DEPARTMENT
OF TRANSPORT

MERCHANT SHIPPING NOTICE No. M.1557

Electrical Installations in Small Craft Fire Risks

Notice to Shipowners, Shipbuilders, Shiprepairers, Masters, Officers and Seamen of Merchant Ships; Owners, Designers, Builders, Skippers and Crew of Fishing Vessels and Yachts

General

1. In a number of cases where fires in small craft have been reported to the Department, the original cause is thought to have been electrical. It is considered appropriate to emphasise to those associated with these vessels the importance of complying with the fundamental rules for electrical installations, whatever the size of the vessel (including cargo ships of under 500 tons, in which the electrical installation is not presently governed by statutory regulations).

2. The purpose of this Merchant Shipping Notice is to highlight those matters which, if not given due attention, could result in high risk of fire and/or explosion.

3. Statutory regulations currently in force with respect to the construction of passenger ships, and of cargo ships of 500 tons and over, require compliance with The Institution of Electrical Engineers—"Regulations for the Electrical and Electronic Equipment of Ships with Recommended Practice for their Implementation" (IEE Regulations), (except in so far as they may be inconsistent with the statutory regulations). As a matter of good practice, cargo ships of under 500 tons and other small vessels should also comply.

The applicable edition of the IEE Regulations depends on the date of build of the ship. The details are set out in other M notices which are referred to by the regulations.

For fishing vessels, the Department's publication "Survey of Fishing Vessels, Instructions for the Guidance of Surveyors" requires compliance with the 1972 edition, but, where the keel is laid or the ship is at a similar stage of construction on or after 31 May 1992, compliance should be with the 1990 edition.

4. In small ships, fishing vessels and other craft many of the systems are of the type that operate at not more than 50 volts, (usually 24 volts) having a propulsion engine driven alternator and batteries, similar to those generally installed in public transport vehicles (buses).

5. In applying the IEE Regulations to small craft, the small scale of the installation must not permit a reduction in the degree of safety, and it must be appreciated that the modern alternator and the battery in particular are capable of giving very high currents. It is therefore important that steps are taken to cut off any excess current as quickly as possible by the use of a fuse or circuit breaker (electrical protection) or by minimising the risk of excess currents by the use of suitable cable.

6. If the electrical protection of the wiring is unsatisfactory, an engine starting battery is capable of causing wiring to glow red hot and even to melt the conductor in severe fault conditions. It will be readily appreciated that these temperatures would be sufficient to start a fire in almost any part of the craft.

7. Consequently, particular attention should be paid to the way that additional equipment is connected, irrespective of whether it is permanently or temporarily installed. Examples are public address systems and sound amplification equipment for discotheques. The power supply should be taken from a point in the circuit which is protected by a fuse or circuit breaker and never connected directly to the battery or alternator or associated wiring.

8. Traditional alkaline and lead acid batteries evolve flammable hydrogen gases which can escape to a high level within the space through the vent plugs provided. Consequently, loose or poorly made electrical connections, wiring with unsatisfactory electrical protection and other sources of ignition such as loose metallic objects, spanners, etc. should be kept clear.

9. It is not always appreciated that flammable gases can be emitted from both alkaline and lead acid batteries of the so called "sealed" or "maintenance free" type. The majority of the hydrogen and oxygen

produced within the cells is re-combined to form water but the process is not 100% efficient. Consequently these batteries are fitted with valves to relieve internal pressure and some ventilation should always be provided for the space where they are located. Guidance is given in section 14 of the 6th Edition of the IEE Regulations. It is understood that future British and International Standards will refer to this type of battery as “valve regulated sealed” type.

10. It is recommended that any additions or modifications to the electrical installations are carried out by qualified personnel.

Existing Craft

11. It is recommended that an examination of the electrical installation is carried out regularly, at least at statutory survey periods where these are applicable, to ensure that:—

.1 all circuits, except the main supply from the battery to the starter motor, and electrically driven steering motors are provided with electrical protection against overload and short circuit (i.e. fuses or circuit breakers are provided). Electrically driven steering motors are seldom fitted to small vessels but, if they are fitted, requirements are given in paragraph A2 of Annex 1.

.2 when additional wiring has been installed, it is in compliance with sub-paragraph 1 above and is properly installed, away from sources of heat, e.g. exhaust pipes etc. and is of a suitable type of cable. Examples of suitable cable types are given in paragraph A3 of Annex 1.

.3 the battery installation and ventilation are in accordance with the IEE Regulations.

.4 all connections are tight (see also Annex 2) properly made and, if necessary, insulated.

.5 the insulation resistance must be maintained at an acceptable level. Details are given in paragraph A9 of Annex 1.

