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## SPECIFICATION GUIDANCE FOR DOCK HOSES

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### TABLE 1  DEFINITION OF PRESSURE RATINGS

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### FIGURE 1  ILLUSTRATION OF PRESSURE RATINGS

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This Information Paper provides guidance on specifying Dock Hoses for use at conventional marine petroleum terminal facilities (such as: docks, jetties, wharves), for the transfer of crude oils, petroleum products, chemicals, vapours and pressurized liquefied gases.

Reference Documents

This Guidance Document references CEN (European Committee for Standardization) Standards, as issued via the British Standards Institution:

- BS EN 1765:2004 Rubber hose assemblies for oil suction and discharge services Specification for the assemblies.
- BS EN 13765:2003 Thermoplastic multi-layer (non-vulcanized) hoses and hose assemblies for the transfer of hydrocarbons, solvents and chemicals - Specification.
- BS EN 1762:2003 Rubber hoses and hose assemblies for liquefied petroleum gas, LPG (liquid or gaseous phase), and natural gas up to 25 bar (2.5 MPa) – Specification.

Application

OCIMF clarifications are provided to assist in applying the referenced European Standards that are to be specified by the Purchaser.

Information provided within this OCIMF Guidance Document is meant to assist in specifying appropriate hose manufacturing standards. This information does not replace or exempt any Standard requirements or local regulatory requirements as may be applicable to a marine terminal.
**Introduction and Purpose**

Hoses for crude oil and petroleum products and vapours are used extensively by the oil industry for the transfer of cargoes between vessels and marine terminals. Hoses specific to this application at marine terminals are herein referred to as Dock Hoses. Generally these hoses are manufactured to local or regional standards applicable to the location where purchased. Consequently there may be differences in the quality of hoses purchased for the same service at marine terminals, depending on where the hoses were manufactured.

The purpose of this OCIMF Information Paper is to provide a standardized format and common reference for the design and manufacture of Dock Hoses used at oil industry marine terminals. This information paper does not cover offshore floating and submarine hoses associated with single point or multi-buoy moorings. For offshore hoses, reference is made to OCIMF Guide to Purchasing, Manufacturing and Testing of Loading and Discharge Hoses for Offshore Moorings.

Application of the procedures in this Information Paper are not intended to exclude use of other Standards, but to suggest a level of practice to ensure that all Dock Hoses provide a secure means for transfer of crude oil and petroleum products.

This OCIMF Information Paper references European (CEN) Standards, specifically British Standards Institution (BSI) versions; however editions in other European community languages are acceptable. CEN (BSI reference herein) Standards EN 1765 (rubber) and EN 13765 (composite*) hoses will be used in conjunction of the OCIMF Information Paper. Rubber specialty hoses for asphalt/bitumen and pressurized LPG are to meet EN 1765 standards as well as additional requirements defined by EN 13482 and EN 1762, respectively.

* "composite hose" is the oil industry terminology for "thermoplastic multi-layer (non-vulcanized) hose" as defined by the CEN Standards.

**Scope**

This Information Paper provides guidance on using British Standards Institution BS EN Standards, 1765 and 13765, for the purchase of hoses to be used at marine terminals, referred to as Dock Hoses.

The noted BS EN Standards use the term "hose" when referring to the hose body, and "hose assemblies" when referring to the completed hose with end fittings. Since the oil industry uses only "hose assemblies", this document refers to a “hose assembly” as a Dock Hose.

Dock Hose requirements are irrespective of whether the hose is to be used for loading or discharging a vessel at a marine terminal. The guidance given is therefore applicable to hoses used in either service.

Dock Hoses are generally used to handle crude oils, refined petroleum products, liquefied (pressurized) petroleum gas* (LPG), chemical products, petroleum/chemical vapours, and for ballasting/deballasting duties.

* Dock hoses, as covered by this Information Paper, do not include refrigerated LPG or liquefied natural gas (LNG)
Although reference is made to API standards for design and fabrication of fittings for Dock Hoses, these requirements are not covered in detail. Purchaser should therefore supplement the information listed, taking account of local conditions and any particular design, operating, or regulatory requirements that need to be met.

This OCIMF Information Paper is developed in two Parts, I and II. Part I provides information on defining Dock Hoses specifications and on the documentation that the hose supplier must submit with each hose. Part II provides guidance on the application of the EN Standards to meet specific issues deemed appropriate by OCIMF, as well as clarifications on manufacturing requirements and terminology.
PART I - SPECIFICATION

Purchaser defines the number of hoses and service requirements for which the hoses shall be used. This information is to be included in a purchase order along with other specific requirements deemed essential by the Purchaser in defining the terms/conditions of the Dock Hose purchase.

