TECHNICAL SPECIFICATION

OIL LOADING AND DISCHARGE HOSES FOR OFFSHORE MOORING INSTALLATIONS

(AMENDMENTS TO OCIMF GUIDE, FOURTH EDITION 1991)

DEP 37.91.20.30-Gen.

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DESIGN AND ENGINEERING PRACTICE

USED BY

COMPANIES OF THE ROYAL DUTCH/SHELL GROUP

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They are based on the experience acquired during their involvement with the design, construction, operation and maintenance of processing units and facilities, and they are supplemented with the experience of Group Operating companies. Where appropriate they are based on, or reference is made to, national and international standards and codes of practice.

The objective is to set the recommended standard for good design and engineering practice applied by Group companies operating an oil refinery, gas handling installation, chemical plant, oil and gas production facility, or any other such facility, and thereby to achieve maximum technical and economic benefit from standardization.

The information set forth in these publications is provided to users for their consideration and decision to implement. This is of particular importance where DEPs may not cover every requirement or diversity of condition at each locality. The system of DEPs is expected to be sufficiently flexible to allow individual operating companies to adapt the information set forth in DEPs to their own environment and requirements.

When Contractors or Manufacturers/Suppliers use DEPs they shall be solely responsible for the quality of work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, the Principal will expect them to follow those design and engineering practices which will achieve the same level of integrity as reflected in the DEPs. If in doubt, the Contractor or Manufacturer/Supplier shall, without detracting from his own responsibility, consult the Principal or its technical advisor.

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All administrative queries should be directed to the DEP Administrator in SIOP.

NOTE: In addition to DEP publications there are Standard Specifications and Draft DEPs for Development (DDDs). DDDs generally introduce new procedures or techniques that will probably need updating as further experience develops during their use. The above requirements for distribution and use of DEPs are also applicable to Standard Specifications and DDDs. Standard Specifications and DDDs will gradually be replaced by DEPs.

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PART I INTRODUCTION

1.1 SCOPE

This DEP is a new publication covering floating and submarine hoses used at single point mooring installations.

It gives minimum technical requirements for these hoses as well as for the approval of prototype hose. As such, it supersedes earlier hose specifications based on OCIMF "Hose Standards" (1978), including the addenda given by MESC SPE 73.15/001.

1.2 EXTERNAL STANDARD

Part II of this DEP amends the OCIMF (Oil Companies International Marine Forum) "Guide to Purchasing, Manufacturing and Testing of Loading and Discharge Hoses for Offshore Moorings" (Fourth Edition, 1991), for use as a Group Specification. Accordingly, the Section numbering of Part II of this DEP follows the numbering of the OCIMF Guide.

The contents of Part 3 of the OCIMF Guide, although useful as an inspection guide, do not form part of this DEP.

Since this DEP has the status of a Technical Specification whereas the OCIMF document has been written as a Guide, *throughout Parts 1 and 2 of the OCIMF Guide the word "**will**" shall be understood to mean "**shall**".* Furthermore, apart from this exception, any Sections within Parts 1 and 2 of the OCIMF Guide which are left unamended by this DEP shall remain applicable as written.

1.3 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorized by SIPM, the distribution of this DEP is confined to companies forming part of the Royal Dutch/Shell Group or managed by a Group company, and to Contractors and Manufacturers/Suppliers nominated by them (i.e. the distribution code is "F" as defined in DEP 00.00.05.05-Gen.).

This DEP is intended as a purchasing specification for hoses used at offshore mooring facilities for transfer of crude oil and liquid petroleum products.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable as regards safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned with the object of obtaining agreement to follow this DEP as closely as possible.

1.4 DEFINITIONS

1.4.1 General definitions

The **Contractor** is the party which carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party which manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party which initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant authorized to act for, and on behalf of, the Principal.

The word **Shall** indicates a requirement.

The word **Should** indicates a recommendation.

1.4.2 Specific definitions

In the context of this DEP, the **Purchaser** (as referred to in the OCIMF Guide) is equivalent to the Principal.

1.5 ITEMS TO BE SPECIFIED BY THE PRINCIPAL

NOTE: Numbers between brackets refer to Section numbers of OCIMF 1991 and this DEP Part II.

