

DEP SPECIFICATION

METEOROLOGICAL AND OCEANOGRAPHIC DESIGN AND OPERATING CONSIDERATIONS OFFSHORE, COASTAL AND ONSHORE (AMENDMENTS/SUPPLEMENTS TO ISO 19901-1:2015)

DEP 37.00.10.10-Gen.

February 2017

DESIGN AND ENGINEERING PRACTICE

DEM1



© 2017 Shell Group of companies

All rights reserved. No part of this document may be reproduced, stored in a retrieval system, published or transmitted, in any form or by any means, without the prior written permission of the copyright owner or Shell Global Solutions International BV.

PREFACE

DEP (Design and Engineering Practice) publications reflect the views, at the time of publication, of Shell Global Solutions International B.V. (Shell GSI) and, in some cases, of other Shell Companies.

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.

The objective is to set the standard for good design and engineering practice to be applied by Shell companies in oil and gas production, oil refining, gas handling, gasification, chemical processing, or any other such facility, and thereby to help achieve maximum technical and economic benefit from standardization.

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.

When Contractors or Manufacturers/Suppliers use DEPs, they shall be solely responsible for such use, including the quality of their work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, the Principal will typically expect them to follow those design and engineering practices that will achieve at least the same level of integrity as reflected in the DEPs. If in doubt, the Contractor or Manufacturer/Supplier shall, without detracting from his own responsibility, consult the Principal.

The right to obtain and to use DEPs is restricted, and is typically granted by Shell GSI (and in some cases by other Shell Companies) under a Service Agreement or a License Agreement. This right is granted primarily to Shell companies and other companies receiving technical advice and services from Shell GSI or another Shell Company. Consequently, three categories of users of DEPs can be distinguished:

- 1) Operating Units having a Service Agreement with Shell GSI or another Shell Company. The use of DEPs by these Operating Units is subject in all respects to the terms and conditions of the relevant Service Agreement.
- 2) Other parties who are authorised to use DEPs subject to appropriate contractual arrangements (whether as part of a Service Agreement or otherwise).
- 3) Contractors/subcontractors and Manufacturers/Suppliers under a contract with users referred to under 1) or 2) which requires that tenders for projects, materials supplied or - generally - work performed on behalf of the said users comply with the relevant standards.

Subject to any particular terms and conditions as may be set forth in specific agreements with users, Shell GSI disclaims any liability of whatsoever nature for any damage (including injury or death) suffered by any company or person whomsoever as a result of or in connection with the use, application or implementation of any DEP, combination of DEPs or any part thereof, even if it is wholly or partly caused by negligence on the part of Shell GSI or other Shell Company. The benefit of this disclaimer shall inure in all respects to Shell GSI and/or any Shell Company, or companies affiliated to these companies, that may issue DEPs or advise or require the use of DEPs.

Without prejudice to any specific terms in respect of confidentiality under relevant contractual arrangements, DEPs shall not, without the prior written consent of Shell GSI, be disclosed by users to any company or person whomsoever and the DEPs shall be used exclusively for the purpose for which they have been provided to the user. They shall be returned after use, including any copies which shall only be made by users with the express prior written consent of Shell GSI. The copyright of DEPs vests in Shell Group of companies. Users shall arrange for DEPs to be held in safe custody and Shell GSI may at any time require information satisfactory to them in order to ascertain how users implement this requirement.

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

TABLE OF CONTENTS

PART I	INTRODUCTION	5
1.1	SCOPE	5
1.2	DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS	5
1.3	DEFINITIONS	5
1.4	CROSS-REFERENCES	7
1.5	SUMMARY OF MAIN CHANGES.....	7
1.6	COMMENTS ON THIS DEP	7
1.7	DUAL UNITS.....	8
1.8	NON NORMATIVE TEXT (COMMENTARY).....	8
PART II	GENERAL	9
1	APPLICATION.....	9
PART III	AMENDMENTS/SUPPLEMENTS TO ISO 19901-1:2015 FOR OFFSHORE STRUCTURES	10
5	Determining the relevant metocean parameters	10
5.2	Expert development of metocean criteria	10
5.3	Selecting appropriate parameters for determining design actions and action effects.....	10
5.4	The metocean database	10
5.6	Directionality	11
5.7	Extrapolation to extreme and abnormal conditions.....	12
5.8	Metocean parameters for fatigue assessments	12
5.9	Metocean parameters for short-term activities	12
5.10	Metocean parameters for medium-term activities.....	12
6	Water depth, tides and storm surges	13
6.4	Extreme water level	13
8	Waves.....	13
8.3	Sea states - Spectral waves	13
8.7	Wave crest elevation	13
11	Collection of metocean data.....	14
11.2	Common requirements	14
PART IV	ALTERNATIVE AND ADDITIONAL REQUIREMENTS FOR ONSHORE	15
5	Determining the relevant metocean parameters	15
5.2	Expert development of metocean and hydrological criteria	15
6	Water depth, tides and storm surges	15
7	Wind	15
7.1	General.....	15
8	Waves.....	16
9	Currents	16
10	Other environmental factors.....	16
10.2	Tsunamis	16
10.3	Seiches	17
10.5	Snow and ice accretion	17
11	Collection of metocean data.....	17
13	Meteorological data	17
14	Rainfall	17
15	Runoff and river flood design.....	18
16	Wave overtopping.....	18

