High Voltage Safety
Rules Regulations and Guidelines

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Outline

Competence requirements
- How High
- International Maritime Law
- National an Flag State rules
- Classification
How high is high voltage?

- In electric power transmission engineering, high voltage is considered any voltage over approximately 35Kv.
- The IEC and its national counterparts (IET, IEEE, VDE, etc.) define high voltage as above 1000 Vac, and 1500 Vdc.
- The National Electrical Manufacturer’s Association (NEMA) defines high voltage as over 100kV to 230kV.
How high is high voltage?

- British Standard defines high voltage as any voltage difference between conductors that is higher than 1000 V AC or 1500 V DC, or any voltage difference between a conductor and Earth that is higher than 600 V AC or 900 V DC.
- In Automotive engineering, high voltage is defined as voltage in range 30 to 1000 Vac or 60 to 1500 Vdc.

In Marine Industry?

Follow the relevant rules.
International Maritime Law

Is a general concept based on international conventions. It covers

- maritime safety
- maritime security
- protection of the marine environment
- the ship’s crew
- the ship’s owner’s responsibility

Membership, is open to all peace-loving States that accept the obligations contained in the United Nations Charter and, in the judgment of the Organization, are able to carry out these obligations.
The international conventions that are essential for us are prepared by the IMO.
Most important IMO Conventions are:

- International Convention for the Safety of Life at Sea (SOLAS)
- International Convention for the Prevention of Pollution from Ships (MARPOL)
- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW)

IMO currently has 170 Member States and three Associate Members.

- The sea laws of a IMO member state should be based on these international conventions.
- IMO does not have the authority to enforce the regulations.
- This authority is the responsibility of the Member States.
- All of this is true with one exception...
The IMO has been given the authority to validate
- The training,
- the examination procedures,
- and the certification procedures to the STCW convention.
- IMO assesses Member States on the implementation and enforcement of relevant Convention standards.
- The member states receive feedback and advice on their current performance.

The first version of the treaty was passed in 1914 in response to the sinking of the RMS Titanic.
The International Convention for Safety of Live at Sea. It's main objective is to specify minimum standards compatible with safety for:

- the construction of ships
- the equipment on ships
- the operation of ships
- Solas is considered the most important of all conventions dealing with maritime safety. But »»»>

Solas only states that:

- all ships shall be sufficiently and efficiently manned
- The minimum standards of competence for engineers electricians are properly described in the STCW Convention and the STCW Code.
Sinking of the TORREY CANYON resulted in adoption of MARPOL (1973) and STCW (1978)

International Convention on Standards of Training, Certification and Watchkeeping for seafarers, known as the 1978 STCW Convention. The STCW convention prescribes minimum standards which Member States are obliged to meet or exceed.
Sinking of the AMOCO CADIZ resulted in the adoption of SOLAS (1978) and MARPOL (1978).

1989 Exxon Valdez grounded on Prince William Sounds Bligh Reef. Over 40,000 tonnes were spilled on that incident and brought legislators to frame the OPA 90.
The Oil Pollution Act

1999 ERIKA and European equivalent of OPA, Eur-OPA

STCW (95) amendments

In 1995 the IMO made significant changes on the STCW convention:
- these changes were made as an amendment
- the convention did not have to be ratified as the changes are only an amendment to it
- the most important change was the creation of the STCW code
STCW (2010) amendments

In 2010 in Manilla the IMO again made significant changes on the STCW convention: the STCW code and the amendments thereto where completely replaced,

- the 1995 amendments where replaced by the 2010 amendments
- the STCW code, part of the 1995 amendments, was completely replaced

The most important changes made on the STCW code are:

- Revalidation for higher and managerial level officers for certificate of competence (COC) issued by any governing authority.
- New and improved training guidance for crew and officers serving onboard.
- New requirements for MARPOL awareness which includes training in leadership and teamwork.
- Stringent measures for preventing fraudulent certificates of competence (COC).
The most important changes made on the STCW code are:

- Rest hours onboard have been increased from 70 hours to 77 hours per week.
- Introduction of Electro-technical officer with approved training and COC.
- More facilities and better training for junior engineers and cadets to tackle the problem of shortage of officer.
- Updated drugs and alcohol policy and stringent medical examination.

New requirements for Able seaman to have a certificate of competency for boarding a vessel.

New methods of training in modern technology like electronic chart display and information system (ECDIS).

Stringent competency norm for ship’ staff serving on tankers, gas and chemical carriers.