1.5.1 Items that shall always be specified

- Type of hose (1.1)
- Nominal diameter (1.1)
- For submarine hose: with or without location collars (1.1/1.6.2)

1.5.2 Items to be specified in case requirements deviate from standard OCIMF settings

This may apply in the following cases:

- Pressure rating in excess of 15 bar (ga) (1.2.1)
- Flow velocity in excess of 21 m/s (diameters up to and including 400 mm) or 15 m/s (diameters 500 mm and larger) (1.2.3)
- Aromatic hydrocarbon content is consistently greater than 25% or incidentally greater than 40% (1.2.4)
- Product temperature is outside the range of minus 20 °C to plus 82 °C (1.2.4)
- Ambient temperature during use and/or storage is outside the range of minus 29 °C to plus 52 °C (1.2.4)
- Hose length different from standard length of 9.1 m for submarine and tanker rail hose, or standard length 10.7 m for other types of hose (1.3.1)
- Special requirements with regard to flange type and/or flange face (1.5.3)
- Welded serial numbers **not** wanted on rim of flanges (1.5.3)
- Submarine hose should be able to operate at a water depth greater than 76 m (1.6.1)
- Floating hose should have a reserve buoyancy in a specified range (1.8.4)
- Special requirements with regard to the marking of tanker rail hose (1.9.5)
- Additional test certificates (1.13)
- Special requirements with regard to marking (1.15)
- Special requirements with regard to packing (1.17)

1.5.3 Items to be specified in case requirements deviate from options selected in this DEP

Certain options in OCIMF 1991 have been given defaults by this DEP.

The Principal should check the relevant Sections and indicate when he wishes to deviate from the DEP option.

The applicable items are:

- Electrical continuity (1.5.4)
- Stiffness test (1.11.5)
- Kerosene test (1.11.7)
- Inspection by Purchaser (1.12)

1.5.4 Items to be specified in case requirements deviate from Manufacturer's standard

Certain items in this Specification are left to the discretion of the Manufacturer (in some cases this discretion is restricted to the Manufacturer choosing permitted options). In case the Principal has specific requirements or preferred options with regard to these items, this shall be explicitly stated in the Purchase Order.

Relevant items are:

- Cover materials (1.5.1)
- Colour of cover (1.8.3)
- Flange coating (1.5.3)
- Collar dimensions (1.6.2)

1.5.5 Items to be specified when ordering floats

In case new floats are ordered for existing hoses:

- Collar dimensions (1.6.2)
- Maximum operating depth (1.6.2)
- Colour preference, if any (1.6.2)

In case new floats are ordered together with new hoses:

- Maximum operating depth (1.6.2)
- Colour preferences, if any (1.6.2)
- Required collar dimensions (1.6.2)

PART II AMENDMENTS TO OCIMF GUIDE

The numbering of the Sections within this Part relates to that in the OCIMF Guide.

1. TECHNICAL REQUIREMENTS FOR COMMERCIAL HOSE

1.1 SCOPE

Supplement this Section with:

Only hoses manufactured according to a design that has been approved by SIPM shall qualify as conforming to this Specification. Such a hose design approval includes:

- Drawing Approval according to Section 2.2 to verify that design, construction and materials are in accordance with good hose engineering principles.
- Prototype Hose Approval according to Section 2.1 to demonstrate that the technical requirements of this Specification can be fulfilled
- Successful completion of an agreed fatigue testing programme to establish confidence in service performance.

The Purchaser's approval of hose design does not release the Manufacturer from the responsibility for satisfactory fabrication and hose performance.

1.2.1 Pressure rating

Supplement with the following:

NOTE: In case system requirements dictate the use of hoses with a higher pressure rating, the Purchaser shall be aware that additional prototype testing may be required.

1.2.4 Resistance to temperature, oil products and ageing

Delete and replace with:

The hoses shall be suitable for use with crude oil and liquid petroleum products (other than liquefied petroleum gases and liquefied natural gases) having a minimum temperature of minus 20 °C to a maximum of plus 82 °C and an aromatic hydrocarbon content that is not consistently greater than 25% or incidentally greater than 40%. Hoses shall also be suitable for use in areas where ambient temperatures during use and/or storage may range from minus 29 °C to a maximum of plus 52 °C. If a hose suitable for handling hydrocarbons with a higher aromatic content or temperatures outside the stated range is required, it shall be specified by the Purchaser.

1.3.2 Tolerance on length

Supplement this Section with:

For floating hose a tolerance of plus 2 and minus 1 percent shall apply.

1.5.1 Hose body

In subsection "Reinforcement Wire Specification":
for "BS 3592" and "BS 3592 Pt. 1"
substitute "BS 3592, or equivalent if approved by the Purchaser".

