

DEP SPECIFICATION

CHEMICAL INJECTION SYSTEMS FOR UPSTREAM PRODUCTION FACILITIES

DEP 31.01.10.10-Gen.

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DESIGN AND ENGINEERING PRACTICE

DEM1



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These views are based on the experience acquired during involvement with the design, construction, operation and maintenance of processing units and facilities. Where deemed appropriate DEPs are based on, or reference international, regional, national and industry standards.

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The information set forth in these publications is provided to Shell companies for their consideration and decision to implement. This is of particular importance where DEPs may not cover every requirement or diversity of condition at each locality. The system of DEPs is expected to be sufficiently flexible to allow individual Operating Units to adapt the information set forth in DEPs to their own environment and requirements.

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All administrative queries should be directed to the DEP Administrator in Shell GSI.

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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the design of chemical injection systems for upstream production facilities. The scope of the DEP includes, but is not limited to, wells, subsea systems, pipelines, processing facilities, water and gas injection facilities and storage facilities.

This DEP is applicable to onshore and offshore production facilities.

This DEP considers injection of chemicals for the treatment of fluids or materials in the production facility.

This DEP considers permanent parts of a system that may be used for the injection of chemicals in conjunction with temporary chemical injection equipment. The DEP does not explicitly consider the specification and design of temporary chemical injection equipment. However, the principles and requirements in this DEP may be considered when specifying and designing temporary chemical injection equipment.

This DEP considers the scope of a chemical injection system to include, but not limited to, the following components:

- a. Chemical transport and logistic systems that impact the design of the permanent parts of the chemical injection system.
- b. Chemical transfer and storage systems.
- c. Vents, drains and sample points.
- d. Injection pumps and IRCDs.
- e. Manifolds, piping, umbilicals and capillary strings.
- f. Valves, valve actuators and downhole valves.
- g. Instruments, level alarms, no flow alarms and trip systems.
- h. Injection points, including devices for dispersion of the injected chemical.

This DEP endeavours to consider all aspects of the design of chemical injection systems that are significant in respect of achieving the purpose of the chemical application. It should be recognised that some niche aspects may not be addressed by this DEP.

This DEP addresses general chemical injection system requirements for a broad range of upstream applications. Additional requirements concerning specific applications are covered in separate DEPs as follows:

- DEP 39.01.10.11-Gen. Selection of materials for life cycle performance (upstream equipment) - materials selection and corrosion management
- DEP 10.02.51.11-Gen. Steam injection systems for safeguarding thermal cracking units
- DEP 31.01.10.11-Gen. Corrosion prevention and control of water injection systems
- DEP 31.38.01.19-Gen. Water injection in downstream hydroprocessing units for corrosion control
- DEP 39.01.40.30-Gen. Seawater injection facilities
- DEP 39.01.40.31-Gen. Produced water treatment and injection facilities

The requirements for selection of chemicals applied in upstream production facilities are addressed in DEP 20.01.10.10-Gen.

There are no industry standards available for chemical injection that covers the breadth of this DEP scope. Where applicable, individual standards are referenced.

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 of the same number dated February 2011, amended February 2012; 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 exploration and production facilities. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall 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.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
Availability	Percentage of time that the chemical is at the required concentration, or within the required concentration range, in the fluid that is being treated when required for production operations. Availability in this document is defined as “f”

Term	Definition
Chemical	In the context of this DEP, a chemical can be a commodity chemical (e.g. methanol), a specialty chemical formulated using proprietary knowledge (e.g. a corrosion inhibitor), a chemical tracer, a chemical recovered from produced fluids and reused for production operations (e.g. ethylene glycol), or a separated process stream that is used to treat produced fluids or process materials (e.g. wash water, hydrocarbon condensate)
Dosage Basis	The basis on which a chemical is injected to achieve the required dosage (concentration) in the fluid to be treated e.g. volumetric rate, volume, mass flow rate of oil, water, gross or gas.
Hazard Statements	Phrase assigned to a hazard class and category that describes the nature of the hazards of a hazardous product, including, where appropriate, the degree of hazard.
Hazardous	Means the division of criteria within each hazard class, e.g., oral acute toxicity; includes five hazard categories flammable liquids, and four hazard categories. These categories compare hazard severity within a hazard class and should not be taken as a comparison of hazard categories more generally.
Manned installation	An installation on which people are routinely accommodated.
Precautionary statements	Phrases (and/or pictograms) that describe recommended measures that should be taken to minimise or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product.
Safety critical element	An item of equipment or structure whose failure could lead to the release of a Major Hazard or whose purpose is to prevent or limit the consequences of a major incident, excluding business loss.
Very toxic (substances)	Refer to DEP 01.00.01.30-Gen. for additional details concerning the definitions of "very toxic - acute", "very toxic - chronic", and "very toxic - environment".

