Keeping a Grip on the Future

Since its establishment in 1917, The Yokohama Rubber Co., Ltd. has maintained a consistent policy of developing advanced materials and production technologies to create high-quality, added-value products designed to give full satisfaction to the customer. Our success in this endeavor may be measured by the excellent reputation enjoyed by our products in markets world-wide. These products are employed in various fields: the marine industry, civil engineering, transportation (including tyres, of course), construction, aerospace, and sports and leisure.

In the marine field, we are well known for our pneumatic rubber fenders as well as marine hoses. Our marine hose series offers the very highest level of quality, derived from the use of the most advanced design methods and production technologies.

For Our Customers, Only the Best is Good Enough

Seaflex marine hoses are designed with the help of computer-aided analysis, manufactured by a highly skilled workforce in state-of-the-art facilities in Japan and subjected to the strictest quality control. The result is top-line performance. That’s why we have so many customers.

Customer List

**FAR EAST**

| JAPAN       | FOSCO, NANSUI SEKIYU
|             | NIHONKAI OIL, US MILITARY
|             | SHIRASHIMA OIL STORAGE
|             | KAMIKOITO OIL STORAGE
|             | KNOO, S OIL, SK ENERGY
|             | HYUNDAI OIL BANK
|             | RUSSIA
|             | NIMIR PETROLEUM, SMNG
|             | CPC
|             | TAIWAN
|             | CPC CORPORATION TAIWAN

**OCEANIA**

| PAPUA NEW GUINEA OIL SEARCH | AUSTRALIA
|                             | BHPP, APACHE ENERGY
|                             | VANGUARD
|                             | NEW ZEALAND
|                             | NEW ZEALAND STEEL
|                             | SHELL TOYO OIL

**SOUTHEAST ASIA**

| PHILIPPINES | BRC (PNOC), ALCORN
| SHELL PHILIPPINES | INDONESIA
| PERTAMINA, BP WEST JAVA | CNOOC, TOTAL E&P
| PETROCHINA, MEDCO ENERGY | CONOCO PHILLIPS, CHEVRON
| PETROFAC | VIETNAM
| VIETSONPETRO, PETROLIMEX | SEAFLEX
| PETROVIETNAM | SINGAPORE
| SHELL SINGAPORE | THAILAND
| ESOS THAILAND, PTTPE | CHEVRON, THAI OIL
| PETROFAC | MALAYSIA
| MURPHY OIL, ESOS MALAYSIA | SHELL MALAYSIA, PETRONAS
| BRUNEI | BRUNEI SHELL
| MYANMAR | PREMIRE PETROLEUM

**SOUTH ASIA**

| INDIA | IOC, ONGC, ENRON
| CAIRN ENERGY | RELIANCE PETROLEUM
| ESSAR OIL | BIG INDIA, HPCL

**MIDDLE EAST**

| IRAN | IOOC, NIOC, POGC, OTC
| UAE | ABDI DABBI OIL, ADMA GOPC
| ADCO | ZADCO, PETROFAC
| SAUDI ARABIA | ARAMCO, ARABIAN OIL
| SWCC, AL KHAIF | QATAR
| QATAR PETROLEUM | MAERSK QATAR
| YEMEN | SEPOC, CANADIAN NEXEN
| KUWAIT | SAUDI TEXACO, KUWAIT OIL
| AL KHAIF | JORDAN
| AQABA PORT | EGYPT
| SEAGUL (EX-ESSO), SUMED | REPSOL, SAVI PERU
| GCC, GPC, PETROBEL | ECUADOR

**AFRICA**

| NIGERIA | SHELL, MOBIL, TOTAL
| ANGORA | EXXON-MOBIL
| EQUATORIAL GUINEA | ESSO-MOBIL
| GABON | SHELL
| SOUTH AFRICA | SAPREF
| GHANA | MODEC
| IVORY COAST | MODEC

**EUROPE**

| SPAIN | CAMPSA, CEPSA, ENIEPSA
| GREECE | HELLENIC PETROLEUM

**SOUTH AMERICA**

| BRAZIL | PETROBRAS
| ARGENTINA | YPF, TERMAP, OIL TANKING
| PERU | REPSOL, SAVI PERU
| ECUADOR | PETRO ECUADOR

**CENTRAL AMERICA**

| MEXICO | PEMEX

**NORTH AMERICA**

| U.S.A. | HIRI, BP AMOCO
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   CAM-LOCK FLANGE
   PICK-UP CHAIN / HANG-OFF CHAIN
   MARKER BUOY / PICK-UP BUOY
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Design/Development

Brief History of Design and Development

1917 Establishment
The Yokohama Rubber Co., Ltd. was established in 1917.

1960 Marine hose
Yokohama marketed its first marine hose in 1960. Since then, Yokohama has succeeded in making a number of technological breakthroughs in product development.

1962 Float Sink hose system for SPM
Yokohama’s helix free main line hose with air buoyancy system was the first of its type installed in Japan.

1977 Leak free tube lining
Yokohama’s new production technology for tube lining, using a special NBR compound, processed by spiral wrapping, completely solved the problems of lining quality, eliminating blisters, lining separation and nipple leak.

1978 Polyurethane cover
Yokohama introduced the polyurethane covered hose as an option to the conventional rubber covered hose. The smooth, hard surface of polyurethane make handling much easier, and its bright colors are also advantageous.

1983 World’s stiffest 24” SRSR (Special Reinforced Submarine Hose)
With a bending stiffness of 500 KN-M² (51ton-m²), Yokohama’s 24” SRSR is three to four times stiffer than conventional 24” hoses. This outstanding characteristic contributed to the successful installation of a SALM system for FOSCO at a depth of 45 meters (150ft.) in the Japan Sea.

1984 Super 300 hose
Yokohama’s Super 300 hose was developed following total construction analysis by FEM (Finite Element Method) and showed notable improvements in resistance to surge pressure and kinking, thus providing a wider safety margin in the operation of SPM systems.
**1987**

**High aromatic hose**
Yokohama’s high aromatic hose, suitable for liquids with up to 60% aromatic hydrocarbon content, was developed. This has fulfilled a growing market demand for high aromatic fluids such as high octane gasoline.

**1992**

**Double Carcass hose with Twist Warning System (TWS)**
Yokohama style warning system, featuring twist of straight orange stripes on the hose, permits much easier sighting than the conventional type warning. It allows the operator to take swift counter-measures against failure of the hose’s primary carcass.

**1999**

**Flashing hose**
An effective built-in flashing light unit on Yokohama floating hose was developed to increase visibility of hose line position to boats nearby especially during night time.

**2004**

**Double Carcass hose with Dual Warning System (DWS)**
New primary carcass leak detector system with clear indication during as well as after operation.

**2005**

**Super Stream Hose**
Yokohama’s “Super Stream” Offloading Marine Hose for rough offshore application.

**2010**

**Reeling Hose**
Developed for FPSO/FSO reel system. Specially designed to withstand the crushing and bending force due to the reeling.

**2012**

**GMPHOM 2009 Hose**
Design/Development

Design Verification

The designs of hoses and systems are verified by prototype test, model test and field examination until their accuracy is proven.

**PROTOTYPE HOSE TEST**

- **KINK RESISTANCE TEST**
  - Seaflex Super-300
  - 600mm dia., bend radius : 0.5D

- **KINK RESISTANCE TEST**
  - Seaflex Super-300
  - 600mm dia., bend radius : 1D

- **COLLAR TEST**
  - Seaflex 600mm dia.

- **BURST TEST**
  - Seaflex Double Carcass
  - 300mm dia. prototype hose
  - primary carcass : 148bar
  - secondary carcass : 65.7bar

- **BURST TEST**
  - Seaflex Double Carcass
  - 600mm dia. prototype hose
  - primary carcass : 122.6bar
  - secondary carcass : 56.9bar

- **DYNAMIC**
  - TENSILE TEST 600mm dia. × 10.7m length
  - TORSION TEST 600mm dia. × 10.7m length

- **DYNAMIC**
  - BENDING TEST 300mm dia. × 10.7m length

**RESEARCH AND DEVELOPMENT CENTER: THE KEY TO QUALITY**

RADIC (Research and Development Integrated Center) at the Hiratsuka factory is equipped with state-of-the-art facilities to serve as a leading-edge R&D base ever since. RADIC employs such instruments as supercomputers, electron microscopes, ESCA (electron spectroscopy for chemical analysis) systems and a nuclear magnetic resonance spectrometer for use in materials development, product design and simulations under diverse conditions.
Field and Customer

Courtesy by PEMEX

Courtesy by CPC Corp.
Field and Customer

Courtesy by PEMEX

Courtesy by PEMEX
Quality System ISO9001

ALL YOKOHAMA hoses are designed and manufactured under a quality system in accordance with ISO9001. The quality system applies to, and interacts with, all activities pertinent to the quality of the product. It involves all phases, from initial identification to final satisfaction of requirements and customer examinations.