1.5.2 Nipples

After the end of the third paragraph, add a new sentence "Acceptance criteria shall be in accordance with API Std 1104".

After "ASME VIII", add "Division 1".

NOTE: Appendix D "Equivalent Material Standards" is not exhaustive. Other equivalent materials may be used if if they are readily weldable and their substitution has been approved by the Purchaser.

1.5.3 Flanges

After the end of the fifth paragraph, add a new sentence "Acceptance criteria shall be in accordance with API Std 1104".

Delete all reference to liner direction marking from this Section (second and fourth alinea of paragraph "Marking").

NOTE: Appendix D "Equivalent Material Standards" is not exhaustive. Provided good weldability is conserved, other equivalents are permitted after written approval of Purchaser has been obtained.

1.5.4 Electrical continuity

Delete the first paragraph of this Section and replace with:

Submarine hoses, tail hoses, tanker rail hoses and hoses to be used in a Multi-Buoy Mooring shall be electrically discontinuous.

All other hoses shall be electrically continuous.

1.5.5 Alternative connections

New Section to be added as follows:

Special hose designs may incorporate steel parts other than nipples and flanges for the connections, such as composite flanges, spool pieces and reducers forming an integral part of a hose assembly. These parts shall be designed, constructed and inspected according to the principles of Sections 1.5.2 and 1.5.3. Design acceptance shall be established in accordance with Section 2.2.

1.6.2 Provision of floats

Delete the entire text of this Section and replace with:

NOTE: In the OCIMF 1991 Standard an attempt is made to standardize on float and collar dimensions, with the aim to provide interchangeability and to minimize the number of mould sizes required for the manufacture of floats. Although it is appreciated that savings might be achieved by separating the supply of floats completely from the supply of submarine hoses, there are several serious disadvantages. Hoses are standardized on nominal diameter, floats have to fit the external hose diameter. This may create a massive need for adaptor pieces because external hose diameters vary with different design and different manufacturer. Using floats of one manufacturer on hoses of another manufacturer may also necessitate a re-design of the underbuoy configuration and negatively affect the guarantee position.
For these reasons it is advised to always liaise with the hose manufacturer before ordering floats and before installing floats of different source. However, to assist future standardization, Manufacturers should aim at meeting the dimensions recommended by OCIMF.

When ordering submarine hoses that are to be fitted with underwater floats, the Purchaser shall specify hoses with retention collars. Collars shall be vulcanized to the base hose.

In case new hoses have to be fitted with existing floats, the Purchaser shall specify the required collar dimensions.

Deep water floats shall be designed for a depth to 76 m.
Shallow water floats shall be designed for a depth to 40 m.

Floats shall consist of a hard shell filled with closed cell foam, and shall be able to retain dimensional stability and buoyancy properties to the maximum design depth.

The cover of the float shall be polyethylene or polyurethane.

The colour shall be white or fluorescent orange to assist divers in underwater inspection.

Floats shall be constructed in two independent half shells. The two half shells shall be designed to be installed on the hose collars while the hose is ashore or in underwater service. All hardware used to secure the float halves together on the hose shall be fabricated from stainless steel type 316 or equivalent, monel or other corrosion-resistant material.

Each float half shall be provided with a serial number and permanently and indelibly marked with details of manufacturer, size and maximum design depth. A float test report shall be included in the Manufacturer's Report.

1.6.5 Marking

After the words "Section 1.11" insert "(or calculated, as applicable)".

1.8.3 Colour of cover

Delete "Polyurethane-covered hoses will be orange. Rubber-covered hoses will be black with an orange spiral" and replace with:
Hose covers shall be orange or black with an orange spiral.

1.8.4 Buoyancy requirements

Delete last paragraph and replace with:

The buoyancy structure of a floating hose shall be such that it retains at least 95 percent of its original buoyancy after submerging the hose at 10 m water depth for 24 hours followed by a recovery period of a further 24 hours.
The correctness of the buoyancy calculations as well as the submergence buoyancy recovery shall be periodically verified as part of Manufacturer's quality system.

1.9.4 Lifting lugs

Delete last paragraph and replace with:

Welding shall be by complete seal welding according to a procedure qualified in accordance with ASME IX. Each lug shall be subjected to the above proof load in accordance with a documented procedure approved by the Purchaser. The proof load shall be applied for a period of two minutes without visible failure or permanent deformation of the lug, nipple or flange.
After proof load testing, the welds shall be 100% wet magnetic particle examined in accordance with ASME VIII, Division 1, Appendix 6.

