

DEP SPECIFICATION

DRAIN SYSTEMS FOR OFFSHORE INSTALLATIONS

DEP 37.14.10.10-Gen.

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(DEP Circular 23/12 has been incorporated)

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DESIGN AND ENGINEERING PRACTICE

DEM1



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TABLE OF CONTENTS

1.	INTRODUCTION	4
1.1	SCOPE.....	4
1.2	DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS	4
1.3	DEFINITIONS	5
1.4	CROSS-REFERENCES	6
1.5	SUMMARY OF MAIN CHANGES.....	6
1.6	COMMENTS ON THIS DEP	6
1.7	DUAL UNITS.....	6
2.	DRAIN SYSTEMS PHILOSOPHY.....	7
2.1	PURPOSE AND FUNCTION OF FACILITY DRAIN SYSTEMS.....	7
2.2	REGULATORY REQUIREMENTS	7
2.3	DRAIN SYSTEM CLASSIFICATIONS.....	8
3.	DRAIN SYSTEMS DESIGN REQUIREMENTS	10
3.1	SOURCES AND DESTINATIONS OF DRAIN SYSTEM LIQUIDS	10
3.2	OPEN NON-HAZARDOUS AREA DRAIN SYSTEM.....	12
3.3	OPEN HAZARDOUS AREA DRAIN SYSTEM	12
3.4	INSTRUMENT DRAINS.....	13
3.5	HELIDECK DRAINS	13
3.6	FIREWATER DRAINS	13
4.	GENERAL DESIGN REQUIREMENTS	15
4.1	SIZING DRAIN SYSTEMS.....	15
4.2	SELECTION AND SIZING OF COLLECTION AND SKIMMING VESSELS	15
4.3	PIPING SYSTEMS.....	17
4.4	PROCESS SAND AND SOLIDS	19
4.5	TOXIC FLUIDS	19
4.6	FACILITY SOLID WASTES	19
4.7	BACKFLOW PROTECTION	19
4.8	FLOOR DRAINS	19
4.9	DRIP PANS.....	20
4.10	TUNDISHES	20
4.11	VENTS	20
4.12	CHEMICAL TREATMENTS	21
4.13	SAMPLING OF EFFLUENT.....	21
4.14	DISPOSAL TO SEA.....	21
5.	REFERENCES	22

APPENDICES

APPENDIX 1	FIGURES.....	23
APPENDIX 2	LIST OF CHANGES	25

1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the design of drain systems for offshore oil and gas production facilities.

This DEP covers the following:

- a) Rainwater and wash-down water from deck drains in non-hazardous / utility areas (2.3.1);
- b) Rainwater and wash-down water from deck drains in hazardous / process areas (2.3.2);
- c) Process drains (2.3.4);
- d) Specialty fluid recovery and disposal systems (2.3.5);
- e) Instrument drains (2.3.6);
- f) Helideck drains (2.3.7);
- g) Firewater drains (2.3.8);
- h) Laboratory drains (2.3.9).

This DEP does not cover the drainage of domestic waste water and sewage streams, or drainage from drilling units.

Generic closed maintenance drains of the type described in previous DEPs are no longer supported, however hard piped drain systems to support specific process or utility systems are included under Process drains (2.3.4).

Specifics for deck drainage in environments with long periods of freezing temperatures or requirements for winterizing of facilities in colder climates are not included.

This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual DEM 1 – Application of Technical Standards.

This is a revision of the DEP with the same number dated January 2010; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorization to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to offshore oil and gas production facilities but may also be applied to onshore facilities located in bodies of water, i.e. in lakes and swamps. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process should be implemented; this is of particular importance when existing facilities are to be modified.

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

1.3 DEFINITIONS

1.3.1 General definitions

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

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

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The capitalised term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