1.0 STANDARDS AND PRACTICES

In developing the Dock Hose purchase order, this OCIMF Information Paper may be used to supplement other applicable Purchaser’s requirements. Use of this Information Paper will help to ensure the hoses meet minimum requirements suitable for safe transfer of petroleum cargoes or vapours.

As a minimum, the latest edition of the following Codes and Standards should be referenced as part of the dock hose specification and used as applicable:

- **BS EN 1765** Rubber hose assemblies for oil suction and discharge services - Specification for the assemblies
- **BS EN 13765** Thermoplastic multi-layer (non-vulcanized) hoses and hose assemblies for the transfer of hydrocarbons, solvents and chemicals - Specification
- **BS EN 1762** Rubber hoses and hose assemblies for liquefied petroleum gas, LPG (liquid or gaseous phase), and natural gas up to 25 bar (2.5 MPa) – Specification.
- **BS EN 13482** Rubber hoses and hose assemblies for asphalt and bitumen – Specification.

- **ASME Codes**
  - Boiler and Pressure Vessel Code
  - Qualification Standard for Welding and Brazing - ASME Code IX
  - B16.5 Pipe Flanges and Flanged Fittings (or equivalent industry code)

- **API Codes**
  - API standard 5L Line Pipe (for hose nipples)
  - API standard 1104 Standard for Welding Pipelines

- **ASTM**
  - ASTM standard A53 - Welded and Seamless pipe
  - ASTM standard A105 - Carbon Steel for Forgings, Seamless Carbon Steel
  - ASTM standard A106 - Seamless Carbon Steel Pipe for High-Temperature Service

- **OCIMF**
  - International Safety Guide for Oil Tankers and Terminals (ISGOTT)

Local and/or National codes shall also be followed if they are more stringent than those listed above.
2.0 APPLICATION OF BS EN STANDARDS

Information provided within this OCIMF Information Paper is intended to assist in specifying appropriate Dock Hose manufacturing standards via the referenced EN Standards.

The referenced EN Standards, although addressing petroleum service, cover hoses for use in a myriad of applications well beyond traditional cargo transfer operations at marine terminals. Thus the use of OCIMF’s terminology of “Dock Hoses” is to distinguish this particular application.

Dock Hoses, being considered a unique application, will have specific design and testing requirements that supersede the generic requirements of the referenced EN standards. These specific requirements are summarized below, but may also be supplemented by additional requirements defined by the Purchaser in their purchase order.

2.1 Aromatic Content
Dock Hose may be manufactured for handling petroleum/chemical products where the aromatic content is greater than the 50% limitation referenced by EN standard 1765. The OCIMF Hose Data Sheet provides for documentation of the aromatic content which the hoses are required to accommodate.

2.2 Temperature Range
Temperature limitations defined by the referenced EN Standards should be adequate. Although rare, Dock Hoses may be manufactured to more extreme values. If increased temperature limits are needed, they must be reviewed with the manufacturer and appropriately documented in the purchase order.

2.3 Date of Manufacture
Referenced EN Standards require that hoses be permanently marked with the Quarter-Year that each individual hose was manufactured. OCIMF recommends that the date of hose manufacture be reported as Month-Year, and if agreeable to the manufacturer should be marked as such on the hose in lieu of Quarter-Year. Irrespective of how the hose is permanently marked, the Dock Hose documentation records are to show Month-Year of manufacture.

2.4 Material for Dock Hose End Fittings
Dock Hose nipples/flanges shall be of steel material. Use of aluminum as permitted by the referenced EN Standards is not acceptable for Dock Hoses. Aluminum alloy fittings do not provide the strength and durability of steel as aluminum flanges are cast as opposed to forged. Thus as also recommended in OCIMF “Design and Construction Specification for Marine Loading Arms”, aluminum is not permitted in petroleum cargo transfer systems.

2.5 Dock Hose Pressure Rating - Rated Working Pressure (RWP)
Hose pressure rating requirement as defined by the referenced EN Standards is typically noted as Maximum Working Pressure. Oil companies generally use the term Rated Working Pressure (RWP), and this term shall be used in referencing the corresponding EN Standard pressure rating.
2.5.1 Maximum RWP
Maximum Rated Working Pressure (RWP) for Dock Hoses may exceed the limits defined by the referenced EN Standards. However RWP pressures should generally not exceed 300 psi (20 bar).

