

**PART II RULES FOR THE CONSTRUCTION
AND CLASSIFICATION OF SHIPS
IDENTIFIED BY THEIR MISSION**

**TITLE 15 ROLL ON - ROLL OFF CARGO
SHIPS**

SECTION 7 ELECTRICITY

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CHAPTER A SCOPE

A1. APPLICATION

A1. APPLICATION

100. Additional requirements for roll on / roll off vessels

101. In addition to the requirements of Part II, Title 11, Section 7, and those in the present Title, electrical installations in spaces intended for the carriage of motor vehicles with fuel in their tanks are to comply with those of Part II, Title 11, Section 3, Chapter E, Subchapter E14.

102. Roll on – roll off vessels with notation to carry dangerous goods are to be in compliance with the requirements of Part II, Title 104, Section 7.

A2. DEFINITIONS

100. Terms employed in this Section

101. **Artificial ventilation:** movement of air and its replacement with fresh air by artificial means (for example fans) and applied to a general area.

102. **Enclosed space:** any space within which, in the absence of artificial ventilation, the ventilation will be limited and any explosive atmosphere will not be dispersed naturally

103. EPL – Equipment Protection Level

- a. **EPL a** – with very high level of protection and thus a very high degree of safety
- b. **EPL b** – with high level of protection and therefore a high degree of safety
- c. **EPL c** – with normal level of protection and therefore a conventional degree of safety

104. **Explosive gas atmosphere:** mixture with air, under atmospheric conditions, of flammable substances in the form of gas, vapour or mist, in which, after ignition, combustion spreads throughout the unconsumed mixture

105. **Hazardous area:** area in which an explosive gas atmosphere is or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of electrical apparatus.

106. **Lower explosive limit (LEL):** concentration of flammable gas, vapour or mist in air, below which an explosive gas atmosphere will not be formed

107. **Natural ventilation:** movement of air and its replacement with fresh air due to the effects of wind and/or temperature gradients

108. **Open space:** space in an open air situation without stagnant areas where vapours are rapidly dispersed by wind and natural convection. Typical air velocities should rarely be less than 0,5 m/s and should frequently be above 2 m/s

109. **Upper explosive limit (UEL):** concentration of flammable gas, vapour or mist in air, above which an explosive gas atmosphere will not be formed

110. **Zone 0:** area in which an explosive gas atmosphere is present continuously or is present for long periods

111. **Zone 1:** area in which an explosive gas atmosphere is likely to occur in normal operation

112. **Zone 2:** area in which an explosive gas atmosphere is not likely to occur in normal operation and, if it does occur, is likely to do so only infrequently and will exist for a short period only

113. Types of protection for electrical apparatuses

- a. **Flameproof enclosure “d”:** Type of protection of electrical apparatus in which the enclosure will withstand an internal explosion of a flammable mixture which has penetrated into the interior, without suffering damage and without causing ignition, through any joints or structural openings in the enclosure, of an external explosive atmosphere consisting of one or more of the gases or vapours for which it is designed
- b. **Increased safety “e”:** Type of protection applied to electrical apparatus that does not produce arcs or sparks in normal service, in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and the occurrence of arcs and sparks
- c. **Intrinsically-safe circuit “i”:** Circuit in which no spark or any thermal effect produced in the test conditions prescribed (which include normal operation and specified fault conditions) is capable of causing ignition of a given explosive gas atmosphere. The coding ‘ia’ denotes that the unit will not cause ignition of explosive atmosphere under normal operation and with two faults present in the circuitry. The coding ‘ib’ denotes that the unit will not cause ignition of explosive atmosphere under normal operation and with one fault present in the circuitry. You should note that this method does not protect entirely against the local over-heating of damaged connections or conductors and these should be kept sound and suitably protected against damage