Proof-load testing may be done before building the hose.

1.9.5 Marking

Supplement this Section with:

Optionally, tanker rail hose may be marked with a number of equidistant circular bands, starting no farther than 2 m from the tanker end hose flange and extending to at least 4.5 m from the tanker end hose flange.

1.10.1 General

Supplement this Section with:

The pressure rating (as defined in Section 1.2.1) of a double carcass hose shall be 15 bar (ga).

1.11.1 Sequence of tests

Delete: Tests will be conducted in the following order:

1.11.4 Minimum bend radius test

Delete: The test will be repeated five times.

1.11.5 Stiffness test

Replace the first sentence with:

Unless explicitly stated in the Purchase Order, this test is not required.

1.11.7 Kerosene test

Replace the first sentence with:

Unless explicitly stated in the Purchase Order, this test is not required.

1.12 INSPECTION

Unless explicitly excluded in the Purchase Order, inspection by (or on behalf of) the Purchaser shall be performed.

The Manufacturer shall provide the necessary facilities to enable Purchaser's inspection to be carried out.

Hoses of 400 mm, 500 mm and 600 mm nominal diameter shall be manufactured under in-line inspection. For hoses of smaller nominal diameter, only final inspection is required unless random or in-line inspection is specified.

1.13 TEST CERTIFICATES

Supplement with following paragraph:

All documentation shall be in the English language. In case original documents are in another language, they shall be accompanied by an authenticated translation.

1.14 MANUFACTURER'S REPORT

Supplement with following paragraph:

All documentation shall be in the English language. In case original documents are in another language, they shall be accompanied by an authenticated translation.

1.16 QUALITY ASSURANCE

Delete and replace with:

Hoses shall be designed, manufactured and tested under a quality system in accordance with ISO 9001 or equivalent.

The quality system shall include documented procedures on the following subjects:

- handling of and responsibilities for any hose repair (1.5.1)
- quality control of closed-cell buoyancy material (1.8.1)
- verification of buoyancy requirements (1.8.4)
- proof-load testing of lifting lugs (1.9.4)
- control of required adhesion levels (1.11.2)
- issue and authentication of certification (1.13 and 1.14)
- control of buoyancy material adhesion (2.4.3)
- collar testing (2.4.10)

NOTE: The above list is not exhaustive and does not preclude the other control and assurance requirements of ISO 9001 or the Manufacturer's quality system.

1.17 PACKING

Supplement this Section with:

In case of small quantity and/or small size, alternative packing may be considered subject to agreement between the Manufacturer and the Purchaser.

2. TECHNICAL REQUIREMENTS FOR PROTOTYPE HOSE APPROVAL

2.1.1 Prototype test requirements

Delete and replace with:

Prototype tests are required to satisfy the Purchaser that the Manufacturer is able to fulfil the technical requirements of this Specification for each specific design of hose and method of manufacture.

Each hose type involving different methods of basic construction and/or design requires a prototype test.

A change in design or the method of manufacture requires a new prototype test. In the context of this paragraph, a reduction in the number of plies as well as any change in ply materials, in ply materials properties, in ply application angle, in number or position of helices, and in binding technique shall constitute a change in design. A change in lining, hose cover, breaker plies, filler materials or consolidation technique shall not constitute a change in design requiring a new prototype test. The addition of material to an already approved construction for the purpose of providing stiffness shall not normally require a new prototype; however, the Purchaser's approval shall be obtained.

Hoses of lesser diameter of an approved type, incorporating the same basic construction and fabrication methods but having fewer plies due to the smaller diameter, but at least equal burst strength, do not require a prototype test.

All prototype hose shall be manufactured and tested under in-line inspection by a qualified independent inspection service.

Prototype tests shall include:

- Adhesion tests
- Weight test
- Minimum bend radius test
- Stiffness test (only if explicitly requested)
- Hydrostatic test
- Kerosene test
- Vacuum test
- Collar test (if applicable)
- Burst test
- Double carcass burst test (if applicable)

The Purchaser may accept alternative evidence that technical requirements are met and waive all or part of the prototype test requirements.

2.1.2 Certification

Delete this Section, and replace with:

The Purchaser is prepared to accept prototype test certificates issued by a qualified independent inspection service and waive all or part of the prototype tests, provided that accepted certified tests were done in accordance with this Specification and within ten years prior to the date of the order for which the waiver is being given. After this period of time, and regardless of whether or not changes have been made in the hose design of manufacturing process, prototype tests shall be redone if the Manufacturer is to claim compliance with the requirements of this Specification.