Production Process

1. Fabrication of Hose Fitting
   - X-RAY
   - NIPPLE
   - FLANGE

2. Inspection of Hose Fitting
   - DIMENSION DATA
   - X-RAY FILM
   - MATERIAL TEST CERTIFICATE

3. Preparation of Materials
   - MATERIAL TEST CERTIFICATES
   - RUBBER SHEET
   - BREAKER
   - REINFORCEMENT CORD
   - WIRE
   - RUBBER CEMENT

4. Nipple Preparation
   - BLASTING
   - APPLICATION OF CEMENTS

5. Mandrel Preparation
   - MANDREL
   - HOSE FITTING

6. Fabrication of Inner Lining & Breaker
   - RUBBER OR BREAKER

7. Fabrication of Reinforcement Cords (1ST)
   - CORD

8. Winding of Body Wire
   - WIRE

9. Fabrication of Rubber Layer
   - RUBBER

10. Fabrication of Reinforcement Cords (2ND)
    - CORD

11. Fabrication of Breaker & Cover
    - RUBBER OR BREAKER
1. PREPARATION OF MATERIALS

- Rubber Sponge
- Rubber Sheet
- Reinforcement Cord
- Material Test Certificates
- Rubber Cement

2. FABRICATION FOR FLOATING MATERIAL

- Rubber Sponge

3. FABRICATION FOR RUBBER LAYER

- Rubber

4. FABRICATION FOR REINFORCEMENT CORDS

- Cord

5. FABRICATION FOR COVER

- Rubber

6. MARKING FOR RUBBER COVER HOSE

- Brand

7. WRAPPING

- Cloth Tape

8. VULCANIZATION

- Steam Vulcanizer

9. UNWRAPPING

- Cloth Tape

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10. QUALITY / PRODUCTION

11. PRODUCTION PROCESS

12. MARKING FOR SUBMARINE HOSE

- Brand
  - White Stripe

13. WRAPPING

- Cloth Tape

14. VULCANIZATION

15. UNWRAPPING

- Cloth Tape

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16. POLYURETHANE COVERING

1. MATERIAL PREHEATING AND DE-GAS

- Prepolymer
- Curing Agent

2. COATING

3. CURING

4. MARKING FOR URETHANE COVER HOSE

- Marking

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THE YOKOHAMA RUBBER CO., LTD.
Test & Inspection

Acceptance testing for hose purchased is to be based on the tests indicated in Guide to Manufacturing and Purchasing Hoses for Offshore Moonings (GMPHOM 2009)

- Adhesion tests
- Weight test
- Minimum bend radius test
- Torsion test (if specified)
- Bending stiffness test
- Hydrostatic test
- Kerosene test (if specified)
- Tensile test (if specified)
- Vacuum test
- Electrical test
- Float hydrostatic test
- Lifting lug acceptance test

Adhesion test

Weight test in air

Minimum bend radius test

Bending stiffness test

Hydrostatic test

Kerosene test (if specified)
Packing and delivery

Hoses are packed for storage and transportation on steel framed pallets. Each pallet has four support legs to allow safe stacking to a height of three pallets. Upon customer’s request, we shall make the special steel framed pallets which allow us to load into 40 feet dry or open top container.

Steel pallet suitable for open top & dry container (overall width 2200mm) is also available upon req.
Hose System

CALM  Catenary Anchor Leg Mooring

LAZY-S
CHINESE LANTERN
CALM  Catenary Anchor Leg Mooring

STEEP-S
Off Buoy Hoses

Conventional 1st Off Buoy Hose System

2nd Off Buoy Hose Floating System for severe operating conditions
SALM  Single Anchor Leg Mooring
Tandem Mooring
Hose System

CMBM  Conventional Multi-Buoy Mooring
Hose Selection

YOKOHAMA offshore loading & discharge hose *Seaflex* fully conforms to Guide to Manufacturing and Purchasing Hoses for Offshore Moorings (GMPHOM 2009), and most specifications exceed it.

**SELECTION FROM HOSE CONSTRUCTION**

<table>
<thead>
<tr>
<th>CONSTRUCTION</th>
<th>FLEXIBILITY</th>
<th>RATED PRESSURE</th>
<th>HOSE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Carcass</td>
<td>OCIMF Standard</td>
<td>15 Bars (225 psig)</td>
<td>SC STANDARD P.21, 24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19 Bars (275 psig)</td>
<td>SC H-Type P.21, 25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 Bars (225 psig) &amp; 21 Bars (300 psig)</td>
<td>SC SUPER 300-15 P.21, 26 &amp; SC SUPER 300 P.21, 27</td>
</tr>
<tr>
<td></td>
<td>Kink Resistance</td>
<td>19 Bars (275 psig)</td>
<td>SC H-Type P.21, 25</td>
</tr>
<tr>
<td>Double Carcass</td>
<td>OCIMF Standard</td>
<td>15 Bars (225 psig)</td>
<td>DC STANDARD P.22, 24</td>
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<tr>
<td></td>
<td></td>
<td>19 Bars (275 psig)</td>
<td>DC H-Type P.22, 25</td>
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<tr>
<td></td>
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<td>15 Bars (225 psig) &amp; 21 Bars (300 psig)</td>
<td>DC SUPER 300-15 P.22, 26 &amp; DC SUPER 300 P.22, 27</td>
</tr>
<tr>
<td></td>
<td>Kink Resistance</td>
<td>15 Bars (225 psig)</td>
<td>DC H-Type P.22, 25</td>
</tr>
</tbody>
</table>

**MARINE HOSES**
Hose Selection

SINGLE CARCASS HOSE

» FEATURES

1. **Seaflex** Design Concepts —— “No Leakage & No Bulge”

2. Leak Free Tube Lining Construction
   - Strong adhesion between nipple & lining
   - Overlapping of tube layers, No air trapped & Strong tightening at tube fabrication
   - High oil resistant material
   - Longer adhesion length

3. Strong Flotation Construction
   - No-Gas-Lock System

4. Polyester Cord Reinforcement
   - Better fatigue performance
   - No permanent deformation (eg. Kinking)
   - Non-Corrosion
   - Light Weight

5. Body Wire
   Each helical wire in layer(s) is continuous without welding.

» CONSTRUCTION

FLOATING HOSE

- HOSE COVER RUBBER
- FLOATING MEDIA
- BASE HOSE COVER
- REINFORCEMENT 2nd (POLYESTER CORD)
- BODY WIRE
- FILLING RUBBER
- REINFORCEMENT 1st (POLYESTER CORD)
- BREAKER
- INNER TUBE (NBR)

SUBMARINE HOSE

- HOSE COVER RUBBER
- REINFORCEMENT 2nd (POLYESTER CORD)
- BODY WIRE
- FILLING RUBBER
- REINFORCEMENT 1st (POLYESTER CORD)
- BREAKER
- INNER TUBE (NBR)
**THE YOKOHAMA RUBBER CO., LTD.**

**DOUBLE CARCASS HOSE**

**YOYOHAMA Oil Detector Warning System (DC)**

**FEATURES**

for FLOATING HOSE

“The Oil Detector Warning System” is a YOKOHAMA double carcass hose’s primary carcass failure detection system. At the time of primary carcass failure, the color inside the built-in oil detector will turn red. It is visible even after completion of operation, allowing operator to easily check and confirm that particular hose at anytime.

for SUBMARINE HOSE

“Twist Warning System (TWS)” is specially designed for the submarine hose as a main leak detector. It is characterized by a distinct visible change which helps diver’s inspection under water. The oil pot detector is also available for submarine hose as a secondary function of detection system. However, for submarine hose, please refer to TWS as a priority since oil pod detector is too sensitive to use as a part of submarine hose. The operators can firmly confirm the primary carcass failure through these two detectors. This confirmation work reduces the risk of unnecessary hose replacement under water.