2.5.2 Minimum RWP
Minimum Rated Working Pressure (RWP) for Dock Hoses shall not be less than 150 psi (10 bar) irrespective of the hose application or service.

2.6 Routine Testing
Routine tests are defined by the referenced EN standards as those tests to be conducted on all hose assemblies prior to dispatch. These tests will thus be conducted on each individual Dock Hose.

2.6.1 Electrical Continuity Test
Electrical continuity checks shall be conducted prior to and after each of the physical tests required under the respective EN Standard routine tests.

2.6.2 Bend Test
Bend tests, presently not included in Routine Testing per the referenced EN Standards, shall be added to the Routine Tests and conducted prior to all other physical tests.

2.6.3 Proof Pressure Test
Proof pressure test is referenced by the various EN Standards, although included only as an additional check in EN 1765, and then only if specifically requested by the Purchaser. OCIMF guidance is that all hoses undergo proof pressure testing as part of the Routine Testing. Proof testing will be the last physical test under the respective EN Standard routine tests.

2.6.3.1 Test Pressure
Test pressure shall be 1.5 times RWP.

2.6.3.2 Test Procedure
Proof Pressure Test shall be in accordance with EN 1765, Annex E.
NOTE: Whereas Annex E refers to testing only to RWP, the test itself shall be conducted to the Proof Pressure of 1.5 times RWP, in lieu of the Maximum Working Pressure referenced by EN 1765. In this situation the EN 1765 additional requirement to test separately to RWP (if requested by the Purchaser) will have been met in the base test procedure.

2.6.3.3 Inspection
Test shall be witnessed by a qualified inspection service, which may or may not be a service group within the manufacturer's organization. If the inspection is not an independent service, manufacturer will advise the Purchaser with their supply proposal. Purchasers may choose to have their own representative witness hose proof testing.
2.7 **Type Approval Test**

Type Approval Tests shall be carried out by, or witnessed and certified by, an *independent third party inspection agent* who shall provide a written report to the hose manufacturer. Copy of this report shall be made available to the Purchaser prior to manufacturing of the individual hoses covered by the Purchase Order.
3.0 HOSE PURCHASE REQUIREMENTS

The OCIMF Data Sheet (Appendix 1) should be used for each type and service of Dock Hose to be purchased.

Purchaser should complete Section 1 and Section 2 to define the Dock Hose requirements. If several hoses are to be purchased, a single form can be completed and the total number of hoses would be identified in the cover document transmittal to the Supplier.

Supplier should complete Section 3 of the OCIMF Data Sheet to identify manufacturing information, hose type, and completion of Type Approval Test.

Supplier should further complete Section 4 for each individual hose, providing an OCIMF Data Sheet for each individual Dock Hose supplied. Information in Sections 1, 2, and 3 are kept (repeated) for each Data Sheet completed for each Dock Hose.

3.1 Data Sheet Section 1 - Application and Hose Type
Section 1 should be completed by the Purchaser, providing information on service of hose and reference documentation of purchase order.
- Purchaser - Purchaser Name.
- Project Name -(if applicable) title of project for which the hoses are being purchased.
- Terminal Name - Name of Marine Terminal where hoses will be used.
- Berth/Pier -Name of specific berth/pier (if applicable) where hoses will be used.
- Service - brief description on the application of the hose, whether mounted on a hose tower, flow-boom, handled by cranes, or handled only manually.
- Name and address of Hose Supplier who will supply the hose, generally the same company as the hose body manufacturer.
- Purchase Record Number and Date as specified by Purchaser.