1.3.3 Abbreviations

Term	Definition
CRA	Corrosion Resistant Alloys
CIMV	Chemical Injection Metering Valve
DCS	Distributed Control System. Also referred to as BPCS (Basic Process Control System)
FAT	Factory Acceptance Test
HAZID	Hazard Identification
HSSE	Health, Safety, Security and the Environment

Term	Definition
IBC	Intermediate Bulk Container
IRCD	Injection Rate Control Device (Also, referred to as CIMV – Chemical Injection Metering Valve)
KPI	Key Performance Indicator
NNM	Not Normally Manned
NRV	Non Return Valve
OU	Operating Unit
ppm v/v	parts per million (volume/volume)
P&ID	Process and Instrumentation Diagram
SCE	Safety Critical Element
SDS	Safety Data Sheet

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section or clause number is shown in brackets (). Other documents referenced by this DEP are listed in (6).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a full revision of the DEP of the same number dated February 2011, amended February 2012. The following are the main, non-editorial changes.

Section/Clause	Change
All previous sections	All sections have been removed and DEP has had full revision with previous numbering system discarded
2.3.1 clause 3	Shall [PS] removed, no replacement section
2.3.1 clause 7	Shall [PS] removed, no replacement section
2.3.1 clause 8	Shall [PS] removed, no replacement section
2.3.1 clause 9	Shall [PS] removed, no replacement section
2.3.1 clause 10	Shall [PS] removed, no replacement section
Table 1	Shall [PS] removed, no replacement section
Table 1	Shall [PS] removed, no replacement section
Table 1	Shall [PS] removed, no replacement section
Table 1	Shall [PS] removed, no replacement section
2.3.2 clause 6	Shall [PS] removed, no replacement section
2.3.2 clause 8	Replaced in section 2.2 clause 3
2.3.2 clause 10	Replaced in section 2.2 clause 3
2.3.2 clause 15	Replaced in section 2.2 clause 3

2.3.2 clause 17	Replaced in section 2.2 clause 3
2.3.5 clause 5	Shall [PS] removed, no replacement section
2.3.5 clause 9	Shall [PS] removed, no replacement section
2.3.8 clause 4	Shall [PS] removed, no replacement section
2.3.8 clause 5	Shall [PS] removed, no replacement section
2.3.10 clause 7	Replaced in section 4.5.6
2.9 clause 1	Shall [PS] removed, no replacement section
2.9 clause 6	Shall [PS] removed, no replacement section
3.4.2 clause 6	Replaced in section 5.5.2

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be submitted to the Administrator using one of the following options:

Shell DEPs Online (Users with access to Shell DEPs Online)	Enter the Shell DEPs Online system at https://www.shelldeps.com Select a DEP and then go to the details screen for that DEP. Click on the "Give feedback" link, fill in the online form and submit.
DEP Feedback System (Users with access to Shell Wide Web)	Enter comments directly in the DEP Feedback System which is accessible from the Technical Standards Portal http://www.shell.com/standards . Select "Submit DEP Feedback", fill in the online form and submit.
DEP Standard Form (Other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

1.7 DUAL UNITS

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.

1.8 NON NORMATIVE TEXT (COMMENTARY)

Text shown in italic style in this DEP indicates text that is non-normative and is provided as explanation or background information only.

Non-normative text is normally indented slightly to the right of the relevant DEP clause.