New and improved requirement for ISPS training and also training to tackle the situation of piracy attack.
STCW (2010) amendments

The most important changes made on the STCW code are:

- Inclusion of modern training methods introducing distance learning and web based learning.
- New training regulations for ship staff in polar water and personnel operating dynamic positioning system.

STCW Code

Part A of the STCW code:

- the only part of the code which is mandatory
- gives in detail the minimum standards required
Part B of the STCW code:

- gives guidance to assist parties to the STCW Convention
- on the implementation and enforcement
- to give the STCW Convention full and complete effect in a uniform manner

In approving training courses and programmes, parties, should take into account that:

- the relevant IMO Model Courses *can assist* in the preparation of such courses and programmes
- and can ensure that the detailed learning objectives recommended therein are suitably covered
After the accident with the Herald of Free Enterprise chapter 9
The ISM code was added to the SOLAS convention.

International Management code for the Safe operation of ships and for Pollution prevention.
After the accident with the Herald it became clear that the sole responsibility for these accidents could no longer be placed on the captain alone.

The International Safety Management Code for the safe operation of ships and for pollution prevention.

- the ISM code gives the freedom to individual shipowners to develop their own Safety Management System (SMS)
- there are no specific references to electricity or electrical safety in the text
- this does not mean that the code considers electric safety unimportant
- each shipping company has to frame a safety management system what makes them follow the SOLAS regulations
United Nations Convention on the Law of the Sea (UNCLOS) states in part:

- **Ships have the nationality of the State whose flag they are entitled to fly.**
- In practice this means that all vessels are required to be registered and comply with the legal requirements of the country in which they are registered.
In addition UNCLOS defines the duties of the flag state. These include, but are not limited to:

- the construction, equipment and seaworthiness of ships
- the manning of the ships, labour conditions and the training of the crews, taking into account the international conventions they have underwritten.
- the use of signals, the maintenance of communications and the prevention of collisions
- consequently, ships should be prepared to be audited and surveyed by its Flag State
Port State Control (PSC)

Port state control is the inspection of foreign ships in national ports by PSC officers for the purpose of verifying:
- the competence of the master and officers on board
- the condition of the ship and its equipment
- in short, that the ship and its crew comply with the requirements of international conventions (e.g. SOLAS, MARPOL, STCW, etc.)

Port State Control functions under mutual agreements between flagstates.
- Flag States in Europe formed the Paris Memorandum of Understanding (Paris MoU).
- as of 2011, nine MoUs have been signed covering various regions
- the United States is not a signatory of any MoU
- the US Coast Guard carries out PSC in compliance with US regulations and international conventions
The **purpose** of a classification society is to provide:
- classification
- statutory services and assistance to the regulatory bodies
- as regard to maritime safety and pollution prevention
- based on their maritime knowledge and technology.

The **objective** of a classification society is to verify:
- structural strength of the hull and its appendages
- reliability and function of essential services
Classification societies aim to achieve this objective through:

- development and application of their own Rules

Classification societies aim to achieve this objective through:

- verifying compliance of their own rules with international and statutory regulations on behalf of flag Administrations
The members of IACS are:
American Bureau of Shipping (ABS);
Bureau Veritas (BV);
China Classification Society (CCS);
Croatian Register of Shipping (CRS);
Det Norske Veritas Germanischer Lloyd (DNV GL);
Indian Register of Shipping (IRS);
Korean Register of Shipping (KR);
Lloyd’s Register (LR);
Nippon Kaiji Kyokai (NK/ClassNK);
Polish Register of Shipping (PRS);
Registro Italiano Navale (RINA);
Russian Maritime Register of Shipping (RS);

- IACS provides technical support and guidance for the IMO
- IACS develops unified interpretations of the international statutory regulations developed by the memberstates of the IMO
Limitations of classifications

The classification process has some serious limitations:

- The society has no control over how the vessel is operated and maintained between periodical surveys.

Activities which fall outside the scope of classification:

- the design and manufacturing process
- choice of type and power of certain equipment
- crew (number qualification)
- maneuvering performance and cargo capacity of a ship
- hull vibrations
- spare parts
- life saving equipment
At sea, equipment and installations are far more defined than the actual work that has to be done on them.

Generally, work onboard is subject to local circumstances.

Since the actual electrical work is not defined as on land, company practices prevail.

All personnel needs to know the risks and operational requirements on electrical equipment.

The amount of electrical work has steadily increased day by day.

The allocation of electrically educated resources is usually lagging behind.