3.2 Data Sheet Section 2 - Hose Performance Requirements
Section 2 should be completed by the Purchaser to define the required performance requirements of the hoses to be purchased.
- Product(s) - crude oil, refinery product, chemical project, liquefied gas, vapour, etc describing the products for which the hose will be used.
- Aromatics (%) - Aromatic content is defined as the volume percentage of toluene in the product to be handled by the hose.
- Other components - information of other specific components the hoses may handle, such as MTBE.
- Rated Working Pressure (RWP), Bar (psi) - Maximum operating pressure for the hose service (see Appendix for detailed information on hose pressure definitions)
- Type Approval Burst Test Pressure, Bar (psi), generally 4 times RWP per EN Standards unless otherwise noted by Purchaser.
- Maximum Flow Velocity, fps (m/s) - maximum fluid flow that hose will be subject to while in service.
- Nominal Hose Diameter, inches (mm) - standard reference terminology to pipeline size.
• Nominal Hose Length, feet (meters) - standard reference to generic length of hose.
• Hose Type, to be specified:
  o Composite hose - thermoplastic multi-layer hose.
  o Rubber Hose - traditionally referred to as "Oil Suction and Discharge" hose:
    - Smooth Bore - no internal wire.
    - Rough Bore - having an internal wire.
    - Softwall - light weight with textile reinforcement (no wires)
• Electrical Continuity:
  o Continuous - for all composite hoses, rubber hoses if specified.
  o Discontinuous - rubber hoses if specified (except rough bore).
• End fittings:
  o Built-in Nipple.
  o Swaged.
• Flanges:
  o Standard - API 150 lb class unless otherwise specified (API 300 lb class for liquefied gas service).
  o Face details - unless otherwise specified to be Raised Face. (alternatively Flat Face).
  o Flange type - Weld Neck, Slip-on, or Ring (only Weld Neck for liquefied gas).

3.3 Data Sheet Section 3 - Manufacturer's Dock Hose Data
Section 3 should be completed by the Dock Hose Manufacturer as to the specific hose type being supplied for the Purchaser purchase order noted above.

• Manufacturer's Name.
• Manufacturer's plant location - city/country of the hose manufacturing plant where hoses are made.
• Dock Hose Brand Name (if applicable).
• Hose Model: model number or name of hose.
• Design Standard: Appropriate EN standard(s) to be identified.
• Type Approval (Burst) Test Information:
  o Date of Type Approval Test (actual date of physical test).
  o Actual Burst pressure, Bar (psi) - pressure that caused failure of the hose following hose testing to the Type Approval Burst pressure.
  o Independent Third Party Inspection Agency providing certification of Type Approval test results.
    - Inspection Agency Name.
    - Inspection Agency Address.
    - Name of Inspector.
3.4 Data Sheet Section 4 - Individual Dock Hose Information

As this document is to be completed for each individual hose supplied, the Dock Hose Manufacturer should also provide a completed copy of this form for each hose.

- Date Manufactured: Date of hose manufactured, reported as Month-Year.
- Hose Serial Number - unique hose identification number of each individual hose. This may be the only item of this form that will change for multiple hose purchases for the same application.
- Hose Weight, lb/ft (kg/m) - weight of hose body assembly of manufacturer's hose supply.
- Hose Diameter, inches (mm) - inside diameter of manufacturer's hose supply to meet purchase order requirements specified in Section 1.
- Dock Hose Proof Test Procedure:
  - Irrespective of the EN hose standard used for manufacturing of the hose, the Proof Test shall be conducted to the 1.5 times RWP in accordance with procedure defined by EN 1765, Annex E.
  - Date of Proof Test for individual hose.
  - Inspection Agency Name, Address, and Inspector's Name.
- Individual Dock Hose Proof Test Results
  - Data for each individually supplied hose to be recorded in the table provided.
  - Initial, Temporary, and Permanent elongation recorded during Proof Test.
Appendix 1 to Part I

OCIMF - DOCK HOSE DATA SHEET

Section 1 - Hose Application (specified by Purchaser)

Purchaser: __________________________________________
Project Title: ________________________________________
Terminal:   __________________________________________
Berth/Pier: __________________________________________
Service: ___________________________________________
Special Marking Requirements: _________________________
___________________________________________________

Hose Supplier Name:  __________________________________
Hose Supplier Address: _________________________________
________________________________________
________________________________________
Order/Purchase Record No.: 
Order/Purchase Record Date: 

Section 2 - Hose Performance Requirements (specified by Purchaser)

Product(s):  ________________________________________
Aromatics (%):  _____________________________________
Other Component (specify):  ___________________________
Rated Working Pressure, bar (psi): ______________________
Type Approval Burst Pressure, bar (psi): __________________
Max. Flow Velocity, fps (m/s):  __________________________
Nominal Diameter, inches (mm):   _______________________
Nominal Length, feet (m):  _____________________________

check appropriate boxes

- Hose Type:
  - Rubber - Smooth Bore
  - Rubber - Softwall
  - Rubber - Rough Bore
  - Composite