- d. **Encapsulation “m”:** A type of protection in which the parts which could ignite an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that this explosive atmosphere cannot be ignited
- e. **Protection “n”:** Type of protection applied to electrical apparatus such that, in normal operation, it is not capable of igniting a surrounding explosive gas atmosphere and a fault capable of causing ignition is not likely to occur.
- f. **Oil immersion “o”:** Type of protection in which the electrical apparatus or parts of the electrical apparatus are immersed in a protective liquid in such a way that an explosive atmosphere, which may be above the liquid or outside the enclosure, cannot be ignited
- g. **Pressurisation “p”:** Technique of guarding against the ingress of the external atmosphere, which may be explosive, into an enclosure by maintaining a protective gas therein at a pressure above that of the external atmosphere
- h. **Sand/Powder/Quartz Filled “q”:** Equipment components are completely covered with a layer of Sand, powder or quartz.
- i. **Ex s** is a coding referenced in IEC 60079-0. The use of EPL and ATEX Category directly is an alternative for “s” marking. The IEC standard EN 60079-33 is made public and is expected to become effective soon, so that the normal Ex certification will also be possible for Ex-s

CHAPTER B TECHNICAL DOCUMENTATION

CHAPTER CONTENTS

B1. DOCUMENTATION TO THE RBNA

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100. Additional documents

701. In addition to the documentation listed in Part II, Title 11, Section 7, Chapter B, Subchapter B1 the following plans shall be required for roll on - roll off ships with cargo spaces intended for the carriage of motor vehicles with fuel in their tanks and / or dangerous goods:

- a. General arrangement of the ship showing the gauge, type, insulation and cable penetrations in bulkheads

and decks, location and type of safety of electrical equipment in hazardous zones and special category spaces;

- b. Diagram of distribution of the systems of side doors identification, cargo doors and closing devices, TV surveillance or detection of flooding and visual alarm showing the segregation of indication circuits, operation and locking in ro-ro cargo spaces and special category spaces;
- c. Diagram of distribution systems and electrical energy monitoring for additional emergency lighting showing the lanterns and connection device for continuous charging batteries;
- d. Diagram of distribution systems, control, monitoring showing the type of electric equipment safety, type, gauge and insulation of cables, automatic devices of closing of the flaps and stopping of the forced ventilation in main vertical zones and special category spaces; and
- e. Diagram of distribution systems, control, monitoring and high water level alarms in cargo spaces and special category spaces

Guidance

Area classification shall be carried out at an early stage of planning, before any construction work starts and the results documented in drawings showing the different zones.

End of guidance

CHAPTER D CONSTRUCTION PRINCIPLES

CHAPTER CONTENTS

D1. SHIP CONSTRUCTION

D2. INSTALATIONS -

D1. SHIP CONSTRUCTION

100. Hazardous areas

101. Any electrical apparatus permitted in the hazardous areas defined in Subchapter A2 above, requires special precautions with respect to its construction, certification, and use and, when applicable, its installation.

102. The spaces are categorized as hazardous only when dangerous goods are carried.

103. All appropriate measures should be taken to prevent flammable gas and/or dust entering spaces adjacent to the hazardous areas.

D2. INSTALLATIONS

100. Electrical equipment in hazardous areas and areas where explosives are stored

101. to 103. See Part II, Title 11, Section 7, Subchapter D2.

104. **Selection with respect to ignition temperature of the gas or vapour:** The electrical apparatus shall be so selected that its maximum surface temperature will not reach the ignition temperature of any gas or vapour, or mixture of gases or vapours, which can be present. The surface temperature considered may be that of an internal or external part, according to the type of protection of the apparatus. Symbols for the temperature classes which may be marked on the electrical apparatus have the meaning indicated in table T.D2.104.1. (IEC 60092-506)

TABLE T.D2.104.1 – RELATIONSHIP BETWEEN THE TEMPERATURE CLASSES AND IGNITION TEMPERATURE*

Temperature class of electrical apparatus	Ignition temperature of gas or vapour
T1	>450 °C
T2	>300 °C
T3	>200 °C
T4	>135 °C
T5	>100 °C
T6	>85 °C
*Derived from IEC 60079-14	
<p>¹⁾ Generally, the ignition temperature of a mixture is taken to be equal to that of the component having the lowest ignition temperature, or is determined by test. However, it is recognized that the properties of certain categories of cargo are sufficiently well established to allow selection of equipment without individual analysis or test; for example equipment of temperature class T3 may be accepted for use in hazardous areas on crude oil or oil products tankers without analysis or test of particular cargoes.</p> <p>²⁾ For certain categories of chemical cargoes, equipment of temperature class T4, T5 or T6 may be required.</p>	

(IEC 60092-502, 6.2.2 and Table 3)

605. **Selection with respect to the classification of gas or vapour:** The explosion group and temperature class of electrical equipment for enclosed ro-ro cargo spaces are to be at least **IIA** and **T3**. Symbols for the groups which may be marked on the apparatus are listed against representative gases in Table T.D2.105.1.