**CONSTRUCTION**

**FLOATING HOSE**

**SUBMARINE HOSE**
CODE SYSTEM

Seaflex NOMENCLATURE EXAMPLE

Code system is defined by combining the following symbols & syntax.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>No Mark</td>
<td>No modification to original design</td>
</tr>
<tr>
<td>U</td>
<td>Polyurethane covered hose</td>
</tr>
<tr>
<td>M</td>
<td>Some modification to original design such as, Extra thick cover Extra buoyancy</td>
</tr>
<tr>
<td>Other Alphabet</td>
<td>Some modification to customer’s own specification</td>
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</table>

<table>
<thead>
<tr>
<th>Carcass</th>
<th>Value</th>
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<tbody>
<tr>
<td>SC</td>
<td>Single Carcass</td>
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<tr>
<td>DC</td>
<td>Double Carcass (Oil Detector Warning)</td>
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</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>STD</td>
<td>Standard Type</td>
</tr>
<tr>
<td>H</td>
<td>H Type</td>
</tr>
<tr>
<td>S-300</td>
<td>Super 300 Type</td>
</tr>
<tr>
<td>S300-15</td>
<td>Super 300-15 Type</td>
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<table>
<thead>
<tr>
<th>Model</th>
<th>Value</th>
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<tbody>
<tr>
<td>2070F</td>
<td>Part Floating Hose with Reinforced One End</td>
</tr>
<tr>
<td>3070F</td>
<td>Full Floating Line Hose</td>
</tr>
<tr>
<td>4070F</td>
<td>Full Floating Line Hose with Built-In Reducer</td>
</tr>
<tr>
<td>5070F</td>
<td>Full Floating Tail Hose</td>
</tr>
<tr>
<td>6070F</td>
<td>Full Floating Tanker Rail Hose</td>
</tr>
<tr>
<td>2570F</td>
<td>Full Length Reinforced Floating Hose</td>
</tr>
<tr>
<td>2470F</td>
<td>Taper Reinforced Floating Hose</td>
</tr>
<tr>
<td>2090S</td>
<td>Submarine Hose with Reinforced One End</td>
</tr>
<tr>
<td>3090S</td>
<td>Submarine Line Hose</td>
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<tr>
<td>6090S</td>
<td>Submarine Tanker Rail Hose</td>
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<tr>
<td>2590S</td>
<td>Full Length Reinforced Submarine Hose</td>
</tr>
<tr>
<td>2091U</td>
<td>Submarine Hose with Reinforced One End &amp; Location Collars</td>
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<tr>
<td>3091U</td>
<td>Submarine Line Hose &amp; Location Collars</td>
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<tr>
<td>8570F</td>
<td>Full Length Reinforced Floating Hose for FPSO</td>
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<tr>
<td>8470F</td>
<td>Taper Reinforced Floating Hose for FPSO</td>
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<tr>
<td>8590S</td>
<td>Full Length Reinforced Hose for FPSO</td>
</tr>
<tr>
<td>8591U</td>
<td>Full Length Reinforced Hose &amp; Location Collars for FPSO</td>
</tr>
<tr>
<td>8491U</td>
<td>Taper Reinforced Hose &amp; Location Collars for FPSO</td>
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Length

<table>
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<tr>
<th>Symbol</th>
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<tbody>
<tr>
<td>9.1 m</td>
<td>30 ft</td>
</tr>
<tr>
<td>10.7 m</td>
<td>35 ft</td>
</tr>
<tr>
<td>12.2 m</td>
<td>40 ft</td>
</tr>
</tbody>
</table>

Sample (Label on the actual hose)
Single carcass, Standard type, Full Floating Tail hose, 500mm × 10.7m

Seaflex SC STD M 3070F 500mm × 10.7m
STANDARD TYPE
15 BARS FLOATING & SUBMARINE HOSES

Seaflex “STANDARD” type is conventional design, and accepted by lots of customers worldwide. In each hose model, customers can choose from both SINGLE CARCASS and DOUBLE CARCASS.

SPECIFICATION

PRESSURE RATING : 15 Bars gauge (225 psig)
FACTORY TEST PRESSURE : 15 Bars gauge (225 psig)
PROOF TEST PRESSURE : 22.5 Bars gauge (337.5 psig)
MINIMUM BURST PRESSURE
   SINGLE CARCASS : 75 Bars gauge (1125 psig)
   DOUBLE CARCASS : 75 Bars gauge (1125 psig)
                  : 30 Bars gauge (450 psig)
ALLOWABLE OPERATING PRESSURE
   Floating & Submarine Hose (Except for tanker rail hose) : -0.85 bars (25 HG) Vacuum
   Submarine hose & Tanker rail hose
   Secondary Carcass : 75 Bars gauge (1125 psig)
   Primary Carcass : 75 Bars gauge (1125 psig)
MINIMUM BENDING RADIUS
   Floating hose (Except for tanker rail hose) : 6 x Nominal Diameter
   Submarine hose & Tanker rail hose : 4 x Nominal Diameter
ALLOWABLE FLOW VELOCITY
   : 21 m/sec (70 ft/sec)
FLUID
   : Crude Oil, Liquid Petroleum Products
ALLOWABLE AROMATIC CONTENT : Max. 60%
ALLOWABLE TEMPERATURE
   : Min. -20°C to Max. 82°C (Min. -4°F to Max. 180°F)
   : Min. -29°C to Max. 52°C (Min. -20°F to Max. 125°F)
ALLOWABLE AMBIENT TEMPERATURE
   : Min. -20°C to Max. 82°C (Min. -4°F to Max. 180°F)
PROTECTION FOR THE EXPOSED INTERNAL AND EXTERNAL SURFACES OF THE NIPPLES AND FLANGES INCLUDING FLANGE FACES
   : Galvanizing
APPLICABLE STANDARDS
INSPECTION OF WELDS BETWEEN NIPPLES AND FLANGES
   : To be 100% radiographed in accordance with GMPHOM 2009

MATERIAL

INNER LINING : NBR (Vulcanized seamless tube)
REINFORCEMENT CORD : Polyester cord
BODY WIRE : Steel wire
FLOATING MEDIUM (FLOATING HOSE) : Closed cell foam
OUTER COVER : Fabric reinforced elastomer cover
FLANGE
   : ASTM A-105 (Max. Carbon 0.25%)
   : ASME B16.5
NIPPLE
   : API 5L Grade A or B or ASTM A-285C
   or Equivalent (Max. Carbon 0.23%)
## Hose Selection

### H TYPE

**19 BARS FLOATING & SUBMARINE HOSES**

*Seaflex* “H” type is designed for 19 bars rated pressure, and accepted by lots of customers worldwide. In each hose model, customers can choose from both **SINGLE CARCASS** and **DOUBLE CARCASS**.

### SPECIFICATION

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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<tbody>
<tr>
<td><strong>PRESSURE RATING</strong></td>
<td>19 Bars gauge (275 psig)</td>
</tr>
<tr>
<td><strong>FACTORY TEST PRESSURE</strong></td>
<td>19 Bars gauge (275 psig)</td>
</tr>
<tr>
<td><strong>PROOF TEST PRESSURE</strong></td>
<td>28.5 Bars gauge (412.5 psig)</td>
</tr>
<tr>
<td><strong>MINIMUM BURST PRESSURE</strong></td>
<td></td>
</tr>
<tr>
<td>SINGLE CARCASS</td>
<td>95 Bars gauge (1375 psig)</td>
</tr>
<tr>
<td>DOUBLE CARCASS</td>
<td>95 Bars gauge (1375 psig)</td>
</tr>
<tr>
<td>Primary Carcass</td>
<td>95 Bars gauge (1375 psig)</td>
</tr>
<tr>
<td>Secondary Carcass</td>
<td>38 Bars gauge (550 psig)</td>
</tr>
<tr>
<td><strong>ALLOWABLE OPERATING PRESSURE</strong></td>
<td>-0.85 bars (25*HG) Vacuum</td>
</tr>
<tr>
<td><strong>MINIMUM BENDING RADIUS</strong></td>
<td></td>
</tr>
<tr>
<td>FLOATING HOSE (Except for tanker rail hose)</td>
<td>6 x Nominal Diameter</td>
</tr>
<tr>
<td>SUBMARINE HOSE &amp; TANKER RAIL HOSE</td>
<td>4 x Nominal Diameter</td>
</tr>
<tr>
<td><strong>ALLOWABLE FLOW VELOCITY</strong></td>
<td>21 m/sec (70 ft/sec)</td>
</tr>
<tr>
<td><strong>FLUID</strong></td>
<td>Crude Oil, Liquid Petroleum Products</td>
</tr>
<tr>
<td><strong>ALLOWABLE AROMATIC CONTENT</strong></td>
<td>Max. 60%</td>
</tr>
<tr>
<td><strong>ALLOWABLE TEMPERATURE</strong></td>
<td>Min. -20°C to Max. 82°C (Min. -4°F to Max. 180°F)</td>
</tr>
<tr>
<td><strong>ALLOWABLE AMBIENT TEMPERATURE</strong></td>
<td>Min. -29°C to Max. 52°C (Min. -20°F to Max. 125°F)</td>
</tr>
<tr>
<td><strong>PROTECTION FOR THE EXPOSED INTERNAL AND EXTERNAL SURFACES OF THE NIPPLES AND FLANGES INCLUDING FLANGE FACES</strong></td>
<td>Galvanizing</td>
</tr>
<tr>
<td><strong>APPLICABLE STANDARDS</strong></td>
<td>OCIMF GUIDE 5th Edition - GMPHOM 2009</td>
</tr>
<tr>
<td><strong>INSPECTION OF WELDS BETWEEN NIPPLES AND FLANGES</strong></td>
<td>To be 100 % radiographed in accordance with GMPHOM 2009</td>
</tr>
</tbody>
</table>

### MATERIAL

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>INNER LINING</td>
<td>NBR (Vulcanized seamless tube)</td>
</tr>
<tr>
<td>REINFORCEMENT CORD</td>
<td>Polyester cord</td>
</tr>
<tr>
<td>BODY WIRE</td>
<td>Steel wire</td>
</tr>
<tr>
<td>FLOATING MEDIUM (FLOATING HOSE)</td>
<td>Closed cell foam</td>
</tr>
<tr>
<td>OUTER COVER</td>
<td>Fabric reinforced elastomer cover</td>
</tr>
<tr>
<td>FLANGE</td>
<td>ASTM A-105 (Max. Carbon 0.25%)</td>
</tr>
<tr>
<td></td>
<td>ASME B16.5</td>
</tr>
<tr>
<td>NIPPLE</td>
<td>API 5L Grade A or B or ASTM A-285C</td>
</tr>
<tr>
<td></td>
<td>or Equivalent (Max. Carbon 0.23%)</td>
</tr>
</tbody>
</table>
SUPER 300-15 TYPE
15 BARS / KINK RESISTANCE
FLOATING & SUBMARINE HOSES

Seaflex “SUPER300-15” type is designed for 15 bars rated pressure, and accepted by lots of customers worldwide.
In each hose model, customers can choose from both SINGLE CARCASS and DOUBLE CARCASS.