- Electrical Continuity:
  - Continuous
  - Discontinuous

- End Fitting:
  - Built-in Nipple
  - Swaged

- Flanges:
  - Raised Face
  - Flat Face
  - Weld Neck
  - Slip-on

Section 3 - Hose Type Data (completed by Hose Manufacturer supplying Hose)

Manufacturer's Name:  ________________________________
Manufacturing Location: _______________________________
_________________________________________________________________
Hose Brand Name (if applicable):  ___________________
Hose Model:  ___________________________________
Design Standard:  ____________________________________
(EN Standard Reference, other if applicable)

Type Approval Test Information:

- Date Hose manufactured (month - year): ____________
- Date of Type Approval Test: ______________________
- Actual Burst pressure, bar (psi): ___________________
- Independent Third Party Inspection Agency:
  - Agency Name:  ________________________________
  - Address:  ___________________________________
  - Name of Inspector:  ___________________________

Section 4 - Individual Hose Data (completed by Hose Manufacturer for every hose)

Date Hose manufactured (month - year): __________________
Hose Serial No.:  _____________________________________
Hose Body Weight, lb/ft (kg/m):  _________________________
Hose Body Inside Diameter, inches (mm): _________________
(Inside diameter must be equal or greater than nominal
diameter noted in Section 2 unless specific approval is
given by Purchaser)

Type Approval Test Procedure:

- Design Standard: _______ EN 1765, Annex E ________
  (if other Standard, note reference)
- Date of Proof Test: ______________________________
- Inspection Agency:
  - Agency Name:  ________________________________
  - Address:  ___________________________________
  - Name of Inspector:  ___________________________

Individual Hose Proof Test elongation data

<table>
<thead>
<tr>
<th>EN 1765, Annex E Procedure</th>
<th>Original Hose Length</th>
<th>Temporary Elongation</th>
<th>Permanent Elongation</th>
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<tbody>
<tr>
<td>Pressure P₀ = 10 psi (0.7 Bar)</td>
<td>P₁ = 150% RWP =</td>
<td>P₂ = 10 psi (0.7 Bar)</td>
<td></td>
</tr>
<tr>
<td>Length L₀ =</td>
<td>L₁ =</td>
<td>L₂ =</td>
<td></td>
</tr>
<tr>
<td>Elongation (%) E₁ =</td>
<td>E₂ =</td>
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</table>
PART II - GUIDANCE AND CLARIFICATIONS

1.0 INTRODUCTION

Part II of this Information Paper provides guidance and clarification to specific items covered in Part I.

In addition, Part II provides general information and commentary on Dock Hose design and purchasing requirements.

2.0 REFERENCES ON PART I - SPECIFICATION

2.1 Part I - 2.1: Aromatic Content

Aromatic content of a petroleum product can adversely affect the hose liner material. To provide a generic standard, the EN 1765 sets an upper bound of 50% for the aromatic content of the fluid to be transferred via the hose. However, the standard also notes this limit may be higher, which in fact will often be the case for Dock Hoses. Thus it is important in purchasing Dock Hoses that the maximum aromatic content be defined. This information is provided for on the OCIMF Dock Hose Data Sheet.

Aromatic content is based on the volume percentage of toluene in the product.

2.2 Part I - 2.2: Temperature

The EN standards cover a range of temperatures under which the hoses would be used:

- EN 1765 provides for a temperature range of -20 C to + 82 C.
- EN 13765 provides for a temperature range of -30 C to + 150 C.
- EN 1762 provides for a temperature range of -30 C to + 70 C (for LPG).
- EN 13482 provides for a temperature range up to +200 C.

The above noted temperature ranges should cater for most applications of Dock Hoses. However hose manufacturers can generally provide for specific designs to cater for variations beyond these limits if necessary. Purchaser needs to advise the hose manufacturer if the Dock Hose application will fall outside the limitations of the referenced EN Standard.

The hose temperatures consider either the product temperatures or extremes of site ambient air temperatures, which may be due to below freezing conditions or surface temperatures due to solar radiation.

2.3 Part I - 2.3: Manufacture Date

The EN Standards provide specific data regarding the hose design properties to be permanently marked on the hose, either on the hose body or on the hose end fittings. As these requirements are specifically defined, it is not proposed by OCIMF to eliminate nor add additional information requirements. Hose markings shall provide the information defined by these Standards, depending on which Standard(s) have been referenced by the Purchaser.
One common requirement of these Standards is to identify the date of hose manufacture in terms of the Quarter and Year, i.e. 4Q06 if manufactured in the fourth quarter of 2006. Traditionally the oil industry has recorded hose information, such as testing, on a monthly basis, i.e. Nov-2006. Therefore the OCIMF guidance is to use Month-Year if hose manufacturer can provide this marking. Since the Month-Year still satisfies the EN Standard requirement (i.e., defines the Quarter of the year), this is deemed to be in compliance with these Standards.