17	Black bulb temperature	19
18	Wild fire	19
PART V	REQUIREMENTS FOR INCLUSION OF CLIMATE CHANGE.....	20
1	Inclusion of climate change.....	20
2	Application of climate model data to metocean and hydrological criteria.....	20
3	Derivation of metocean and hydrological criteria.....	20
PART VI	REFERENCES	21

PART I INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the determination and use of meteorological, oceanographic (metocean) and hydrological conditions for the design, construction and operation of offshore and onshore structures of all types used in the petroleum and natural gas industries. Ice-related phenomena are not part of this DEP.

Part III of this DEP covers metocean design and operating specific requirements for offshore structures and is based on ISO 19901-1:2015. Part III of this DEP amends, supplements and deletes various clauses of ISO 19901-1:2015. Part III follows the clause numbering of ISO 19901-1:2015 for easy reference.

Part IV of this DEP covers metocean and hydrological design and operating specific requirements for onshore structures where these differ or require a different approach from offshore structures. It draws from a range of standards used in addition to country specific onshore building design requirements and criteria, where these exist. All clauses of ISO 19901-1:2015 not modified by this DEP remain valid as written.

Part V of this DEP covers the requirements to include the impact of climate change metocean and hydrological design and operating specific requirements.

This DEP includes design and operating requirements previously addressed by DEP 37.00.10.14-Gen. for onshore structures and the requirements to include the impact of climate change on design and operating criteria for both onshore and offshore structures.

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 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. 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
Climate Change	Change in the state of the climate that can be identified by changes in the mean, extremes and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change can be due to natural internal processes or external forcing and persistent anthropogenic changes in the composition of the atmosphere or in land use.
Coastal structures	A specific case of an onshore structure that is placed on land but near to the coast such that the environment and associated metocean parameters are significantly influenced by the proximity of the marine environment.
End of life criteria	Metocean and hydrological design criteria for the reference period representing the future conditions associated with the life span of the asset. For this purpose all new assets are assumed to have a minimum life span of 40 years.
Exposure	Presence of facilities, people, ecosystems, environmental resources, services, resources and infrastructure in places and settings that could be adversely affected by the hazard.
Hazard	Potential of occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources.
Near-shore structures	A specific case of an offshore structure where the structure is placed within the marine environment but near to the coast or in shallow water such that the environment and associated metocean parameters are significantly influenced by the proximity of the land and bathymetry.
Offshore structure	A structure that is placed within the marine environment.
Onshore structures	A structure that is placed on land including in coastal, riverine or marsh environments.
SafeTrans software	The SafeTrans Office Software is an integrated tool to design and operate marine heavy lift transports and installations of major facilities in a safe and efficient manner using modern PC-based analysis methods, databases, and hydrodynamics. The software was approved as engineering tool for marine transports and operations by DNV in 2007.

Term	Definition
SafeTrans	Joint Industry Project made up of several companies.
Start of life criteria	Metoccean and hydrological design criteria for the reference period representing the present conditions as derived from historical data in the conventional manner.
Vulnerability	Propensity or predisposition to be adversely affected including sensitivity or susceptibility to harm or damage. Within this DEP, the vulnerability rating is linked to the consequence severity rating from the Shell RAM. A vulnerability rated 'high' could lead to a consequence severity 4 or 5, 'Medium' to a consequence severity 2 or 3 and 'Low' and consequence severity 0 or 1.

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 (Part IV).

1.5 SUMMARY OF MAIN CHANGES

The DEP is based on the second edition of ISO 19901-1, published October 2015.

The DEP includes additional requirements for both onshore and offshore structures for the inclusion of the impact of climate change, including content from DEP 37.00.10.14-Gen. (now withdrawn).

This DEP is a full revision of the DEP of the same number dated February 2016. The following are the main, non-editorial changes.

Section/Clause	Change
Part III, 8.7	Inclusion of area effects for determining total extreme water levels
Part IV	New section to cover criteria for onshore installations
Part V	New section for inclusion of climate change effects

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.