SPECIFICATION

PRESSURE RATING
FACTORY TEST PRESSURE
PROOF TEST PRESSURE
MINIMUM BURST PRESSURE
SINGLE CARCASS
DOUBLE CARCASS
Primary Carcass
Secondary Carcass
ALLOWABLE OPERATING PRESSURE
FLOATING HOSE (Except for tanker rail hose)
SUBMARINE HOSE & TANKER RAIL HOSE
ALLOWABLE FLOW VELOCITY
FLUID
ALLOWABLE AROMATIC CONTENT
ALLOWABLE TEMPERATURE
ALLOWABLE AMBIENT TEMPERATURE
PROTECTION FOR THE EXPOSED INTERNAL AND EXTERNAL SURFACES
OF THE NIPPLES AND FLANGES INCLUDING FLANGE FACES
APPLICABLE STANDARDS
INSPECTION OF WELDS BETWEEN NIPPLES AND FLANGES

MATERIAL
INNER LINING
REINFORCEMENT CORD
BODY WIRE
FLOATING MEDIUM (FLOATING HOSE)
OUTER COVER
FLANGE
NIPPLE

HOSE SELECTION
SUPER 300-15 TYPE

THE YOKOHAMA RUBBER CO., LTD
SUPPER 300 TYPE
21 BARS / KINK RESISTANCE
FLOATING & SUBMARINE HOSES

“SUPPER 300” type is designed for 21 bars rated pressure, and accepted by lots of customers worldwide. In each hose model, customers can choose from both SINGLE CARCASS and DOUBLE CARCASS.

SPECIFICATION

PRESSURE RATING : 21 Bars gauge (300 psig)
FACTORY TEST PRESSURE : 21 Bars gauge (300 psig)
PROOF TEST PRESSURE : 31.5 Bars gauge (450 psig)
MINIMUM BURST PRESSURE : 105 Bars gauge (500 psig)
SINGLE CARCASS : 105 Bars gauge (1500 psig)
DOUBLE CARCASS : 42 Bars gauge (600 psig)
ALLOWABLE OPERATING PRESSURE : -0.85 bars (25 HG) Vacuum
MINIMUM BENDING RADIUS
FLOATING HOSE (Except for tanker rail hose) : 5 x Nominal Diameter
SUBMARINE HOSE & TANKER RAIL HOSE : 4 x Nominal Diameter
ALLOWABLE FLOW VELOCITY : 21 m/sec (70 ft/sec)
FLUID : Crude Oil, Liquid Petroleum Products
ALLOWABLE AROMATIC CONTENT : Max. 60%
ALLOWABLE TEMPERATURE : Min. -20°C to Max. 82°C (Min. -4°F to Max. 180°F)
ALLOWABLE AMBIENT TEMPERATURE : Min. -29°C to Max. 52°C (Min. -20°F to Max. 125°F)
PROTECTION FOR THE EXPOSED INTERNAL AND EXTERNAL SURFACES OF THE NIPPLES AND FLANGES INCLUDING FLANGE FACES : Galvanizing
INSPECTION OF WELDS BETWEEN NIPPLES AND FLANGES : To be 100% radiographed in accordance with GMPHOM 2009

MATERIAL
INNER LINING : NBR (Vulcanized seamless tube)
REINFORCEMENT CORD : Polyester cord
BODY WIRE : Steel wire
FLOATING MEDIUM (FLOATING HOSE) : Closed cell foam
OUTER COVER : Fabric reinforced elastomer cover
FLANGE : ASTM A-105 (Max. Carbon 0.25%)
ASME B16.5
NIPPLE : API 5L Grade A or B or ASTM A-285C or Equivalent (Max. Carbon 0.23%)
PRECAUTIONS

The precautions to handling and storage are shown as follows. For further information, please confirm separately manuals. If you have any question, ask YOKOHAMA or our sales agents.

FOR HANDLING

1. The best way to lift a hose for moving is to use a Lifting Bar and Lifting Straps. (See also chapter “ANCILLARY EQUIPMENT – Lifting Bar”).
2. The Lifting Bar must have at least three hooks. Place Lifting Straps under both ends and the centre of the hose as shown in Fig.1.
3. The Lifting Straps should be at least 6” wide and made of nylon or some other resilient material to prevent deformation of the floatation medium and damage to the cover of the hose. If the lifting straps are narrower than 6”, the number of lifting points should be increased to disperse the pressure as shown in Fig.2.

CAUTION
Avoid at all costs the one-point centre lift shown in Fig.3 and the two point end lift shown in Fig.4. Also, avoid dragging the hose along the ground-Lift.

FOR STORAGE

1. Keep hoses in a well ventilated, flat, dry, cool, and dark place as shown in Fig.5. If an ideal location is not available, hoses should at least be protected from direct sunlight and given good air circulation.
2. Store in a place free of insects and rodents.
3. Completely drain hoses of water before storing.

CAUTION
1. The hoses shall not exposed to extreme temperatures (lower than -20 deg F [-29 deg C], or higher than 125 deg F [52 deg C]).
2. The hoses shall not stored near any equipment which could generate ozone or heat, electrical sparks, humidity, oil and chemicals.
3. The hoses shall not stored bent or with floatation medium deformed.
4. The hoses shall not stacked without storage racks.
SPECIALITY PRODUCTS

FEATURING
1. POLYURETHANE COVERED HOSE
2. FLASHING HOSE
3. SPECIALLY REINFORCED & VARIABLLY REINFORCED SUBMARINE HOSE
4. REELING HOSE
5. SHIP-TO-SHIP HOSE

POLYURETHANE COVERED HOSE

Applicable for busy terminals coping with marine hoses that quickly deteriorate and become worn. YOKOHAMA Polyurethane covered hose gives you superior abrasion resistance in severe conditions. It comes with vivid orange color which gives you better visibility. Polyurethane covers are applicable to all floating hose products.

FEATURES

1. POLYURETHANE COVERED HOSE
2. FLASHING HOSE
3. SPECIALLY REINFORCED & VARIABLLY REINFORCED SUBMARINE HOSE
4. REELING HOSE
5. SHIP-TO-SHIP HOSE

CHARACTERISTICS COMPARISON

<table>
<thead>
<tr>
<th>Feature</th>
<th>Rubber</th>
<th>Polyurethane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength</td>
<td>Very Good</td>
<td>Excellent</td>
</tr>
<tr>
<td></td>
<td>200 kgf/cm²</td>
<td>400 kgf/cm²</td>
</tr>
<tr>
<td>Hardness</td>
<td>Very Good</td>
<td>Excellent</td>
</tr>
<tr>
<td></td>
<td>55 degrees</td>
<td>90 degrees</td>
</tr>
<tr>
<td>Visibility</td>
<td>Clear</td>
<td>Very clear</td>
</tr>
<tr>
<td></td>
<td>Orange colored stripes</td>
<td>Full bright orange color</td>
</tr>
<tr>
<td>Scrapping off Marine Growth</td>
<td>Good</td>
<td>Very Good</td>
</tr>
</tbody>
</table>

FLASHING HOSE (Patented)

Seaflex Flashing Hose is the best solution for cost saving and safety. Flashing Hose comes with a built-in solar powered LED flashing light to improve visibility of hose line for operators and boats at sea. Flashing lights are visible from a distance even in the dark. Improved visibility minimizes the possibility of boat accidents and adverse losses.

ADVANTAGES
- No more costly hose damage by fishing boats and tug-boats
- Easy monitoring of hose line configuration
- No battery required—maintenance free and environmentally-friendly
SPECIALLY REINFORCED & VARIABLY REINFORCED SUBMARINE HOSE

SRSH (Specially Reinforced Submarine Hose) and VRSH (Variably Reinforced Submarine Hose) with bending stiffness 500kN-m² (51ton-m²) designed for SALM (Single Anchor Leg Mooring) System were developed and employed for FOSCO Japan in 1983 originally. This outstanding characteristic contributed to the successful operation of SALM System since then. For more details, please contact YOKOHAMA.