2.1.3 Sequence of tests

Delete this Section.

2.3.2 Length

Delete and replace with:

The length of the prototype hose shall be 9.1 m or 10.7 m. This shall qualify all hoses of identical design having a length between 7.2 m and 12. 9 m. Hoses having a length less than 7.2 m or more than 12.9 m shall require separate prototype tests.

2.4.3 Buoyancy material adhesion tests

Replace "This test will be run on all prototype testing" with "This test need not be done as part of the prototype test but it shall be done periodically as part of Manufacturer's quality system."

2.4.7 Stiffness test

Supplement with:

This test to be carried out only if explicitly requested.

2.4.10 Collar test

Add: This test need not be done as part of the prototype test but it shall be done periodically as part of the Manufacturer's quality system.

3. PURCHASER'S INSPECTION GUIDE

Insert before Section 3.1:

This part of the OCIMF Guide does not form part of this DEP. It may be used, unamended by this DEP, for guidance of inspection activities by, or on behalf of, the Purchaser.

4. REFERENCES

Add a new Section as follows:

In this DEP, reference is made to the following publications:

NOTES: 1. Unless specifically designated by date, the latest edition of each publication shall be used, together with any amendments/supplements/revisions thereto.

2. This list includes those standards referenced within the OCIMF Guide which remain applicable after amendment by this DEP

SHELL STANDARDS

Index to DEP publications and standard specifications	DEP 00.00.05.05-Gen.

AMERICAN STANDARDS

Pipe flanges and flanged fittings	ANSI B16.5

Issued by:
American National Standards Institute
Sales Department
1430 Broadway
New York NY 10018
USA.

Specification for line pipe	API Spec 5L
Standard for welding pipelines and related facilities	API Std 1104

Issued by:
American Petroleum Institute
Publications and Distribution Section
1220 L Street Northwest
Washington DC 20005
USA.

Material specifications, Part C - welding rods, electrodes and filler metals	ASME IIc
Rules for construction of pressure vessels.	ASME VIII
Qualification standard for welding and brazing, procedures, welders, brazers, and welding and brazing operators	ASME IX

Issued by:
American Society of Mechanical Engineers
345 East 47th Street
New York NY 10017
USA.

Standard specification for forgings, carbon steel, for piping components	ASTM A105
Standard specification for pressure vessel plates, carbon steel, low - and intermediate-tensile strength	ASTM A285
Test method for rubber property - effect of liquids	ASTM D471

Issued by:
American Society for Testing and Materials
1916 Race Street, Philadelphia 19103
USA.

BRITISH STANDARDS

Hot dip galvanized coatings on iron and steel articles	BS 729
Methods of testing vulcanized rubber, part a12 - determination of adhesion strength of vulcanized rubbers to fabrics (ply adhesion)	BS 903: part a12
Steel pipe flanges for the petroleum industry, metric dimensions	BS 1560, part 2
Specification for sprayed metal coatings, Part 1 - protection of iron and steel by aluminium and zinc against atmospheric corrosion	BS 2569, Part 1
Radiographic examination of fusion welded butt joints in steel Part 1 - Methods for steel, 2 mm up to and including 50 mm thick	BS 2600, Part 1
Steel wire for hose reinforcement, Part 1 - specification for coated round and flat steel wire for rubber hose reinforcement	BS 3592, Part 1

Issued by:
British Standards Institution
2 Park Street, London
W1A 2BS, England.

INTERNATIONAL STANDARDS

Quality systems - model for quality assurance in design/development, production, installation and servicing	ISO 9001

Issued by:
Central Secretariat of ISO
1, Rue de Varembé
1211 Geneva 20
Switzerland.

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London EC1R 0ET
England.

APPENDICES

APPENDIX A

This Appendix does not form part of the technical requirements of the OCIMF Guide and shall not be considered part of this DEP.

APPENDIX B

This Appendix does not form part of the technical requirements of the OCIMF Guide and shall not be considered part of this DEP.

APPENDIX C

Delete this Appendix in its entirety and refer to this DEP, Part II, Section 4

APPENDIX D

Add the following note at the end of this Appendix:

NOTE: The above list of "Equivalent Material Standards" is not exhaustive. Other equivalent materials may be used if if they are readily weldable and their substitution has been approved by the Purchaser.