






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COMMON FACILITIES DESIGN CONSIDERATIONS

Contract No:	22640	Client Contract No	280815/FEED/BSR-AFW	
Client's Name:	Binh Son Refining and Petrochemical Company Ltd			
Project Title:	Dung Quat Refinery Upgrading and Expansion Project			
Project Location:	Quang Ngai Province, Vietnam			
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COMMON FACILITIES DESIGN CONSIDERATIONS

1 GENERAL

This document describes the philosophy which will be followed for the design of the Common Facilities serving the process Units/Areas in the New Facilities that are listed in this document.

Common Facilities covered in this document are:

- Closed Hydrocarbon Drain system (CD system)
- Oily Water Collection Sumps (part of OW system)

The streams covered by the above may generally be routed to segregated collection systems for disposal / treatment to locations including flare, slops and / or Effluent Treatment Plant.

The configuration and capacity of each of the common facilities shall be standardised as much as possible but will be dependent upon source pressure segregation, the magnitude of the individual inventories within the unit, their properties and the available plot space.

This document provides a generic definition of the equipment required to meet and implement the requirements of the Common Facilities philosophy.

The system design shall be completed and optimised by the Contractor during the detailed design phase.

2 BASIS OF DESIGN

2.1 Closed Hydrocarbon Drain System

2.1.1 System Purpose

CD systems for hydrocarbon & water are to be installed where liquid hydrocarbons are present. Contractor is required to develop the system design and all details in accordance with the following requirements.

The systems are intended to handle liquid hydrocarbons drained from equipment during partial or total unit shutdown. The CD system shall be a closed system to minimise release of hydrocarbons to atmosphere or to the oily water system. Recovered liquids are pumped out via a cooler (if required) to the refinery heavy or light slops network. Hydrocarbon/water separation will take place in the heavy/light slop tanks rather than in CD drum(s).

The systems are designed to handle relatively small quantities of liquids and are not intended to handle total inventories from Units. Liquid, from individual items designed to be shutdown for maintenance while the Unit is in operation, may be drained to the CD system. During total unit shutdown, it is envisaged that the majority of liquid inventory will be pumped out to normal process destination or to slop, using the normal process

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pumps so that only the inventory below low liquid level that is, drum heads and piping, needs to be drained.

It is also intended to use the system to receive purge/steam out vapours from hydrocarbon containing equipment to minimise release of hydrocarbons to atmosphere.

CD system(s) shall be provided for such liquid hydrocarbon sources from the following new process areas:

- CDF / VDU (Units 011/085)
- SDA (Unit 086)
- NHT2 (Unit 087)
- ALK (Unit 088)
- GHDT (Unit 089)
- DHDT (Unit 090)
- HGU (Unit 092)

2.1.2 System Configuration

Each CD system comprises

- closed connections at low points to the collection header
- the collection header (gravity flow) run below ground
- a closed drain drum located in a dedicated sump below ground connected to an appropriate flare system
- submersible pumps installed within the drain drum
- a steam coil located in the base of the drain drum (if required)
- a Purge Vent Condenser (if required)
- a Pumpout Cooler (if required)
- associated instrumentation, PSV protection and level controls

2.1.3 Basis of Design

Generally, each Unit within an area of plot bordered by roads will have a dedicated CD system. However, some units will be served by a common drum or multiple drums based on gravity drainage needs.

Each CD system shall be designed in accordance with the Refinery Drainage Philosophy Document No, 15001-000-CN-0008-004.

Each system shall be designed to handle the residual liquid from a total shutdown over an 8 hour period.

The drum shall be designed for 30 minutes hold up between high and low liquid levels. The CD system submersible pump shall be designed to evacuate the overall inventory of the drain drum in 20 to 30 minutes to the appropriate slops.

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The CD drum will operate at a little above atmospheric pressure, sufficient to allow venting to the flare appropriate system.

The CD system Purge Vent Condenser, if required, shall be designed to prevent condensable liquids entering the flare system.

The CD system Pump out Coolers, if required, shall be sized to cool material pumped out to Light Slop Oil system to 40 °C and to the Heavy Slop Oil System to 70 °C.

Preliminary details of equipment required for each Unit / Area are listed in Attachment 1. Contractor shall develop relevant standard specifications including materials of construction. All preliminary details given in the attachment are subject to development by Contractor based on design considerations provided and current refinery practice.

Typical arrangement for a CD system is shown in Attachment 2. These typical drawings shall be developed to standard P&IDs by Contractor and submitted to Employer for review. HAZOP study shall be carried out subsequently.