REELING HOSE

Developed for FPSO/FSO reel system. The hose is specially designed to withstand the crushing and bending force due to the reeling. For more details, please contact YOKOHAMA.

STS (SHIP-TO-SHIP) HOSE

The name of YOKOHAMA is well known as the manufacturer of support products such as YOKOHAMA FENDER and SEAFLEX STS HOSE for offshore Ship to Ship (STS) transfer operation. SEAFLEX STS hose is designed for safe offshore operation, and has outstanding characteristics as follows,

Applicable Standard : EN1765

A. Heavy duty design – Safety factory of pressure strength is more than five times of the operating pressure.
B. No permanent deformation – Helix wire free construction – Deformation shall not remain permanently even though hoses get kinked by rough bending and deformation by slight vacuum during operation.

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>6”</td>
<td>6m (19.7ft)</td>
</tr>
<tr>
<td>8”</td>
<td>6m (19.7ft) 8m (26.2ft) 10m (32.2ft) 12m (39.4ft)</td>
</tr>
<tr>
<td>10”</td>
<td>8m (26.2ft) 10m (32.2ft) 12m (39.4ft)</td>
</tr>
<tr>
<td>12”</td>
<td>7.6m (25.0ft) 9.1m (30.0ft) 10m (32.2ft) 12m (39.4ft)</td>
</tr>
</tbody>
</table>
ANCILLARY EQUIPMENTS

STUD BOLT & NUT P.32
GASKET (Full Face Type) P.32
GASKET (Ring Type) P.33
GASKET (Spirally Wound Metal Type) P.33
BUTTERFLY VALVE P.34
PICK-UP ROPE P.34
SPOOL PIECE P.35
LIGHT WEIGHT BLIND FLANGE P.35
CAM-LOCK FLANGE P.36
PICK-UP CHAIN P.37
HANG-OFF CHAIN P.37
MARKER BUOY P.38
PICK-UP BUOY P.38
SMALL MARKER BUOY P.39
FLOAT P.39
FLOATING REDUCER P.40
FLOATING Y-PIECE P.40
WINKER LIGHT P.41
LIFTING BAR P.41
## STUD BOLT & NUT

### MATERIAL
- Bolt: ASTM A193 GR B7 Cr-Mo Steel
- Nut: ASTM A194 GR 2H Carbon Steel

### COATING
Fluoropolymer coating for long term rust and corrosion prevention. And this coating will be provided low friction fastening.

### APPLICABLE STANDARDS
- Thread: ASME B 1.1
- Hex. Nut: ASME B 18.2.2 Heavy Hex Nut

### DIMENSION

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>ASME 150 Flange</th>
<th>ASME 300 Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D (inch)</td>
<td>L (mm)</td>
</tr>
<tr>
<td>3/4 UNC</td>
<td>3/4 UNC</td>
<td>130</td>
</tr>
<tr>
<td>7/8 UNC</td>
<td>7/8 UNC</td>
<td>140</td>
</tr>
<tr>
<td>1 UNC</td>
<td>1 UNC</td>
<td>25</td>
</tr>
</tbody>
</table>

### GASKET (Full Face Type)

### MATERIAL
Non-Asbestos Compressed Fiber (N.A.F.)

### DIMENSION

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>ASME 150 Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I.D (mm)</td>
</tr>
<tr>
<td>6</td>
<td>150</td>
</tr>
<tr>
<td>8</td>
<td>200</td>
</tr>
<tr>
<td>10</td>
<td>250</td>
</tr>
<tr>
<td>12</td>
<td>300</td>
</tr>
<tr>
<td>16</td>
<td>400</td>
</tr>
<tr>
<td>20</td>
<td>500</td>
</tr>
<tr>
<td>24</td>
<td>600</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>ASME 300 Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I.D (mm)</td>
</tr>
<tr>
<td>6</td>
<td>150</td>
</tr>
<tr>
<td>8</td>
<td>200</td>
</tr>
<tr>
<td>10</td>
<td>250</td>
</tr>
<tr>
<td>12</td>
<td>300</td>
</tr>
<tr>
<td>16</td>
<td>400</td>
</tr>
<tr>
<td>20</td>
<td>500</td>
</tr>
<tr>
<td>24</td>
<td>600</td>
</tr>
</tbody>
</table>
ANCILLARY EQUIPMENTS

GASKET (Ring Type)

**MATERIAL:** Non-Asbestos Compressed Fiber (N.A.F.)

**DIMENSION**

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>ASME 150 Flange</th>
<th>ASME 300 Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I.D (mm)</td>
<td>O.D (mm)</td>
</tr>
<tr>
<td>inch/mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6/150</td>
<td>169</td>
<td>221</td>
</tr>
<tr>
<td>8/200</td>
<td>220</td>
<td>277</td>
</tr>
<tr>
<td>10/250</td>
<td>275</td>
<td>338</td>
</tr>
<tr>
<td>12/300</td>
<td>326</td>
<td>408</td>
</tr>
<tr>
<td>16/400</td>
<td>408</td>
<td>512</td>
</tr>
<tr>
<td>20/500</td>
<td>510</td>
<td>604</td>
</tr>
<tr>
<td>24/600</td>
<td>612</td>
<td>715</td>
</tr>
</tbody>
</table>

1. With outer and inner ring type is also available upon request.
2. Please consult us for the material other than above.
3. PTFE and Graphite are also available upon request.

GASKET (Spirally Wound Metal Type)

**MATERIAL:**
- Outer Ring: SPCC Carbon Steel
- Winding: Type 304 Stainless Steel
- Filler: Non-Asbestos

**DIMENSION**

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>ASME 150 Flange</th>
<th>ASME 300 Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D1 (mm)</td>
<td>D2 (mm)</td>
</tr>
<tr>
<td>inch/mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6/150</td>
<td>182.6</td>
<td>209.6</td>
</tr>
<tr>
<td>8/200</td>
<td>233.4</td>
<td>263.7</td>
</tr>
<tr>
<td>10/250</td>
<td>287.3</td>
<td>317.5</td>
</tr>
<tr>
<td>12/300</td>
<td>339.9</td>
<td>374.7</td>
</tr>
<tr>
<td>16/400</td>
<td>422.4</td>
<td>463.6</td>
</tr>
<tr>
<td>20/500</td>
<td>525.5</td>
<td>577.9</td>
</tr>
<tr>
<td>24/600</td>
<td>628.7</td>
<td>685.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>ASME 300 Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D1 (mm)</td>
</tr>
<tr>
<td>inch/mm</td>
<td></td>
</tr>
<tr>
<td>6/150</td>
<td>182.6</td>
</tr>
<tr>
<td>8/200</td>
<td>233.4</td>
</tr>
<tr>
<td>10/250</td>
<td>287.3</td>
</tr>
<tr>
<td>12/300</td>
<td>339.9</td>
</tr>
<tr>
<td>16/400</td>
<td>422.4</td>
</tr>
<tr>
<td>20/500</td>
<td>525.5</td>
</tr>
<tr>
<td>24/600</td>
<td>628.7</td>
</tr>
</tbody>
</table>
BUTTERFLY VALVE

WAFFER TYPE Butterfly valve is used for fluid shut in a hose string. This is installed between a tanker rail hose and a short spool piece (or short spool piece type cam-lock) by using longer stud bolts. Butterfly valve comes with detachable handle and stud bolts & nuts for assembly. Length of stud bolt for butterfly valve is shown in the following table.

MATERIAL  Body : Carbon Steel
          Disc : Stainless Steel

APPROXIMATE DIMENSION

<table>
<thead>
<tr>
<th>Nominal</th>
<th>ASME 150 Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>inch</td>
<td>mm</td>
</tr>
<tr>
<td></td>
<td>A (mm)</td>
</tr>
<tr>
<td>10</td>
<td>250</td>
</tr>
<tr>
<td>12</td>
<td>300</td>
</tr>
<tr>
<td>16</td>
<td>400</td>
</tr>
</tbody>
</table>

1. Please consult us for the material other than above.
2. Above specifications are subject to change without notice.

PICK-UP ROPE

Pick-up rope connects pick-up chain and small marker buoy.