In the meantime, some trained resources have become rare, what can be the reasons?
Classification and Certification

- The everyday organisation and monitoring of the work requires competent and responsible decisions on task allocation.
- Misunderstandings between the different professional groups involved have to be minimized:
  - Electricians
  - Mecanics
  - Staff

Equipment Standardisation

- All equipment on board of a ship must fulfill the class requirements.
- All electric equipment is build and tested according to international standards.
- Classification societies approve delivered equipment as:
  - Type/ standard approved or
  - Case by case approved
ISO, the International Organisation for Standardisation, is a worldwide federation.

- The scope of ISO covers standardisation in all fields except electrical and electronic engineering standards, which are included in IEC-standards.
- Almost everything from drawing sheet size to the welding strength calculation and re lubrication nipple dimensions has an appropriate ISO standard. The sound pressure level test is also included in ISO standards as are transportation package and container construction.

DIN, Deutsches Institut fur Normung. DIN standards are old and generally used in Europe. In DIN standards have been defined dimensional standards for bolts, screws, nuts and accessories for bolt nut assemblies. Also different type of shaft end, material requirements and couplings are standardized in DIN standards.
Examples of DIN standards are:

- DIN 476: international paper sizes (now ISO 216 or DIN EN ISO 216)
- DIN 946: Determination of coefficient of friction of bolt/nut assemblies under specified conditions.
- DIN 1451: typeface used by German railways and on traffic signs
- DIN 31635: transliteration of the Arabic language
- DIN 4512: A definition of film speed
- DIN 72552: electric terminal numbers in automobiles

ANSI and ASME, also inch-based mechanical standards have been defined.
For example ANSI (American Standard Institution) and ASME (American Society of Mechanical Engineers) Standards define inch screw threads and give inch based bolts, screws, nuts and bolt/nut assemblies.
## Electrical Standards

### IEC Standard

<table>
<thead>
<tr>
<th>Unit (binary)</th>
<th>Symbol</th>
<th>Base</th>
<th>Exponent (bits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>bit</td>
<td>bit</td>
<td>2^0</td>
<td>0 or 1</td>
</tr>
<tr>
<td>byte</td>
<td>B</td>
<td>2^3</td>
<td>8</td>
</tr>
<tr>
<td>kibibit</td>
<td>KiB</td>
<td>2^10</td>
<td>1024 bits</td>
</tr>
<tr>
<td>kilobit</td>
<td>kbit</td>
<td>2^10</td>
<td>1000 bits</td>
</tr>
<tr>
<td>kibibyte (binary)</td>
<td>KiB</td>
<td>2^20</td>
<td>1024 kibibytes</td>
</tr>
<tr>
<td>kilobyte (decimal)</td>
<td>kB</td>
<td>10^3</td>
<td>1000 bytes</td>
</tr>
<tr>
<td>megabit</td>
<td>Mbit</td>
<td>2^20</td>
<td>1000 kilobits</td>
</tr>
<tr>
<td>mebibyte (binary)</td>
<td>MiB</td>
<td>2^20</td>
<td>1024 mebibytes</td>
</tr>
<tr>
<td>megabyte (decimal)</td>
<td>MB</td>
<td>10^6</td>
<td>1000 kilobytes</td>
</tr>
<tr>
<td>gigabit</td>
<td>Gbit</td>
<td>2^30</td>
<td>1000 megabits</td>
</tr>
<tr>
<td>gibibyte (binary)</td>
<td>GiB</td>
<td>2^30</td>
<td>1024 gibibytes</td>
</tr>
<tr>
<td>gigabyte (decimal)</td>
<td>GB</td>
<td>10^9</td>
<td>1000 megabytes</td>
</tr>
<tr>
<td>terabit</td>
<td>Tbit</td>
<td>2^40</td>
<td>1000 terabits</td>
</tr>
<tr>
<td>tebibyte (binary)</td>
<td>TiB</td>
<td>2^40</td>
<td>1024 tebibytes</td>
</tr>
<tr>
<td>terabyte (decimal)</td>
<td>TB</td>
<td>10^12</td>
<td>1000 gigabytes</td>
</tr>
<tr>
<td>petabit</td>
<td>Pbit</td>
<td>2^50</td>
<td>1000 petabits</td>
</tr>
<tr>
<td>pebibyte (binary)</td>
<td>PiB</td>
<td>2^50</td>
<td>1024 pebibytes</td>
</tr>
<tr>
<td>petabyte (decimal)</td>
<td>PB</td>
<td>10^15</td>
<td>1000 terabytes</td>
</tr>
</tbody>
</table>

**Figure:** Computer power cord, IEC 60320 C13, C14
IEC
- The International Electrotechnical Commission is the organisation responsible for standardisation in the electrical and electronics field.
- IEC is composed of 44 National Committees which collectively represent some 80 percent of the world's population that produces and consumes 95 percent of electric energy.
- The main problem with the IEC standards is that their status in the world is not strong enough. In many countries national electric standards are in common use.