New Systems

12. It is recommended that in designing new electrical installations of the type described in this Merchant Shipping Notice, account is taken of the items listed in Annex 1 to this Merchant Shipping Notice.

Department of Transport
Marine Directorate
Southampton SO15 1EG
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ANNEX 1

BASIC REQUIREMENTS FOR ELECTRICAL SYSTEMS NOT EXCEEDING 50V DC

A1. Systems should be two wire, except that single wire systems are acceptable for engine circuits comprising engine mounted equipment, provided the return connection from these is made at the engine itself.

A2. All circuits, except the main supply from the battery to the starter motor, and electrically driven steering motors should be provided with electrical protection against overload and short circuit (i.e. fuses or circuit breakers should be installed). Steering motors should have an overload alarm in lieu of overload protection and short circuit protection. The short circuit protection should be for not less than twice the total rated current of the motors in the circuit protected.

A3. Cables which are not provided with electrical protection should be kept as short as possible and should be "short circuit proofed", e.g. single core with additional insulated sleeve over the insulation of each core. Normal marine cable (e.g. in compliance with BS 6883) which is single core will meet this requirement without an additional sleeve, since it has both conductor insulation and a sheath.

A4. In systems where there is no intentional connection of the circuit to earth (insulated systems) double pole switches should be provided, except that single pole switches may be used in the final sub-circuit.

A5. Single pole switches are acceptable in systems with one pole earthed. Fuses should not be installed in an earthed conductor.

A6. A battery cut-out switch is recommended for all systems. It is preferred that this switch acts as an isolator, i.e. it is double pole. If a battery change-over switch is fitted and is provided with an "off" position, this may serve as the cut-out switch also.

A7. The battery installation and ventilation should be in accordance with IEE Regulations.

A8. All wiring should be carried out with flame retardant cable. Normal domestic PVC insulated, PVC sheathed, power and lighting cable manufactured to BS 6004 is acceptable. PVC cable to BS 6862, Part 1 "Cables for Vehicles" is also acceptable provided it is flame retardant. Note that when selecting cables, particular attention should be given to environmental factors such as temperature and contact with substances, e.g. polystyrene, which degrades PVC insulation.

A9. The insulation resistance, using a low voltage instrument so as not to cause damage, is not less than 0.3 megohm for all new vessels, but a minimum of 0.1 megohm can be accepted on existing vessels.

References

(1) The Institution of Electrical Engineers Regulations for the Electrical and Electronic Equipment of Ships with Recommended Practice for their Implementation, 6th Edition 1990.

Also refer to the following ISO standards which are in course of preparation and are anticipated will be published by 1995.

(2) ISO 10133 Small Craft—Electrical Equipment—Extra-low Voltage DC Installations.

(3) ISO 13297 Small Craft—Electrical Equipment—Alternating Current Installations.

ANNEX 2

LOOSE CONNECTIONS AND PARTS IN ELECTRICAL EQUIPMENT

A number of incidents reported to the Department indicate that ships have been placed in danger, unnecessarily, due to connections and parts of electrical equipment becoming loose in service.

All electrical equipment for use in ships should be suitably specified, constructed and maintained for the conditions of vibration and mechanical shock to which it will be subject in normal shipboard service.

The following four incidents illustrate that equipment has failed due to inadequate design or maintenance:—

(1) A switchboard fire in a tanker was caused by overheating of loose contacts on a motor starter.

(2) Loose connections on the steering gear position transmitter of a general cargo ship caused a failure of the control system and loss of steering, leading to collision with another ship.

(3) Loose parts of a switch-fuse became detached, fell onto bus-bars causing an arc which resulted in a main switchboard fire, complete loss of electrical power and propulsion. This incident involved a passenger ship in severe weather conditions and was potentially extremely serious. Subsequent investigation revealed that similar parts on a number of other switch fuses in the same switchboard were also loose.

(4) The report of a switchboard fire on an offshore standby vessel referred to many loose connections although they do not appear to have been the cause of the fire in this instance.

The incidents referred to indicate that insufficient attention is being paid to the provision of locking facilities are to ensuring during regular maintenance periods that connections and securing devices of electrical equipment are tight.

Those responsible for the design and installation of such equipment should ensure that adequate provision is made for securing and/or locking of parts and connections and that the equipment is not put into service unless such provision has been made effective.

Once the equipment is in service those responsible for its operation and maintenance should ensure that it is checked at suitable intervals so that any wear or other deterioration which could eventually lead to loose parts, overheating or disintegration, is detected and corrected before any serious consequences arise.

The performance of the securing arrangements should be monitored during regular maintenance periods. If the performance in this respect is unsatisfactory the need for modification or replacement of existing equipment should be considered.

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