

DEP SPECIFICATION

PREDICTION OF HYDROGEN SULPHIDE CONTENT

DEP 25.80.10.18-Gen.

February 2017

ECCN EAR99

DESIGN AND ENGINEERING PRACTICE

DEM1



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for assessment of current and/or future hydrogen sulphide (H₂S) concentrations in fluids (including gas) that are present in and potentially produced from any oil or gas reservoirs, including overburden, so that the risks are properly assessed and optimally controlled. It covers the following cases:

- a. Pre-drill prediction of the H₂S concentration for any proposed exploration, appraisal or development well.
- b. Prediction of the changes in H₂S due to the applied hydrocarbon-recovery method e.g., waterflooding, thermal (steam) flooding. All mechanisms are collectively known as “reservoir souring”.
- c. Pre-drill prediction of any proposed infill well, drilled in a new part of a developed reservoir, where the reservoir might be expected to have undergone reservoir souring.

This DEP can be applied to a single well or a field development.

It should be noted that local legislation may define specific requirements in respect of H₂S prediction, e.g., Alberta Energy Regulator.

Because the presence of H₂S in produced fluids can affect all stages of hydrocarbon maturation, different disciplines are responsible for ensuring that an H₂S-prediction study is performed using personnel with suitable expertise.

This DEP does not address how H₂S impacts transport and processing of produced fluids, production system design and operation, or the associated commercial and economic implications. Detailed field surveillance requirements and mitigation measures associated with H₂S are also not addressed.

This DEP does address H₂S prediction requirements that should be part of planning well operations e.g., acid stimulation, coring, fracture stimulation, water injection well backflow, etc. The custodianship and accountability for this DEP lies with the Global Discipline Head for Production Geosciences, who will ensure alignment with Global Exploration and Global Production Technology/Chemistry, who remain responsible for their respective inputs into this DEP.

Design and Engineering Manual DEM 2 – Process Safety – PSBR10 applies to the Execution/Operate Phase and addresses H₂S risk areas and actual operational measures required to be in place for wells/facilities with sour gas.

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 2016; 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 authorisation to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to wells and facilities related to oil and gas production. 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
Well Functional Specification (WFS)	Document that specifies the requirements of the well, defining what the well should target and how it is meant to behave over its lifetime.
Well Proposal	Document that describes the well objective(s), critical success factor(s), data gathering and recovery plan for the well.

1.3.3 Abbreviations

Term	Definition
ALARP	As Low As Reasonably Practicable
DCAF	Discipline Controls and Assurance Framework
FDP	Field Development Plan
FEAST	Fluid Evaluation and Sampling Technologies Team
GDH	Global Discipline Head
GM	Geomechanics
HSE-CA	Health, Safety and Environmental - Critical Activity
OU	Operating Unit