Figure: CJ86 EMC armored Marine Power and Control Cable 0.6/1kV
IEC92

- IEC 60092 Electrical installations in ships
- This standard forms a series of international standards for electrical installations in seagoing ships, incorporating good practise and co-ordinating, as far as possible, existing rules.
- The standard is said to form a code for practical interpretation and amplification of the requirements of the international convention on Safety Of Life At Sea (SOLAS).

IEEE 45

What is IEEE 45?

- It is the recommended standard for electrical on-board installations based on USA practices.
- The scope of this standard covers oceangoing vessels and vessels for use on rivers, lakes, bays, etc.
- It is considered an alternative standard to the IEC 60092, which are part of ABS rules.
Where is IEEE 45 used?
The IEEE 45 electrical practice is often applied to offshore GOM (Gulf Of Mexico) support vessels and drill ships especially those that are US-build. Outside the US and for non US-flag vessels operating outside the GOM, electrical equipment vendors more frequently adhere to IEC standards.

Can IEEE 45 be used in place of IEC standards to meet ABS Rule requirements? Both IEEE 45 and IEC standards can be used to meet ABS rules. Equipment, components and systems for which ABS has specific requirements may comply with an alternative standard such as IEEE 45, in lieu of the IEC-based requirements in the Rules. It is essential, however, that IEEE 45 or any other alternative standard proposed for use is determined by ABS to be no less effective than the Rules.
Can parts of IEEE 45 be coupled with parts of IEC standards for meeting ABS Rule requirements. When IEEE 45 is proposed as an alternative, all equipment must fully comply with the IEEE 45 standard. **Coupling sections of several standards together can result in less effective electrical requirements**, and thus, cannot be accepted as being in compliance with ABS Rules. Although ABS has been migrating towards IEC-based rules, it continues to recognize American equipment and practices.
Other international electrical standards

- VDE (German Association of Electrical Engineers)
- CENELEC
- ANSI/ASME
- IEEE (Institute of Electrical and Electronics Engineers)
- NEMA (National Electrical Manufacturers Association)
- BS (British Standards)
- JAS (JAPAN)
- CSA (Canadian Standards Association)
- AS (Australian Standards)
- API (American Petroleum Institute)

Figure: Control Resources supplies low profile mounting rails in accordance to DIN 46277, CENELEC EN 50.022/50.035 standards
Most national standards cover things like terminal markings, direction of rotation and minimum creepage distances, which affects machine construction but not performance. In many cases API-standard refer to NEMA standard. The most frequently used national electrical standard replacing IEC is NEMA.

The IP Code, International Protection Marking, IEC standard 60529, sometimes interpreted as Ingress Protection Marking, classifies and rates the degree of protection provided against intrusion (body parts such as hands and fingers), dust, accidental contact, and water by mechanical casings and electrical enclosures. It is published by the International Electrotechnical Commission (IEC).
## IP Classification for Enclosures

### TABLE 1A

<table>
<thead>
<tr>
<th>First IP numeral</th>
<th>Short description</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Non-protected</td>
<td>No special protection</td>
</tr>
<tr>
<td>1</td>
<td>Protected against solid objects</td>
<td>A large surface of the body, such as a hand (but no protection against deliberate access). Solid object exceeding 50 mm (2 in) in diameter.</td>
</tr>
<tr>
<td></td>
<td>greater than 50 mm (2 in.)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Protected against solid objects</td>
<td>Fingers or similar objects not exceeding 80 mm (3.15 in) in length. Solid objects exceeding 12 mm (0.5 in) in diameter.</td>
</tr>
<tr>
<td></td>
<td>greater than 12 mm (0.5 in.)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Protected against solid objects</td>
<td>Tools, wires, etc. of diameter or thickness greater than 2.5 mm (0.1 in). Solid objects exceeding 2.5 mm (0.1 in) in diameter.</td>
</tr>
<tr>
<td></td>
<td>greater than 2.5 mm (0.1 in.)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Protected against solid objects</td>
<td>Wires or strips of thickness greater than 1 mm (0.04 in). Solid objects exceeding 1 mm (0.04 in) in diameter.</td>
</tr>
<tr>
<td></td>
<td>greater than 1 mm (0.04 in.)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Dust protected</td>
<td>Ingress of dust is not totally prevented, but dust does not enter in sufficient quantity to interfere with satisfactory operation of the equipment.</td>
</tr>
<tr>
<td>6</td>
<td>Dust-tight</td>
<td>No ingress of dust</td>
</tr>
</tbody>
</table>