Term	Definition
Hazardous Area	An area in which flammable gases or vapours can be present in quantities sufficient to produce explosive or ignitable mixtures in the atmosphere. In European and most other world countries it is identified as Zone 0 - An area in which an explosive gas atmosphere is present continuously, or is present for long periods; or Zone 1 - An area in which an explosive gas atmosphere is likely to occur in normal operation.
Non-Hazardous Area	An area in which flammable gases or vapours are not likely to occur in quantities sufficient to produce explosive or ignitable mixtures in the atmosphere. In European and most other world countries it is identified as Zone 2 - An area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur it will exist for a short period only. Note: Area classification is a technical HSSE concept and shown on the hazardous area classification drawings. Refer to DEP 80.00.10.10-Gen. for details.
Very toxic (substances)	substances that are very hazardous for the environment or human health Note: The classification of the toxicity of substances is a very complex matter and one should refer to DEP 01.00.01.30-Gen. (which also identifies "toxic" substances by reference to chemical substances databases) for more details. In general the process fluids on oil and gas production facilities will not be classified as very toxic unless that there are substantial levels of hydrogen sulphide. With regard to the chemicals used for treatment of the process fluids, their material safety data sheets shall be consulted for their toxicity classification.
Segregated	Typically the complete physical separation (with no connections between) of the collection piping, vessels and water disposal routes of different drainage systems. Alternative means of segregation using intrinsically secure methods shall be subject to approval by the Principal. Potential corrosion or other degradation of drainage system components (e.g. dip legs, seal loops, etc.) shall be taken into account. Enclosed modules present particular hazards in this respect due to potential differences between module atmospheric pressures dependent on HVAC design and operation.

1.3.3 Abbreviations

FPSO	Floating Production System Offshore (most commonly used when referring to a tanker shaped vessel)
HVAC	Heating, Ventilation and Air Conditioning
OHD	Open Hazardous area Drains
ONHD	Open Non-Hazardous area Drains
TLP	Tension Leg Platform

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets. Other documents referenced by this DEP are listed in (5).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated January 2010. The changes to this DEP are extensive and the main non-editorial changes are listed in (Appendix 2).

For this revision a companion document called a "DEP Informative" has been created containing background information and which is accessible from the Shell Standards web page.

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be sent to the Administrator at standards@shell.com, using the DEP Feedback Form. The DEP Feedback Form can be found on the main page of "DEPs on the Web", available through the Global Technical Standards web portal <http://swww.shell.com/standards> and on the main page of the DEPs DVD-ROM.

1.7 DUAL UNITS

**Amended per
Circular 23/12**

Dual units have been incorporated throughout this DEP.

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

2. DRAIN SYSTEMS PHILOSOPHY

2.1 PURPOSE AND FUNCTION OF FACILITY DRAIN SYSTEMS

The purposes of the drain systems considered in this DEP are:

- 1) To collect and convey facility drained liquids to an appropriate treating and / or disposal system in such a way as to protect personnel, equipment; and
- 2) to avoid environmental pollution.

It is written in the context of oil and gas production facilities where pollution due to the discharge of hydrocarbons or other hazardous liquids to the sea is a significant environmental risk.

Drain systems provide the means of safely removing rainwater run-off and wash-down liquids from drip pans, plated and curbed areas and flooring together with residual process hydrocarbons drained from vessels, piping, and instruments, resulting either from operational activities or from preparation prior to carrying out maintenance work. The liquids collected in a recovery system with the water are disposed of in a safe and environmentally acceptable fashion. Any accompanying solids shall be collected and transported to an onshore site for disposal.

A fundamental safety consideration is that a drain system must not provide a route for migration of a fire, flammable liquids or vapours from one hazardous area to another, or to non-hazardous areas.

For this reason, drain systems SHALL [PS] be segregated into specific systems, each designed for a particular type of stream, with no interconnection between the systems. Further to this, when appropriate, features such as seal loops and air gaps shall be used to segregate areas served by the same drain system.

Other factors affecting the safety and environmental acceptability of a drain system include:

- a) Its effectiveness in separating oil from water before discharge overboard;
- b) Its ability to block the discharge of oil overboard during upset conditions;
- c) Its ability to handle solids and prevention of flow blockages;
- d) Its resistance to degradation from corrosion;
- e) A design that reduces the risk of accidental misuse;
- f) A design that prevents release of very toxic substances to the atmosphere and contact with personnel;
- g) The selection of the proper materials of construction;
- h) Its ability to be cleaned and maintained.

Specific safety and environmental considerations for open drain systems shall apply to refrigerated hydrocarbons, cryogenic liquids (e.g. LNG) or other fluids which are otherwise vapour at ambient conditions. These systems merit specific considerations based on fluid behaviour, safety considerations and environmental impacts if discharged to the deck or sea. For example, where a hydrocarbon will completely evaporate on contact with sea (e.g. LNG) it is normal not to attempt to collect an accidental spill, but to allow the fluids to be released overboard for safety reasons.

2.2 REGULATORY REQUIREMENTS

All operating locations should have mandated discharge limits in accordance with national and international regulations, as well as company policy, for pollutants as part of their environmental management plan. It is the responsibility of the designer to ensure the system proposed can be operated in compliance with these limits, and seek clarification as necessary from the Principal.