2.4 Part I - 2.4: End Fittings

Although use of aluminum is permitted by the EN Standards, it is not accepted by the oil industry for cargo transfer equipment such as marine loading arms and Dock Hoses.

2.5 Part I - 2.5: Rated Working Pressure (RWP)

Pressure Rating
Nomenclature of the various EN Standards varies in defining hose pressure ratings and manufacturing test requirements. Notwithstanding the pressure rating terms, the basic requirement is to set the maximum pressure that the hose is subject to during normal cargo transfer operations. Test requirements for hose acceptance (proof and burst) are then generally multiples of this maximum pressure.

Rated Working Pressure (RWP) is the oil industry's most common terminology to describe the maximum pressure for cargo transfer. This pressure may be set based on the loading/discharge pump maximum pressure, pressure relief settings of the piping system, or the piping system design pressure. As with petroleum piping system designs, the RWP is not intended to cover dynamic or abnormal surge conditions, as for example that which may occur from sudden stoppage of cargo flow. The RWP rating does however permit nominal pressure increases and variations due to normal cargo transfer operations, such as initial flow rates, normal value closures/openings in transfer or stopping flow. These latter conditions are deemed the same as would be permitted in petroleum piping systems under ASME B31.3 petroleum pipeline design guidance.

Rated Working Pressure (RWP) should be used in defining Dock Hose requirements when referring to the EN Standards. Thus RWP is the oil industry term for Maximum Working Pressure defined by EN standards. Figure 1 illustrates graphically the relationship of the various nomenclatures used by the oil industry and the EN standards. Table 1 provides a summary of various pressure definitions.

Minimum and Maximum RWP should take into consideration oil industry practices to have Dock Hoses suitable for pressures of at least 150 psi (10 bar) and generally not more than 300 psi (20 bar).

2.6 Part I - 2.6: Routine Testing

Although Routine Testing is defined by the referenced EN Standards, the specific requirements of the testing are not identical. Nor do the defined testing requirements necessarily meet oil industry practices used for Dock Hoses. Thus the need to amend or qualify the testing requirements as noted in Part I of this Information Paper.
The commonality of the EN Standards and oil industry practices is that every hose shall be tested prior to leaving the manufacturing plant. This testing, not having a specific oil industry terminology, is referred to as Routine Tests by the EN Standards and will be referenced as same in this OCIMF document.

2.6.1 Electrical Resistance

Electrical resistance of hoses is defined by the various EN Standards that will need to be met by the manufacturers. As the electrical continuity may be affected by any of the physical hose tests, it is recommended that the check on electrical resistance be measured prior to and again following all other hose tests.

Industry practices have also identified electrical resistance levels which should be specifically required in the manufacturing of hoses if they are more stringent than the requirements of the relevant Standard.

- Electrically continuous hoses shall not have a resistance higher than 1.0 ohms/meter measured between nipples (end flange to end flange), but in no case greater than 10 ohms per dock hose length.

- Electrically discontinuous hoses shall have a resistance not less than 25k ohms measured between nipples (end flange to end flange).

2.6.2 Bending tests

Bending Tests shall be the first physical test conducted, i.e. prior to all other tests. Industry practice would be to repeat/cycle Bending Test 5 times prior to visual inspection and continuation of other tests. Annex F of EN 1765 provides a procedure for this test that can be referenced for all Dock Hoses.

2.6.3 Proof Pressure Test

Proof Pressure Test shall be the hydrostatic testing associated with the Routine Tests. This testing matches EN Standards, albeit a special Purchaser request in EN 1765. Proof Pressure Tests are a common oil industry practice and thus shall be carried out as part of the Routine Test procedure for all hoses.

Hydrostatic pressure for the Proof Pressure Test is defined by referenced EN Standards as 1.5 times RWP, which is a common oil industry practice as well as a regulatory requirement in many countries.

EN 1765 provides a definitive procedure in Annex E on for Hydrostatic Test protocol which shall be used for the Proof Pressure Test, with the exception that pressure shall be equal to the Proof Pressure of 1.5 times RWP. This same protocol and pressure level shall be applicable to all Dock Hoses.