2.1.4 Design Criteria

The following criteria are to be followed

- the residual liquid volume, as introduced in the previous section, is equal to twice that of the liquid held in the largest process vessel 200mm above drum bottom (horizontal drums) or 200mm above bottom tan line (vertical drums). In the case of large drums, bottom tan line may be considered instead of 200mm above that. This includes an allowance for liquid in the associated piping in determining the volume required to be handled by each CD drum and pump within 8 hours. Contractor to review this piping allowance based on final piping design and adjust equipment sizing accordingly.
- collection lines below ground are sloped to CD drums without pockets and located in a secondary concrete containment trench covered with grating.
- discharge of any rainwater / leaked hydrocarbon in the trench's collection sump may be permitted, upon inspection, to the oily water system.
- each closed drain drum is located in a covered containment pit.
- drum diameter may be limited (to be confirmed by Contractor) due to site water table considerations
- a drain pump is to be installed in each CD drum with an installed spare

2.1.5 Design Development by Contractor

Contractor is required to develop the design, confirm the number and location of CD systems based on final plot layout and equipment/piping dimensions. The volume of drain drums and associated pump capacity are to be revised by Contractor as required.

Contractor shall consider pressure source segregation of the CD systems based on the operating pressure within respective Unit(s) / Area(s).

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Each system shall be located so that the distance from the equipment being drained permits gravity drainage. Contractor is required to take into account the required slope for gravity flow lines and depth (water table considerations in the civil design) when finalising the size and location of drums. In order to avoid overlarge and deep sited drums, additional systems may be required where the equipment to be drained covers a large area.

Contractor to consider common sizes for the drain drum pumps to minimise investment in warehouse spares. This may require modification of the sizing basis for the drain drums.

Contractor is required to review the requirement for pump out coolers to avoid excessive vapour generation in storage. EPC Contractor to optimise the design of the pump out coolers including the selection of air versus water cooling.

Contractor to consider area based pump out coolers rather than individual unit pump out coolers.

Contractor to review and finalise the metallurgy of the system.

Finalised CD system designs to be reviewed and agreed with Employer prior to implementation.

2.2 Oily Water Sumps

2.2.1 System Purpose

Operational and maintenance liquids from process equipment are collected through drain funnels and discharged through a dedicated pipe system by gravity to collection sumps from where it is pumped to the ETP for further treatment. Pressurised process wastewater shall be pumped direct to the ETP for treatment and are excluded from this scope.

OW system(s) shall be provided for oily water sources from the following new process areas:

- CDF / VDU (Units 011/085)
- SWS2/ARU2 (Units 093/094)
- SDA (Unit 086)
- NHT2 (Unit 087)
- ALK (Unit 088)
- GHDT (Unit 089)
- DHDT (Unit 090)
- HGU (Unit 092)
- SRU3/4 (Units 095/096/098)

2.2.2 System Configuration

Each OW system comprises:

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- open connection(s) at low points to the collection header
- the collection header (gravity flow) run below ground
- a concrete OW collection sump below ground and vented to atmosphere
- a lift pump (with warehouse spare) installed at grade
- associated instrumentation and level controls, as required

2.2.3 Design Basis

Generally, each Unit within an area of plot bordered by roads will have a dedicated OW system. However, some units will be served by a common sump or multiple sumps based on gravity drainage needs.

Each OW system shall be designed in accordance with the Refinery Drainage Philosophy Document No, 15001-000-CN-0008-004.

Each sump shall be sized by Contractor in line with existing practice within the process areas on the refinery. These have a nominal working volume of 12m³ with a total volume dependant on depths required for gravity flow. The lift pump has a nominal 20m³/h design capacity and 35m head.

Typical arrangement and size details for an Oily Water Sump system is shown in Attachment 3. All preliminary details given in the attachment are subject to Contractor confirmation. This typical drawing shall be developed to standard P&IDs by Contractor and submitted to Employer for review. HAZOP study shall be carried out subsequently.

2.2.4 Design Development by Contractor

Contractor is required to develop the design, confirm the number and location of OW systems based on final plot layout and equipment/piping dimensions. The volume of sumps and associated pump capacity are to be revised by Contractor as required.

Each system shall be located so that the distance from the equipment being drained permits gravity drainage. Contractor is required to take into account the required slope for gravity flow lines and depth when finalising the size and location of sumps. In order to avoid overlarge and deep sited sumps, additional systems may be required where the equipment to be drained covers a large area.

Contractor to consider common sizes for the sump pumps to minimise investment in warehouse spares.

Contractor to review and finalise the metallurgy of the system.

Finalised OW system designs to be reviewed and agreed with Employer prior to implementation.