Guidance

Refer to the recommendations of the International Electrotechnical Commission, in particular publication 60079.

End of guidance

TABLE T.D2.105.1 – RELATIONSHIPS BETWEEN APPARATUS GROUP AND REPRESENTATIVE GASES*

Apparatus group	Representative gas
IIA	Propane
IIB	Ethylene
IIC	Hydrogen
*Derived from IEC 60079-1	
NOTE - Gases generally are allocated to various groups upon determination of the maximum experimental safe gap or the minimum ignition current. These are related to the maximum gaps permissible in flameproof enclosures and the maximum currents permitted in intrinsically-safe circuits; both reduce progressively from group IIA to group IIC. See IEC 60079-12.	

CHAPTER E BASIC PRINCIPLES FOR DIMENSIONING

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E1. OPERATIONAL CONDITIONS– See Part II, Title 11, Section 7

E2. TYPES OF PROTECTION

E3. DISTRIBUTION SYSTEMS FOR VOLTAGE AND FREQUENCY - See Part II, Title 11, Section 7

E2. TYPES OF PROTECTION

100. General conditions

101. a 103 See Part II, Title 11, Section 7.

200. Degrees of protection

201. The present requirements are additional to those of Part II, Title 11, Section 7, Subchapter E2. The requirements are based upon IEC Standard 60079-14, Section 5.

202. For electrical equipment installed in closed ro-ro cargo spaces, only the following types are permitted:

TABLE T.E2.302.1 – ELECTRICAL EQUIPMENT AND WIRING PERMITTED IN CLOSED RO-RO- CARGO SPACES

Zone	Description of spaces	EPL	Degree of protection	Code	
1	Ro-ro cargo spaces except areas defined in item 3 of the present Table T.E2.302.1.	-	Any type that may be considered for Zone 0		
			Through runs of cable		
	Electrical equipment and wiring shall be of a type suitable for use in an explosive petrol and air mixture.	Ga	Intrinsically safe	Ex(ia)	
			Encapsulated	Ex(ma)	
		Gb	Flame proof	Ex(d)	
			Increased safety	Ex(e)	
			Intrinsically safe	Ex(ib)	
			Encapsulated	Ex(m) Ex(mb)	
			Pressurized	Ex(p)	
Sand filled	Ex(q)				
1	Electrical equipment and wiring in exhaust ventilation ducts Electrical equipment and wiring, if installed in an exhaust ventilation duct, shall be of a type approved for use in explosive petrol and air mixtures and the outlet from any exhaust duct shall be sited in a safe position, having regard to other possible sources of ignition.		As per item for “Zone 1” above		
2	On condition that the ventilation system is so designed and operated as to provide continuous ventilation of the cargo spaces at the rate of at least ten air changes per hour whenever vehicles are on board, in case of other than special category spaces below the bulkhead deck, notwithstanding the provisions in item 1 above: a. a height of 450 mm from the deck; b. areas above a height of 450 mm from each platform for vehicles, if fitted, without openings of sufficient size permitting penetration of petrol gases downward; c. areas above platforms with openings of sufficient size permitting penetration of petrol gases downwards; Electrical equipment of a type so enclosed and protected as to prevent the escape of sparks shall be permitted as an alternative	-	Any type that may be considered for Zone 1		
			Gc	Intrinsically safe	Ex(ic)
				Encapsulated	Ex(mc)
				Not ignited	Ex(n) Ex nA
				Restricted “breathing”	Ex(nR)
				Energy restriction	Ex(nL)
				Sparking apparatus in which the contacts are protected in a suitable way	Ex(nC)
				Pressurized	Ex(pZ)
				FISCO – Fieldbus intrinsically safe concept	