MATERIAL  Rope : Polypropylene Rope with Thimbles, covered with Rubber sleeve
            Metal Part : Steel (Hot-dip galvanized)

DIMENSION

<table>
<thead>
<tr>
<th>Hose Diameter</th>
<th>A (mm)</th>
<th>B (mm)</th>
<th>C (mm)</th>
<th>D (mm)</th>
<th>L (mm)</th>
<th>Approx. Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>inch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>150</td>
<td>24</td>
<td>50</td>
<td>22</td>
<td>26</td>
<td>4000</td>
</tr>
<tr>
<td>8</td>
<td>200</td>
<td>24</td>
<td>50</td>
<td>25</td>
<td>26</td>
<td>4000</td>
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<tr>
<td>10</td>
<td>250</td>
<td>24</td>
<td>50</td>
<td>28</td>
<td>26</td>
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<td>12</td>
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<td>24</td>
<td>50</td>
<td>35</td>
<td>26</td>
<td>4000</td>
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<td>16</td>
<td>400</td>
<td>24</td>
<td>50</td>
<td>42</td>
<td>26</td>
<td>4000</td>
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<tr>
<td>20</td>
<td>500</td>
<td>24</td>
<td>50</td>
<td>50</td>
<td>26</td>
<td>4000</td>
</tr>
</tbody>
</table>
Ancillary Equipment

**SPOOL PIECE**

Spool piece is constructed from back-to-back welded 2 weld-neck type flanges. This comes with lifting lugs used for connection of various equipment to a hose string. In general, this is directly jointed with studded type cam-lock. In another example, this is used for connection of a retention wire between FPSO and a hose string. Number of Lifting Lugs can be selected by the customer or ask YOKOHAMA for a recommendation.

- **MATERIAL**: Carbon Steel
- **COATING**: Hot-dip galvanized
- **DIMENSION**

<table>
<thead>
<tr>
<th>Nominal</th>
<th>ASME 150 Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>inch (mm)</td>
<td>A (mm)</td>
</tr>
<tr>
<td>6 150</td>
<td>154.9</td>
</tr>
<tr>
<td>8 200</td>
<td>202.5</td>
</tr>
<tr>
<td>10 250</td>
<td>252.5</td>
</tr>
<tr>
<td>12 300</td>
<td>302.6</td>
</tr>
<tr>
<td>16 400</td>
<td>387.4</td>
</tr>
<tr>
<td>20 500</td>
<td>482.6</td>
</tr>
</tbody>
</table>

1. For ASME 300 flange is also available upon request.

**LIGHT WEIGHT BLIND FLANGE**

Light weight blind flange is the protection of cam-lock flange surface when a hose string is not in use. In addition, this prevents marine growth from adhesion on the surface of a butterfly valve.

- **MATERIAL**: Carbon Steel
- **COATING**: Hot-dip galvanized
- **DIMENSION**

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>ASME 150 Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>inch (mm)</td>
<td>A (mm)</td>
</tr>
<tr>
<td>6 150</td>
<td>200</td>
</tr>
<tr>
<td>8 200</td>
<td>255</td>
</tr>
<tr>
<td>10 250</td>
<td>310</td>
</tr>
<tr>
<td>12 300</td>
<td>385</td>
</tr>
<tr>
<td>16 400</td>
<td>485</td>
</tr>
<tr>
<td>20 500</td>
<td>575</td>
</tr>
</tbody>
</table>

1. For ASME 300 flange is also available upon request.
CAM-LOCK FLANGE

Cam-lock flange is used for connection of a hose string and a tanker manifold during operation. After operation, a blind flange is mounted to protect a cam-lock flange surface. There are two types of cam-lock as follows.

SHORT SPOOL PIECE TYPE: Short spool piece is welded to a cam-lock. Cam-lock can be connected to a tanker manifold by standard stud bolts & nuts even after cams are damaged.

STUDDED TYPE: Studded type cam-lock flange comes with stud bolts at back side for the connection to a short spool piece.

MATERIAL

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flange</td>
<td>Forged Steel (Spool piece type), Steel (Studded type)</td>
</tr>
<tr>
<td>Cam</td>
<td>Steel Casting</td>
</tr>
<tr>
<td>O-ring</td>
<td>Rubber</td>
</tr>
<tr>
<td>Stud bolt &amp; Nut (for Studded type)</td>
<td>ASTM A193 GR B7 Cr-Mo Steel (Bolt)</td>
</tr>
<tr>
<td></td>
<td>ASTM A194 GR 2H Carbon Steel (Nut)</td>
</tr>
</tbody>
</table>

COATING

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>External surfaces of Flange &amp; Cams</td>
<td>Painting</td>
</tr>
<tr>
<td>Stud bolt &amp; Nut (for Studded type)</td>
<td>Fluoropolymer coating</td>
</tr>
</tbody>
</table>

DIMENSION

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>ASME 150 Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>inch/mm</td>
<td>A (mm)</td>
</tr>
<tr>
<td>--------------</td>
<td>--------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>6/150</td>
<td>564</td>
</tr>
<tr>
<td>8/200</td>
<td>616</td>
</tr>
<tr>
<td>10/250</td>
<td>686</td>
</tr>
<tr>
<td>12/300</td>
<td>762</td>
</tr>
<tr>
<td>16/400</td>
<td>854</td>
</tr>
<tr>
<td>20/500</td>
<td>959</td>
</tr>
</tbody>
</table>

1. Above specifications are subject to change without notice.
ANCILLARY EQUIPMENTS

Ancillary Equipment

PICK-UP CHAIN

Pick-up chain is used for picking up a hose string, and connected to a lifting lug on tanker rail hose flange. Safety Working Load (S.W.L.) is in accordance with GMPHOM 2009 “Tanker rail hose/Lifting lugs”.

**MATERIAL**

- Chain : Flash butt welded anchor chain (JIS F 3303 SBC690), Hot-dip galvanized
- Others : Steel (Hot-dip galvanized)

**DIMENSION**

<table>
<thead>
<tr>
<th>Hose Diameter</th>
<th>S.W.L. (kN)</th>
<th>A (mm)</th>
<th>B (mm)</th>
<th>Marker Buoy / Pick-up Buoy</th>
<th>Small Marker Buoy</th>
</tr>
</thead>
<tbody>
<tr>
<td>inch</td>
<td>mm</td>
<td></td>
<td></td>
<td>L (mm)</td>
<td>Approx. Weight (kg)</td>
</tr>
<tr>
<td>6</td>
<td>150</td>
<td>40</td>
<td>16</td>
<td>22</td>
<td>3000</td>
</tr>
<tr>
<td>8</td>
<td>200</td>
<td>50</td>
<td>19</td>
<td>25</td>
<td>3000</td>
</tr>
<tr>
<td>10</td>
<td>250</td>
<td>70</td>
<td>22</td>
<td>28</td>
<td>3000</td>
</tr>
<tr>
<td>12</td>
<td>300</td>
<td>100</td>
<td>26</td>
<td>35</td>
<td>3000</td>
</tr>
<tr>
<td>16</td>
<td>400</td>
<td>150</td>
<td>32</td>
<td>42</td>
<td>3000</td>
</tr>
<tr>
<td>20</td>
<td>500</td>
<td>200</td>
<td>36</td>
<td>50</td>
<td>3000</td>
</tr>
</tbody>
</table>

1. SCM440 Chain (Grade 80) is also available upon request.
2. Ring is assembled only when using with small marker buoy. In case of using with marker buoy / pick-up buoy, these buoys is directly connected by shackle of pick-up chain without Ring.

HANG-OFF CHAIN

Hang-off chain (sometimes called “Snubbing chain”) is used to hang a tanker rail hose at a tanker. Safety Working Load (S.W.L.) is in accordance with GMPHOM 2009 “Tanker rail hose/Lifting lugs”.

**MATERIAL**

- Chain : Flash butt welded anchor chain (JIS F 3303 SBC690), Hot-dip galvanized
- Others : Steel (Hot-dip galvanized)

**DIMENSION**

<table>
<thead>
<tr>
<th>Hose Diameter</th>
<th>S.W.L. (kN)</th>
<th>A (mm)</th>
<th>B (mm)</th>
<th>C (mm)</th>
<th>D (mm)</th>
<th>For 30 ft Hose (For 35 ft Hose)</th>
<th>Approx. Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>inch</td>
<td>mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L1 (mm)</td>
<td>L2 (mm)</td>
</tr>
<tr>
<td>6</td>
<td>150</td>
<td>40</td>
<td>16</td>
<td>22</td>
<td>180 x 95</td>
<td>21 x 25</td>
<td>3560 (4060)</td>
</tr>
<tr>
<td>8</td>
<td>200</td>
<td>50</td>
<td>19</td>
<td>25</td>
<td>125</td>
<td>3570 (4020)</td>
<td>3560 (4160)</td>
</tr>
<tr>
<td>10</td>
<td>250</td>
<td>70</td>
<td>22</td>
<td>28</td>
<td>150</td>
<td>3510 (4040)</td>
<td>3680 (4120)</td>
</tr>
<tr>
<td>12</td>
<td>300</td>
<td>100</td>
<td>26</td>
<td>35</td>
<td>230 x 120</td>
<td>27 x 34</td>
<td>3530 (4060)</td>
</tr>
<tr>
<td>16</td>
<td>400</td>
<td>150</td>
<td>32</td>
<td>42</td>
<td>300 x 150</td>
<td>42</td>
<td>3520 (4020)</td>
</tr>
<tr>
<td>20</td>
<td>500</td>
<td>200</td>
<td>36</td>
<td>50</td>
<td>330</td>
<td>3510 (3970)</td>
<td>3680 (4260)</td>
</tr>
</tbody>
</table>

1. SCM440 Chain (Grade 80) is also available upon request.
MARKER BUOY

Marker buoy is a positional marker for the end of a hose string at sea surface, and Safety Working Load (S.W.L.) of a lifting eye is available from 1 to 8.5 ton.