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ATTACHMENT 1 DETAILS OF CLOSED HYDROCARBON DRAIN (CD) DRUMS AND ASSOCIATED EQUIPMENT

CD Drums

Unit Name	Unit Number	Slops Type	Materials of Construction	Diameter m	T/T m	Type	Design Pressure kg/cm ² g	Design Temperature °C
CDF / VDU	011/085	Heavy	KCS	1.5	4.5	Horizontal with steam coil	3.5	110
DHDT	090	Light	KCS	1.5	4.5	Horizontal	3.5	110
GHDT	089	Light	KCS	1.5	4.5	Horizontal	3.5	110
HGU	092	Light	KCS	1.0	3.0	Horizontal	3.5	110
NHT2	087	Light	KCS	1.0	3.0	Horizontal	3.5	110
SDA	086	Heavy	KCS	1.0	3.0	Horizontal with steam coil	3.5	110
ALK	088	Light	KCS	1.0	3.0	Horizontal	3.5	110

Drum Pumps

Each drum to have two submersible pumps, each of nominal 20m³/h design capacity and 60m head.

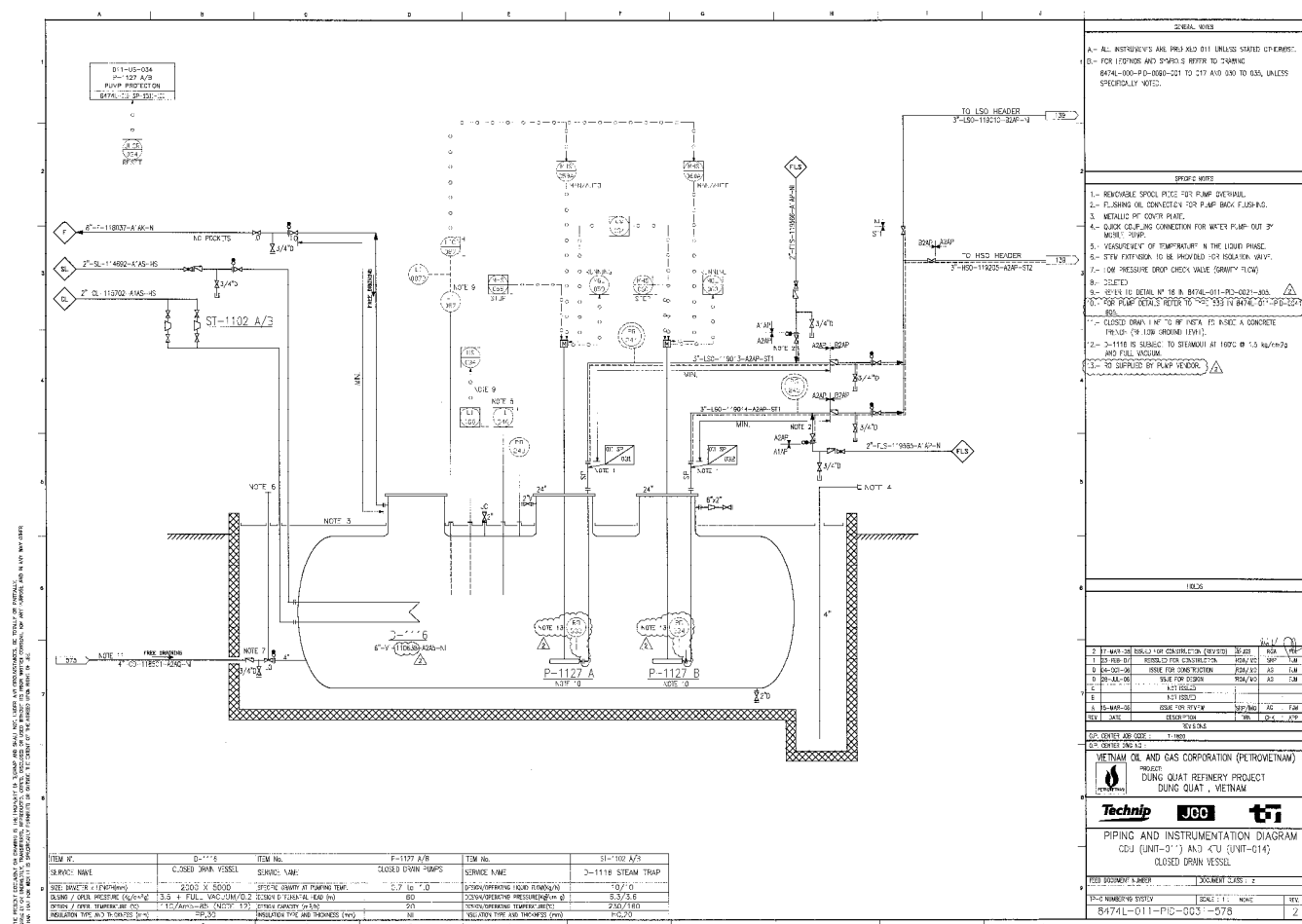
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ATTACHMENT 2: TYPICAL P&ID – CLOSED HYDROCARBON DRAIN (CD) SYSTEM



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ATTACHMENT 3: TYPICAL P&ID – OILY WATER (OW) SUMP SYSTEM