As the Proof Pressure Test provides the assurance on the integrity of the hose, this test must be witnessed and certified by an inspection quality control agent. Generally inspection will be conducted by an independent service contracted by the hose manufacturer, but for some larger hose companies may be an internal inspection department. If the latter, Purchaser shall have the opportunity to utilize their own inspection service if desired.
2.7 Part I - 2.7: Type Approval Test

Type Approval Test is required by EN Standards to be conducted once every 5 years or whenever a major change in design is made. Guidance on design changes is noted by EN 1765 to include any of the following:

- Change in material of lining.
- Change in material of reinforcement (type or grade).
- Change in size of yarn or wire cord of reinforcement material.
- Change in angle of lay of reinforcement.
- Change of method of application of reinforcement.
- Change of method of design of coupling or attachment.
- Change in location of manufacture.

Type Approval Test shall preferably be carried out with a random hose from the manufacturing process. However if a hose is manufactured specifically for the Type Approval Test, it shall have a length greater than 10 ft (3 m), except if EN 1765 is the referenced standard where a hose length of 6 meters is required.

The Type Approval Test confirms the hose design parameters for all hoses of the same type manufactured for a period 5 years, and thus becomes a critical test protocol. Purchaser should not place an order for a specific type of hose without first reviewing the Type Approval Test results. All inspections for the Type Approval Test shall be witnessed and certified by an independent third party inspection agency with documentation provided to the hose manufacturer which can be provided for each hose purchase order.

3.0 GENERAL CLARIFICATIONS

Additional guidance and clarifications are provided in this Section to facilitate an understanding of oil industry Dock Hose practices to help guide hose selection by the Purchaser.

3.1 Hose Diameter

The EN Standards encompass everything from small hydraulic tubes to the largest dock hoses; thus manufacturers will readily offer whatever size is desired. Caution should however be exercised if Dock Hoses are outside the typical sizes being supplied for dock application, i.e.

- Rubber Hose
  - Rough Bore - 12" diameter (300 mm).
  - Softwall - 4" diameter (100 mm).
  - Smooth Bore - 12" diameter (300 mm).
- Composite Hose - 10" diameter (250 mm).

3.2 Wire Reinforcement Material

EN Standards permit use of aluminum, which is not deemed suitable for Dock Hose applications. All wire reinforcement shall be of steel material.
Wire reinforcement used in Dock Hoses shall be of a single continuous length. Joining (welding or mechanical) wires is not permitted in order to make up the necessary length of wire for any single Dock Hose.

### 3.3 Flow Velocity

Cargo flow velocity is generally not defined or limited by the EN Standards, however industry practices are to limit flow velocity to avoid high pressure losses, reduce static electricity generation, avoid excessive product cavitation, and prevent damage to hose liner. General guidance on maximum cargo flow velocity for Dock Hoses is as follows:

- Rubber Hoses - rough bore - 50 ft/s (15 m/s);
  - smooth bore - 70 ft/s (21 m/s).
- Composite Hoses - 23 ft/s (7 m/s).

For products where static electricity accumulation may occur, recommendations on limiting flow velocity are covered by the *International Safety Guide for Oil Tankers and Terminals (ISGOTT)*.

### 3.4 End Fittings

Each hose manufacturer may customize their design and thus the specific details of end fittings of Dock Hoses could vary. As general guidance, steel pipe used for nipples shall not be less than standard wall weight unless increased thickness is required for pressure rating.

Swaged fittings, a relatively new development, offer a lower cost hose yet have provided good service. However it is recommended that swage fitting be considered only for composite hoses of 10 inch (250 mm) or less, and for smooth bore hoses of 8 inch (200 mm) or less. If swaged fittings are utilized, placement shall be via an external process utilizing a hydraulic ram.

End Fittings incorporating a "strap-on" feature shall not be used for Dock Hoses.

Flanges shall be either welded (weld neck, slip-on) or ringed (slip-on) flanges assembled to the nipple or swaged fitting prior to End Fitting being assembled to hose body.

### 3.5 Test Procedures

Test Procedures, like pressure ratings, vary in description and requirements among the EN Standards. The specific Standard requirements need to be followed where noted, but can also be amended to insure testing meets common industry practices. Procedures on conducting these tests should include:

Hose lengths shall be measured from face-to-face of flanges, and shall be measured prior to testing, during the pressure test at stated pressures, and following the testing.