### Figure: First IP numeral

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## IP Classification for Enclosures

### TABLE 1B

<table>
<thead>
<tr>
<th>Second IP numeral</th>
<th>Short description</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Non-protected</td>
<td>No special protection</td>
</tr>
<tr>
<td>1</td>
<td>Protected against dripping water</td>
<td>Dripping water (vertically falling drops) is to have no harmful effect.</td>
</tr>
<tr>
<td>2</td>
<td>Protected against dripping water</td>
<td>Vertically dripping water is to have no harmful effect when the enclosure is tilted at any angle up to 15° from its normal position.</td>
</tr>
<tr>
<td></td>
<td>when tilted up to 15°</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Protected against spraying water</td>
<td>Water falling as spray at an angle up to 60° from the vertical is to have no harmful effect.</td>
</tr>
<tr>
<td>4</td>
<td>Protected against splashing water</td>
<td>Water splashed against the enclosure from any direction is to have no harmful effect.</td>
</tr>
<tr>
<td>5</td>
<td>Protected against water jets</td>
<td>Water projected by a nozzle against the enclosure from any direction is to have no harmful effect.</td>
</tr>
<tr>
<td>6</td>
<td>Protected against heavy seas</td>
<td>Water from heavy seas or water projected in powerful jets is not to enter the enclosure in harmful quantities.</td>
</tr>
<tr>
<td>7</td>
<td>Protected against the effects of</td>
<td>Ingress of water in a harmful quantity is not to be possible when the enclosure is immersed in water under defined conditions of pressure and time.</td>
</tr>
<tr>
<td>immersion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Protected against submersion</td>
<td>The equipment is suitable for continuous submersion in water under conditions which are to be specified by the manufacturer.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Normally this will mean that the equipment is hermetically sealed. However, with certain types of equipment, it can mean that water can enter but only in such a manner that it produces no harmful effects.</td>
</tr>
</tbody>
</table>

### Figure: Second IP numeral

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**Table 2: Minimum Degree of Protection (2006)**

<table>
<thead>
<tr>
<th>Example of Location</th>
<th>Condition of Location</th>
<th>Switchboards, distribution boards, motor control centers and controllers</th>
<th>Generators</th>
<th>Motors</th>
<th>Transformers, Converters</th>
<th>Lighting fixtures</th>
<th>Heating appliances</th>
<th>Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry accommodation space</td>
<td>Dry parts only</td>
<td>IP20 IP20 IP20 IP20 IP20 IP20 IP20 IP20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry control rooms</td>
<td></td>
<td>IP20 IP20 IP20 IP20 IP20 IP20 IP20 IP20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control rooms</td>
<td>Damage of touching live parts only</td>
<td>IP22 IP22 IP22 IP22 IP22 IP22 IP22 IP22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machinery spaces above floor plates</td>
<td>Damage of dripping liquid and/or moderate mechanical damage</td>
<td>IP22 IP22 IP22 IP22 IP22 IP22 IP22 IP22 IP44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stering gear rooms</td>
<td></td>
<td>IP22 IP22 IP22 IP22 IP22 IP22 IP22 IP22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerating machinery rooms</td>
<td></td>
<td>IP22 IP22 IP22 IP22 IP22 IP22 IP22 IP22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency machinery rooms</td>
<td></td>
<td>IP22 IP22 IP22 IP22 IP22 IP22 IP22 IP22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General store rooms</td>
<td></td>
<td>IP22 IP22 IP22 IP22 IP22 IP22 IP22 IP22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pantries</td>
<td></td>
<td>IP22 IP22 IP22 IP22 IP22 IP22 IP22 IP22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passage rooms</td>
<td></td>
<td>IP22 IP22 IP22 IP22 IP22 IP22 IP22 IP22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bathrooms and Showers</td>
<td>Increased danger of liquid and/or mechanical damage</td>
<td>- - - - - - IP44 IP44 IP55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machinery spaces below floor plates</td>
<td></td>
<td>- - IP44 IP44 IP44 IP55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closed fuel oil or lubricating oil separator rooms</td>
<td></td>
<td>IP44 IP44 IP44 IP44 IP44 IP44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ballast pump rooms</td>
<td></td>
<td>IP44 IP44 IP44 IP44 IP44 IP44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerated rooms</td>
<td></td>
<td>IP44 IP44 IP44 IP44 IP44 IP44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure**: Minimum degree of protection

---

**For Further Reading**

- The Rules
  - *Lloyds register of shipping.*
- The Rules
  - *ABS.*