**MATERIAL**
- Skin Cover: Elastomer Polyurethane
- Buoy Body: Closed cell foam
- Metal Part: Steel (Hot-dip galvanized)

**DIMENSION**

<table>
<thead>
<tr>
<th>Net Buoyancy (kg)</th>
<th>A (mm)</th>
<th>B (mm)</th>
<th>C (mm)</th>
<th>Weight in Air (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>600</td>
<td>520</td>
<td>785</td>
<td>28</td>
</tr>
<tr>
<td>150</td>
<td>660</td>
<td>605</td>
<td>870</td>
<td>34</td>
</tr>
<tr>
<td>200</td>
<td>670</td>
<td>775</td>
<td>1040</td>
<td>40</td>
</tr>
<tr>
<td>300</td>
<td>750</td>
<td>860</td>
<td>1125</td>
<td>51</td>
</tr>
<tr>
<td>400</td>
<td>850</td>
<td>903</td>
<td>1170</td>
<td>66</td>
</tr>
<tr>
<td>500</td>
<td>910</td>
<td>945</td>
<td>1210</td>
<td>74</td>
</tr>
</tbody>
</table>

1. Above specifications are subject to change without notice.

PICK-UP BUOY

Pick-up buoy is a positional marker of the end of a hose string at sea surface. Safety Working Load (S.W.L.) of a hanging eye shall be carefully studied and selected to meet the requirements of each particular site such as height of free board of a vessel, weight of hose string etc.

**MATERIAL**
- Skin Cover: Elastomer Polyurethane
- Buoy Body: Closed cell foam
- Metal Part: Steel

**DIMENSION**

<table>
<thead>
<tr>
<th>Net Buoyancy (kg)</th>
<th>S.W.L. (ton)</th>
<th>A (mm)</th>
<th>B (mm)</th>
<th>C (mm)</th>
<th>Weight in Air (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>11</td>
<td>700</td>
<td>800</td>
<td>1330</td>
<td>86</td>
</tr>
</tbody>
</table>

1. Above specifications are subject to change without notice.
ANCILLARY EQUIPMENTS

SMALL MARKER BUOY

Small marker buoy is a positional marker of the end of a hose string at sea surface.

➤ MATERIAL : Aluminum Alloy filled with Polyurethane foam

➤ DIMENSION

<table>
<thead>
<tr>
<th></th>
<th>A (mm)</th>
<th>B (mm)</th>
<th>C (mm)</th>
<th>Weight in Air (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Buoyancy (kg)</td>
<td>20</td>
<td>450</td>
<td>505</td>
<td>636</td>
</tr>
</tbody>
</table>

1. Above specifications are subject to change without notice.

FLOAT

Bolted type Float is installed on the integral location collars of a hose to maintain the appropriate configuration of a hose string under sea water. Appropriate float is selected based on the outside diameter of location collars on submarine hoses that specified by GMPHOM 2009.

➤ MATERIAL

- Shell : Polyethylene
- Filling : Polyurethane Foam
- Metal Part : Stainless Steel
- Color : Orange (White is also available upon request)

➤ DIMENSION, NET BUOYANCY & WEIGHT

<table>
<thead>
<tr>
<th>Outside Diameter of Location Collars (GMPHOM 2009) (mm)</th>
<th>A (mm)</th>
<th>B (mm)</th>
<th>C (mm)</th>
<th>D (mm)</th>
<th>Net Buoyancy (kg)</th>
<th>Weight in Air (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>310</td>
<td>310</td>
<td>580</td>
<td>400</td>
<td>200</td>
<td>40</td>
<td>21</td>
</tr>
<tr>
<td>370</td>
<td>370</td>
<td>650</td>
<td>400</td>
<td>200</td>
<td>55</td>
<td>26</td>
</tr>
<tr>
<td>420</td>
<td>420</td>
<td>710</td>
<td>550</td>
<td>200</td>
<td>70</td>
<td>38</td>
</tr>
<tr>
<td>471</td>
<td>471</td>
<td>710</td>
<td>550</td>
<td>200</td>
<td>70</td>
<td>38</td>
</tr>
<tr>
<td>581</td>
<td>581</td>
<td>1050</td>
<td>550</td>
<td>200</td>
<td>210</td>
<td>83</td>
</tr>
<tr>
<td>697</td>
<td>697</td>
<td>1200</td>
<td>600</td>
<td>200</td>
<td>232</td>
<td>118</td>
</tr>
<tr>
<td>799</td>
<td>799</td>
<td>1230</td>
<td>600</td>
<td>200</td>
<td>280</td>
<td>102</td>
</tr>
<tr>
<td>876</td>
<td>876</td>
<td>1330</td>
<td>600</td>
<td>200</td>
<td>360</td>
<td>118</td>
</tr>
<tr>
<td>946</td>
<td>946</td>
<td>1370</td>
<td>800</td>
<td>200</td>
<td>420</td>
<td>157</td>
</tr>
</tbody>
</table>

1. Above Dimensions, Net buoyancy and Weight in air are approximately.
2. Deep water float (up to 80 m) is also available upon request.
3. Hinged type float is available upon request.
4. Above specifications are subject to change without notice.
FLOATING REDUCER

Floating concentric reducer is installed between a main line and a tail hose to reduce the internal diameter in a floating hose string.

**MATERIAL**
- Outer Cover: Polyurethane
- Floater: Closed cell foam
- Flange: ASTM A105

**RESERVE BUOYANCY**: Minimum 25%

**DIMENSION**

<table>
<thead>
<tr>
<th>Size Flange A x B</th>
<th>D (mm)</th>
<th>L (mm)</th>
<th>Weight in Air (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 x 10 300 x 250</td>
<td>670</td>
<td>1500</td>
<td>200</td>
</tr>
<tr>
<td>16 x 12 400 x 300</td>
<td>800</td>
<td>1500</td>
<td>260</td>
</tr>
<tr>
<td>20 x 12 500 x 300</td>
<td>900</td>
<td>1600</td>
<td>350</td>
</tr>
<tr>
<td>20 x 16 500 x 400</td>
<td>940</td>
<td>1600</td>
<td>370</td>
</tr>
<tr>
<td>24 x 16 600 x 400</td>
<td>1060</td>
<td>1700</td>
<td>460</td>
</tr>
<tr>
<td>24 x 20 600 x 500</td>
<td>1080</td>
<td>1700</td>
<td>490</td>
</tr>
</tbody>
</table>

1. ASME 300 is also available upon request.
2. Above specifications are subject to change without notice.

FLOATING Y-PIECE

Floating Y-piece (with concentric reducers), which bifurcates one floating hose string to two hose strings, is installed between a main line hose and tail hoses.

**MATERIAL**
- Skin Cover: Polyurethane
- Floater: Polyethylene foam
- Flange: ASTM A105

**RESERVE BUOYANCY**: Minimum 25%

**DIMENSION**

<table>
<thead>
<tr>
<th>Size Flange A x B</th>
<th>ASME 150</th>
</tr>
</thead>
<tbody>
<tr>
<td>D (mm)</td>
<td>L (mm)</td>
</tr>
<tr>
<td>16 x 12 400 x 300</td>
<td>850 2400 1830 800</td>
</tr>
<tr>
<td>20 x 12 500 x 300</td>
<td>950 2500 1830 950</td>
</tr>
<tr>
<td>20 x 16 500 x 400</td>
<td>950 2500 1830 1100</td>
</tr>
<tr>
<td>24 x 16 600 x 400</td>
<td>1050 2500 1830 1350</td>
</tr>
<tr>
<td>24 x 20 600 x 500</td>
<td>1050 2600 1830 1400</td>
</tr>
</tbody>
</table>

1. ASME 300 flange is also available upon request.
2. Above specifications are subject to change without notice.
ANCILLARY EQUIPMENTS

WINKER LIGHT

Winker light increases the visibility of a floating hose string in darkness. This is usually installed on every three-five main line hose, and this is assembled to the hose flange by steel adaptor, which enables you to replace the winker light without disassembling the hose connection. Winker light is supplied with a steel adaptor and stud bolt & nut for assembly. Length of stud bolt for winker light is shown in the following table.