- Hose pressure shall be 10 psi (0.7 bar) for the relaxed hose during measurements prior to and following the application of the test pressure.
• Pressure and Vacuum Tests shall hold the prescribed pressure/vacuum for a minimum duration of 10 minutes unless otherwise prescribed longer by the relevant standard.
• Testing should be performed at ambient conditions, i.e. range 10 C to 30 C (48 F to 88 F), unless specifically defined by the referenced EN standard.
• Pressure gauges and other measurement devices used for the hose tests shall be calibrated within 30 days prior to the tests and certification certificates shall be available during the tests for review by the owner's inspector.

3.6 Certificates

Copy of Test Certificate for the Type Approval shall be provided for hose purchases of that type of hose.

Test Certificate(s) covering the Routine Tests shall be provided for each individual hose upon purchasing.

Manufacturers should be encouraged to keep copies of all certificates for a period of 10 years from date of test.

3.7 Length

Hose length, end-to-end fitting, shall be defined by Purchaser. Guidance on selecting hose length:

• In defining hose length, transport and storage limitations should be considered in addition to field application requirements. Typical transport methods may impose limitations on length due to transport vehicle (truck), container (marine vessel), or handling limitations of interim storage facilities.
• Appropriate allowances in hose length, as much as 20%, should also be considered relative to design/application needs to ensure the hose is not inadvertently stressed while in service.
TABLE 1

DEFINITIONS on PRESSURE RATINGS

See Figure 1 for schematic illustration on pressure definitions

Operating Pressure is an expression which is commonly used to define the normal pressure that would be experienced by the hose during cargo transfer. This would generally reflect the cargo pump operating pressures or hydrostatic pressure from a static system.

Working Pressure is generally considered to mean the same as Operating Pressure.

Rated Working Pressure (RWP) is the common oil industry reference that defines the maximum cargo system pressure capabilities, i.e. pump shut-in plus any static head or cargo system safety valve relief setting. This pressure rating is not expected to account for dynamic surge pressures, but does include nominal pressure variation expected during cargo transfer operations. Dynamic surge pressure resulting from sudden stoppage of cargo flow (defined as Surge Pressure) is not included in RWP.

Maximum Working Pressure (MWP) is the same as Rated Working Pressure (RWP), and is generally used by EN Standards for design of hoses. (ISO references for hose design also refer to the Maximum Working pressure.)

Maximum Allowable Working Pressure (MAWP), as referenced by the United States Coast Guard and commonly used by petroleum terminals to define their hose equipment limitations, is the same as Rated Working Pressure (RWP).

Factory Test Pressure is referenced in EN 1765 but then is equated to Maximum Working Pressure (MWP), which in turn is the same as Rated Working Pressure (RWP).

Surge Pressure is the momentary buildup in internal pressure caused when the moving cargo fluid is rapidly stopped as in the situation where marine vessel or dock valve is quickly closed. The surge pressure would be additive to the existing pressure in the cargo system. Surge pressure will depend on the particular cargo transfer system and would need to be assessed for each marine terminal cargo transfer system. For rare/occasional surge pressures, industry codes accept additive pressures of 20 to 30% on the cargo system design. This occasional additional pressure is addressed by insuring every hose is subject to a Proof Pressure test after manufacturing and during field confirmation tests.

Proof Pressure is a one-time pressure applied to manufactured hoses to insure quality and is equal to 1.5 times Rated Working Pressure. Under this OCIMF Guidance Document, the Proof Pressure shall be applied during Routine Test for manufactured hoses and during integrity checks of in service hoses.
**Burst Test Pressure** is the Type Approval test requirement on a single prototype hose to confirm the hose design/manufacturing of each specific hose type. This pressure is equal to a minimum of 4 times the **Rated Working Pressure** and must be applied in a specific fashion and held for 15 minutes without hose failure.

**Burst Pressure** is the actual pressure at which the prototype hose failed during the Type Approval Tests. For a successful prototype hose, the **Burst Pressure** would exceed the **Burst Test Pressure**.
Figure 1 - Illustration of terminology used for defining hose pressures

- Operating Pressure
- Working Pressure
- MWP (Maximum Working Pressure)
- Factory Test Pressure
- Proof Pressure
- Integrity Check Pressure
- Burst Test Pressure
- Burst Pressure
- RWP (Rated Working Pressure)
- MAWP (Maximum Allowable Working Pressure)
- OCIMF Guidance Industry Practice
- BS EN1765 and EN13705

- 4 times RWP
- 1.5 times RWP

Increasing Pressure