2.3 DRAIN SYSTEM CLASSIFICATIONS

The types of drain systems found on typical offshore facilities are classified as follows:

2.3.1 Open non-hazardous area drain system (ONHD)

This system provides drainage from those areas of the facility which have been designated non-hazardous. These generally include storage areas for utility liquid consumables such as diesel fuel and lubricating oils.

This type of drain system handles fluids collected from floors, drip pans and tundishes in non-hazardous areas and operates at atmospheric pressure. Open non-hazardous drain systems SHALL [PS] be completely segregated from all other drain systems to eliminate the possibility of flammable vapour transmission through the drains from other areas to the non-hazardous area.

2.3.2 Open hazardous area drain system (OHD)

This system provides drainage from those areas which are designated hazardous. These generally include all process areas and other locations in the facility where process hydrocarbons may be present.

Open hazardous drain systems handle liquids collected from plated decks, drip pans and tundishes in hazardous areas. Open hazardous drain systems are only used for draining residual hydrocarbon liquids from vessels and equipment after the majority of the liquid hydrocarbons from those vessels or equipment have been transferred to other process systems or to storage, e.g. by operational procedure rather than design.

2.3.3 Closed maintenance drain

In the previous version of this DEP, this was defined as a fully contained (hard-piped) system to route drains from process vessels and equipment to a common collection system. This relied to a significant degree on maintenance preparation procedures to avoid hazardous events such as overpressure and inadvertent communication between systems.

Closed maintenance drain systems SHALL [PS] not be installed in new facilities or as a modification to existing systems. Where by virtue of fluid characteristics (e.g. volatility, toxicity, impact on water treatment systems, temperature, value) it is desired to fully contain, segregate or recover fluids, these systems SHALL [PS] be designed as part of the overall process system as a process drain (2.3.4), with suitable engineered barriers against hazards. Equipment and piping shall be of a consistent standard with the standards for the installation.

NOTE: Closed maintenance drains are not considered further in this DEP.

2.3.4 Process drains

Some operations and equipment in the process facilities require periodic and partial draining during operation to keep them working at peak efficiency. This drainage often occurs when the connected system may still be operational rather than a maintenance activity. Hence they SHALL [PS] be designed as part of the overall process system with engineered barriers against hazards and appropriate standards for vessels, tanks, piping and overpressure protection. Streams drained typically include, but are not limited to the following: emulsion layers in freewater knockouts and oil dehydration vessels, condensate layers in glycol contactors and glycol surge tanks, refrigerant heavy ends blowdown, compressor scrubber drains where no continuous liquids are present. These systems may route fluids from one part of the process to another rather than to a dedicated system.

In some cases for fluids under pressure, drainage to the flare system may be appropriate.

NOTE: Process drains are not considered further in this DEP.

2.3.5 Specialty fluid recovery and disposal systems

Certain liquids such as:

- a) lube oils;
- b) diesel fuel;
- c) aviation fuel;
- d) hydraulic oils;
- e) methanol;
- f) glycol;
- g) amines and refrigerants;

require segregation and disposal separately from the open drain systems during maintenance activities. This may be because of environmental considerations, impact on the process or water treatment (if recycled to the process), value or hazard control. An example of this is collection of lube oil from machinery maintenance activities.

Heat transfer fluids as defined in DEP 20.05.50.10-Gen. normally require a dedicated hard-piped collection system. DEP 20.05.50.10-Gen. shall be referred to for specific requirements.

On oil production facilities, it may be permissible via suitably engineered systems to dispose of some of these liquids via the oil export pipeline.

These systems are typically used for maintenance activities.

Rainwater, wash water and minor spillages into drip pans can flow into the relevant open drain system.

2.3.6 Instrument drains

Refer to Section 3.4.1.

2.3.7 Helideck drains

Refer to Section 3.5.

2.3.8 Firewater drains

Refer to Section 3.6.

2.3.9 Laboratory drains

Laboratory drains are used for the disposal of hydrocarbon samples, chemicals and solvents. The normal disposal route would be to an open hazardous area drain via a water sealed drain pipe and / or a drain with an air gap into an OHD gully outside the laboratory wall.

Since the laboratory is typically in an enclosed area, the drain SHALL [PS] not be hard-piped to the OHD to avoid the possibility of back-flow of flammable vapours.

Only hydrocarbon and water samples may be disposed of into the laboratory drain system. All other liquids shall be collected in drums for removal from the platform. If the only convenient drain is an open non-hazardous drain, then all liquids including hydrocarbons shall be collected in containers for onshore disposal.