SPECIFICATION

<table>
<thead>
<tr>
<th>Light Source</th>
<th>High-intensity LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens</td>
<td>Aspheric lens</td>
</tr>
<tr>
<td>Light Color</td>
<td>Yellow</td>
</tr>
<tr>
<td>Luminous Intensity</td>
<td>8.7 cd</td>
</tr>
<tr>
<td>Luminous Range</td>
<td>4.5km (T=0.74)</td>
</tr>
<tr>
<td>Signaling</td>
<td>1 flashing every 4 sec.</td>
</tr>
<tr>
<td>Battery</td>
<td>Solar cell</td>
</tr>
</tbody>
</table>

MATERIAL

<table>
<thead>
<tr>
<th>Lens</th>
<th>Polycarbonate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>Aluminum alloy</td>
</tr>
<tr>
<td>Adaptor</td>
<td>Galvanized Steel</td>
</tr>
<tr>
<td>Guard</td>
<td>Stainless &amp; Aluminum</td>
</tr>
</tbody>
</table>

DIMENSION

<table>
<thead>
<tr>
<th>Nominal inch</th>
<th>ASME 150 Flange [A (mm)]</th>
<th>B (mm)</th>
<th>C (mm)</th>
<th>D (mm)</th>
<th>R (mm)</th>
<th>d (mm)</th>
<th>Approx. Weight (kg)</th>
<th>Length of Bolt (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>150</td>
<td>210</td>
<td>160</td>
<td>285</td>
<td>328</td>
<td>121</td>
<td>23</td>
<td>17</td>
</tr>
<tr>
<td>8</td>
<td>200</td>
<td>210</td>
<td>160</td>
<td>285</td>
<td>328</td>
<td>149</td>
<td>23</td>
<td>17</td>
</tr>
<tr>
<td>10</td>
<td>250</td>
<td>210</td>
<td>100</td>
<td>580</td>
<td>623</td>
<td>181</td>
<td>26</td>
<td>13</td>
</tr>
<tr>
<td>12</td>
<td>300</td>
<td>210</td>
<td>100</td>
<td>580</td>
<td>623</td>
<td>216</td>
<td>26</td>
<td>13</td>
</tr>
<tr>
<td>16</td>
<td>400</td>
<td>210</td>
<td>100</td>
<td>580</td>
<td>623</td>
<td>270</td>
<td>29</td>
<td>13</td>
</tr>
<tr>
<td>20</td>
<td>500</td>
<td>210</td>
<td>100</td>
<td>580</td>
<td>623</td>
<td>318</td>
<td>33</td>
<td>13</td>
</tr>
<tr>
<td>24</td>
<td>600</td>
<td>210</td>
<td>100</td>
<td>580</td>
<td>623</td>
<td>375</td>
<td>36</td>
<td>13</td>
</tr>
</tbody>
</table>

1. Please refer to "STUD BOLT & NUT" section for other dimension & coating specification.
2. Above specifications are subject to change without notice.

LIFTING BAR

Lifting Bar is used to lift up a hose safely. This is supplied with a chain sling for crane connection and nylon slings for a hose lifting from several points. Safety Working Load (S.W.L.) is 8 tons.

MATERIAL

<table>
<thead>
<tr>
<th>Lifting Bar</th>
<th>Steel (Color = Red)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain Sling</td>
<td>ø20 Chain</td>
</tr>
<tr>
<td>Belt Sling</td>
<td>Polyester (S.W.L. = 5 tons)</td>
</tr>
<tr>
<td>Weight</td>
<td>1250 kg</td>
</tr>
</tbody>
</table>
TANKER END GEAR ASSEMBLY
FOR FLOATING HOSE LINE

- Tanker Rail Hose (Model 6070F)
- Light Weight Blind Flange
- Butterfly Valve
- Short Spool Piece Camlock
- Gasket
- Studded Type Camlock (w/Stud Bolt & Nut)
- White Bands (Tanker Side)
- Hang-Off Chain (Snubbing Chain)
- Short Spool Piece
- Lifting Lug of Hose
- Hang-Off Chain
- Shackles
- Hang-Off Chain
- Stud Bolt & Nut
- Pick-Up Rope
- Marker Buoy
- Small Marker Buoy
- Pick-Up Chain
- Pick-Up Rope
- Tanker Rail Hose
- Hang-Off Chain (Snubbing Chain)
FLOW VELOCITY & FLOW RATE

The maximum flow velocity recommended by GMPHOM 2009 is 21 m/sec (70 ft/sec). The following graph shows the correlation between flow rate and flow velocity for each nominal hose diameter.
PRESSURE LOSS & FLOW RATE

The following graphs show the correlation between pressure loss and flow rate for each nominal hose diameter. These are calculated based on the Darcy – Weisbach equation with Mise’s experiment under the following conditions.

- Length of Hose line: 100 m
- Specific gravity of Fluid: 0.85
- Kinematic viscosity: $6.0 \times 10^{-6}$
- Mise’s experiment: $0.3 \times 10^{-6}$
Quotation Required Sheet

Please complete as fully as possible to allow prompt quotation.

Customer: 
Customer’s Reference Number: 
Date of Inquiry: 
Required Date of Quotation: 
Required Date of Delivery: 
Destination: 
Condition: □ FOB Japan □ CIF (port: ) □ Others 
Currency: □ US Dollar □ Japanese Yen □ Others 

1. Hose
1.1 Specification: □ GMPHOM 2009 □ Customer’s Spec.
1.2 Rated Pressure: □ 15 bars □ 19 bars □ 21 bars
1.3 Fluid: [ ] crude oil [ ] liquid petroleum products [ ] others [ ]
1.4 Cover: □ Rubber
 [ ] Polyurethane (floating hoses only) [ ] all hoses
1.5 Flange Rating: □ ASME 150
 [ ] ASME 300 (for all hoses marked hoses below)
1.6 Flange Face: □ Flat face (FF) □ Raised face (RF)
1.7 Third Party Inspection: □ Not required (Manufacturer’s full test certificates for each hose are to be submitted.)
 [ ] Required: Final only [ ] including in-line
 [ ] at customer’s account [ ] at manufacturer’s account
1.8 Packing: □ Steel pallet, dimensions by GMPHOM 2009 Hose Guide (overall width 2414mm)
 [ ] Steel pallet suitable for container (overall width 2200mm)
 [ ] Wooden slat packing
1.9 Drawing: □ Required with BID
 [ ] Required when ordered
 [ ] Required when ordered for approval
1.10 Details

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Seaflex Model</th>
<th>Nominal dia. (mm)</th>
<th>Length (m)</th>
<th>Q’ty (pcs)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
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<tr>
<td>Ex. Full floating hose for line hose of floating hose string</td>
<td>STD</td>
<td>U3070F</td>
<td>600</td>
<td>10.7</td>
<td>15</td>
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</tbody>
</table>

2. Ancillary equipment
2.1 Third party Inspection: □ Not required (Manufacturer’s full test certificates for each product are to be submitted.)
 [ ] Required: Final only
 [ ] at customer’s account
 [ ] at manufacturer’s account
2.2 Drawing: □ Required with BID
 [ ] Required when ordered
 [ ] Required when ordered for approval
2.3 Details

<table>
<thead>
<tr>
<th>Description</th>
<th>Q’ty (pcs)</th>
<th>Remarks</th>
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<tbody>
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<tr>
<td>Ex. Hang-off Chain</td>
<td>SWL 11 tons, 10.7m</td>
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</table>
Information Required Sheet

Please complete as fully as possible to facilitate best design.

1. Customer :

2. Port / Field :

3. Location :

4. System :  
   - CALM  
   - SALM  
   - CMBM  
   - TANDEM MOORINGS  
   - Other (___________________________)

5. Environmental Conditions
   5.1 Sea Depth :
   5.2 Tidal Range :

5.3 Operational Conditions
   (a) Wave height :
   (b) Wave period :
   (c) Wind speed :

5.4 Survival Conditions
   (a) Wave height :
   (b) Wave period :
   (c) Wind speed :
   (d) Current speed :

6. Purpose:  
   - Loading  
   - Unloading

7. Cargo
   7.1 Kind of Cargo:  
      - Crude oil  
      - Liquid petroleum products
   7.2 Specific Gravity: 
   7.3 Max. Aromatic Carbon Content:

8. Operating Pressure
   8.1 Operating Pressure at Buoy :
   8.2 Operating Pressure at Tanker :
   8.3 Maximum Pressure :

9. Temperature
   Fluid :
   Ambient :

10. Flow Rate:

11. Hose Line
   11.1 Number of Lines
   11.2 Floating Main Line (size & number) :
   11.3 Floating Tail/Rail (size & number) :
   11.4 Submarine Line (size & number) :

12. Under-buoy Hose Line Configuration:
   - Chinese Lantern  
   - Lazy-S  
   - Steep-S  
   - Other (___________________________)

13. Vessels
   13.1 Size:  
      - D.W.T. Max. :
      - D.W.T. Average :
      - D.W.T. Min. :
   13.2 Frequency of operation (Vessels/Month) :

14. Hose Average Life
   14.1 Floating Main Line :
   14.2 Floating 1st off Buoy :
   14.3 Floating Tail :
   14.4 Floating Rail :
   14.5 Under-buoy Hose for CALM :
   14.6 Submarine Hose for SALM :

15. Others
   15.1 Submarine Pipe Line Diameter and Length: 
   15.2 Mooring Rope Length: 

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