



Materials other than steel and concrete

**OFFSHORE TECHNOLOGY REPORT
2001/017**



Materials other than steel and concrete

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FOREWORD

This document provides technical information previously contained in the Fourth Edition of the Health and Safety Executive's '*Offshore Installations: Guidance on Design, Construction and Certification*' (1990 edition plus amendments)⁽¹⁾. The 'Guidance' was originally published in support of the certification regime under SI289, the Offshore Installations (Construction and Survey) Regulations 1974⁽²⁾. However, SI289 was revoked by the Offshore Installations (Design and Construction, etc) Regulations, 1996, which also introduced the verification provisions into the Offshore Installations (Safety Case) Regulations, 1992. The 'Guidance' was formally withdrawn in its entirety on 30 June 1998 (see HSE OSD Operations Notice 27⁽³⁾).

The withdrawal of the 'Guidance' was not a reflection of the soundness (or otherwise) of the technical information it contained; some sections (or part of sections) of the 'Guidance' are currently referred to by the offshore industry. For this reason, after consultation with industry, relevant sections are now published as separate documents in the HSE Offshore Technology (OT) Report series.

It should be noted that the technical content of the 'Guidance' has not been updated as part of the re-formatting for OTO publication, although prescriptive requirements and reference to the former regulatory regime have been removed. **The user of this document must therefore assess the appropriateness and currency of the technical information for any specific application. Additionally, the user should be aware that published sections may cease to be applicable in time and should check with Operations Notice 27, which can be viewed at http://www.hse.gov.uk/hid/osd/notices/on_index.htm, for their current status.**

1. INTRODUCTION AND SOURCE OF INFORMATION

This Offshore Technology (OT) Report provides technical information on the structural use of materials other than steel or concrete for Offshore Installations. It is based on guidance previously contained in Section 24 of the Fourth Edition of the Health and Safety Executive's 'Offshore Installations: Guidance on Design, Construction and Certification'⁽¹⁾ which was withdrawn in 1998. As discussed in the Foreword, whilst the text has been re-formatted for Offshore Technology publication, the technical content has not been updated. The appropriateness and currency of the information contained in this document must therefore be assessed by the user for any specific application.

2. REQUIREMENTS FOR MATERIALS

2.1 GENERAL

All materials should be suitable for the service conditions of those elements of the Installation in which they are used. Non-combustible materials should be used except where any required property or use of a material precludes non-combustibility. Materials, other than those specified on the design drawings, including materials of a higher strength grade, should not be substituted in any part of the primary structure without a full evaluation of the consequences and approval of the owner of the Installation. For all materials, appropriate testing should be carried out in accordance with relevant standards or Codes of Practice and the certified reports of those tests should be retained for future reference.

Specific information on aluminium and composite materials is presented in Sections 3 and 4 respectively.

2.2 CODES AND STANDARDS

All structural materials used in the construction of Installations should have allowable stresses and load-carrying capacities determined in accordance with a standard recognised as appropriate to those materials.

3. ALUMINIUM ALLOYS

Aluminium alloys should comply with a recognised specification or with a recognised standard for use in a marine environment. For welded structural members, aluminium alloys should be used in the annealed condition and should be selected from those having a specified minimum 0.2 per cent proof strength in the annealed condition not exceeding 130 N/mm². Higher strength alloys may be considered for non-welded construction. It should be noted that in the event of fire, aluminium loses strength and stiffness very rapidly.

Incendive frictional sparking can occur when light metals or their alloys are brought into contact with an oxygen carrier such as rusty steel. The degree of contact required to produce an incendive spark is low and a light glancing blow is sufficient.

An alloy in which the frictional sparking hazard is not regarded as incendive is one in which the total content by weight of aluminium, magnesium and titanium is less than 15% and in which the alloying elements of magnesium and titanium together do not exceed 4%, by weight.

It is important that apparatus made of light metal or with light metal enclosures that is otherwise unprotected against incendive frictional contact, e.g. by end caps, rubbing strips etc, should not be taken into hazardous areas unless special precautions are taken to ensure safety. It is recommended that equipment containing light alloys (e.g. aluminium ladders) should only be permitted in hazardous areas with the specific authority.

Further guidance may be found in SPE 16548/1⁽⁴⁾ and BS 5345: Part 1⁽⁵⁾.

4. COMPOSITE MATERIALS

Factors that need to be taken into account when proposing to use composite materials such as glass reinforced plastics (GRP) include:

- Fire risk in the location of use and likely fire exposure (intensity and duration).
- Consequences of failure in fire (e.g. for pipes or tanks containing combustible liquids or gasses, or structures supporting such).
- Fire endurance to provide the necessary fire integrity of the structure or piping system.
- Combustibility.
- Ignitability.
- Surface spread of flame.
- Emission of smoke and toxic combustion products, especially for applications within enclosed spaces likely to be occupied by personnel.

5. OPERATIONAL MANUAL (OTHER MATERIALS)

Data should be available giving detailed particulars of the materials used and methods employed to limit corrosion or other deterioration. Guidance should be given on the correct maintenance procedures. In particular details of flammable materials used in the construction of the Installation and its equipment should be provided together with special requirements to be observed in the case of fire.

6. REFERENCES

1. Department of Energy. Offshore Installations: Guidance on Design, Construction and Certification, 4th Edition. HMSO, Consolidated Edition, 1993 (plus Amendment No. 3, 1995). [Withdrawn 1998 by Operations Notice 27].
2. SI 1974 / 289 : The Offshore Installations (Construction and Survey) Regulations 1974, HMSO, 1974. [Revoked and has been replaced by SI 1996 / 913 – The Offshore Installations and Wells (Design and Construction etc.) Regulations, 1996 – ISBN: 0 110 54451 X].
3. Health and Safety Executive. Status of Technical Guidance on Design, Construction and Certification. Operations Notice 27. Revised and reissued, August 1998.
4. Hay, R and Alderman, R. Thermite Sparking in the Offshore Environment. Society of Petroleum Engineers, SPE 16548/1.
5. British Standards Institution. BS 5345 : Code of Practice for Selection, Installation and Maintenance of Electrical Apparatus for Use in Potentially Explosive Atmospheres (other than mining applications or explosive processing and manufacture). Part 1 : 1989 – General Recommendations. Superseded and withdrawn. [This has been replaced by BS EN 60079-14 : 1997 – Electrical Apparatus for Explosive Gas Atmospheres. Electrical Installations in Hazardous Areas (other than mines).]



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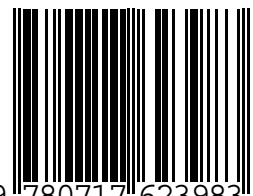
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