to be tested.
- Megger testing of power circuits.
Note that Megger testing in gas dangerous spaces may involve risk of explosion due to sparks.
- In spaces protected by overpressure: audible and visual alarm upon loss of pressure to be tested and automatic or manual disconnection of power supply to be checked.

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