SPECIFICATION FOR MARINE LOADING/UNLOADING FACILITIES
(PROJECT STANDARDS AND SPECIFICATIONS)

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1.0 SCOPE

This manual covers basic design procedures for marine loading/unloading facilities for flammable liquid except for LNG, Ethylene, liquid sulphur and etc. and should be used for the Front End Engineering or verification stage of the project.

Basic design of marine loading/unloading facilities is closely related to Civil and HSE engineering.

2.0 WORK PROCEDURE

2.1 Inputs to the Design

2.1.1 Data to be provided by The Client

1. Annual Shipment
   Products handled and annual quantity
2. Lot Size of Loading/Unloading
   Tanker size and/or lot size per product
3. Maximum berth occupancy time per shipment, if available
   (Berthing/de-berthing time + Loading or unloading time)
4. Annual Berth Operation Time
   — Annual operation days
   — Daily operation hours
5. Ballast water disposal quantity
6. Required Utilities for tankers
7. Seasonal variations for each product, if available.

2.1.2 Process Conditions

1. Source of the data
   The design data shall be obtained from, but is not limited to, the following documents:
   — Refinery Scheme including material balances for all operation cases.
   — The design philosophy of the process units (hereinafter called as “on-site”), product blenders, and marine loading/unloading facilities
   — Process Flow Diagram (PFD): Refer to Note 1
   — Basic Engineering Design Data (BEDD)
   — Piping & Instrument Diagram (P&ID): Refer to Note below.
   Note: This manual includes a definitive study to determine berth spot arrangement. At this stage, Flow Schemes are not available.
2. Design basis
Maximum, normal and minimum flow rate and corresponding physical properties should be used for designing loading pumps and Loading/unloading facilities.

2.2 Output from Design

The process data to be prepared based on this manual should be as follows:

<table>
<thead>
<tr>
<th>Name of Facilities</th>
<th>Process Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Berth</td>
<td>Tanker size and number of berths</td>
</tr>
<tr>
<td>2. Loading/unloading facilities</td>
<td>Number, types and size of loading/unloading spots, and process conditions for loading arms.</td>
</tr>
<tr>
<td>3. Interconnecting piping</td>
<td>Number and size of piping and process conditions</td>
</tr>
<tr>
<td>4. Loading Pump</td>
<td>Pump data sheet</td>
</tr>
<tr>
<td>5. Measuring facilities</td>
<td>Number and type of facilities, and process conditions</td>
</tr>
<tr>
<td>6. Utility supply facilities</td>
<td>Type and quality of utility and conditions of tie-in with tankers and miscellaneous uses on platform</td>
</tr>
<tr>
<td>7. ESD Systems</td>
<td>ESV, Emergency Release Coupler, etc</td>
</tr>
<tr>
<td>8. Oily Sewer Systems</td>
<td>Oily water drainage system</td>
</tr>
</tbody>
</table>
2.3 Work Steps

As a guideline the design of marine loading/unloading facilities should be conducted according to the following work steps.

- **Annual Shipment**
- **Lot Size of Loading/ Unloading**
- **Tanker Type & Size (To be discussed with The Client)**
- **Tanker Type Distribution (To be confirmed with The Client)**
- **Average Tanker Capacity**
- **Annual Berth Occupancy Time for Average Tanker Capacity**
- **Annual Berth Occupancy Time**
- **Average Berth Occupancy Ratio**
- **Number of Berths**
- **Decision of Number of Berth & Spot Arrangement**
- **Berth Type & Location**
- **Loading Equipment Specification (Arm/ Hose)**
- **Pre-determination of Loading Arm Layout**
- **Hydraulic Calculation of Interconnection Piping**
- **Metering System Design**
- **Loading Pump Specification**
- **Simple Piping Layout on Platform**
- **Minimum Platform Length**

Legend:
- By Client
- By Process
- By Process & Other Discipline
- By Client Discipline

- **Estimation of Number of Berths**
  - **Annual Berth Operation Time**
  - **No**
  - **Yes**

- **By Client**
- **By Process**
- **By Process & Other Discipline**
- **By Client Discipline**
3.0 SYSTEM DESCRIPTION

The marine loading/unloading facilities are mainly composed of the followings:

1. Berth
   Fixes tankers at a certain point to connect with the loading/unloading facilities that are of a fixed type and include a specific mooring type.

2. Loading/Unloading Equipment
   Connects loading/unloading piping with the tanker and shall compensate for tanker movements.

3. Interconnecting Piping
   Connects loading/unloading equipment and refinery/oil terminal pumps and tanks.

4. Loading/Unloading Pumps
   The loading pumps such as centrifugal or rotary types shall be provided. However, pumps provided on the tanker are used for unloading, therefore, a new pump for the unloading operation will not be necessary.

5. Measuring Facilities
   Measures the volume of oil for the custody transfer of oil loaded or unloaded. The following methods shall be used to measure the volume of oil loaded or unloaded.
   — Special flow meters such as PD meters or turbine meters should be used when a higher accuracy is required. A flow meter shall also be used for loading flow rate control.
   — Tank level gauges on cargo tanks or shore tanks
6. Ballast Water Facilities
   Ballast water is to stabilize the empty tanker by seawater. Therefore, the necessity for ballast water facilities shall be confirmed with the Client.

7. Utility Supply Facilities
   Piping systems in the berth area for supplying bunker fuel oil, potable water, and other water necessary for tanker navigation and general uses shall be necessary. However, there is a case that bunker fuel is supplied using a supply boat. When a buoy mooring type berth is used, utilities are supplied using small ships; therefore, utility supply facilities should not be necessary. A utility supply facility to the small ships, such as tag boats, is considered, if necessary.

8. ESD Systems
   For safety isolation of the tanker and berthing facilities as well as for the refinery and interconnecting piping.

**4.0 SYSTEM DESIGN**

**4.1 Mooring Facility**

4.1.1 Type of Berth

The type of berth can be classified into one of the following groups.
1. Fixed Type
   a. Dolphin Type
   b. Pier Type
2. Buoy Mooring
   a. Single Point Mooring Type
   b. Multi Buoy Mooring Type

On the basis of conditions for selecting a berth type, the type of a berth most suitable for the job concerned should be selected by the project team members and respective disciplines or a marine consultant. Table 4.1.1 below shows a comparison between the fixed and floating types for reference.