

DEP SPECIFICATION

PLATE AND FRAME HEAT EXCHANGERS (AMENDMENTS/SUPPLEMENTS TO ISO 15547-1:2005)

DEP 31.21.01.32-Gen.

February 2012

ECCN EAR99

DESIGN AND ENGINEERING PRACTICE

DEM1



© 2012 Shell Group of companies

All rights reserved. No part of this publication 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.

This document contains information that is classified as EAR99 and, as a consequence, can neither be exported nor re-exported to any country which is under an embargo of the U.S. government pursuant to Part 746 of the Export Administration Regulations (15 C.F.R. Parts 746) nor can be made available to any national of such country. In addition, the information in this document cannot be exported nor re-exported to an end-user or for an end-use that is prohibited by Part 744 of the Export Administration Regulations (15 C.F.R. Parts 744)

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	4
1.1	SCOPE.....	4
1.2	DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS	4
1.3	TERMS AND DEFINITIONS	4
1.4	CROSS REFERENCES.....	5
1.5	SUMMARY OF MAIN CHANGES.....	5
1.6	COMMENTS ON THIS DEP	5
1.7	DUAL UNITS.....	5
PART II	GENERAL REQUIREMENTS	6
1.	GENERAL.....	6
2.	SELECTION OF TYPE OF PLATE-AND-FRAME HEAT EXCHANGER (PHE).....	6
3.	SCOPE OF SUPPLY	6
4.	EQUIPMENT NUMBERING	6
5.	THERMAL DESIGN AND RATING.....	6
PART III	AMENDMENTS AND SUPPLEMENTS TO ISO 15547-PART 1.....	7
3.	TERMS AND DEFINITIONS.....	7
4.	GENERAL.....	7
5.	PROPOSAL INFORMATION REQUIRED	7
6.	DRAWINGS AND OTHER DATA REQUIREMENTS	7
7.	DESIGN	8
7.1	GENERAL	8
7.2	DESIGN TEMPERATURES.....	8
7.3	DESIGN PRESSURE	8
7.4	FOULING MARGIN.....	8
7.6	COMPONENTS	9
7.7	CONNECTIONS	10
7.8	PLATE GASKETS.....	11
7.9	HANDLING DEVICES.....	12
8.	MATERIALS	12
9.	FABRICATION	13
9.1	WELDING	13
9.3	SURFACE FINISH	13
10.	INSPECTION AND TESTING.....	13
10.1	QUALITY CONTROL	13
10.2	HYDROSTATIC TESTING.....	14
10.3	NAMEPLATES	14
11.	PREPARATION FOR SHIPMENT	14
ANNEX B	(INFORMATIVE) PLATE-AND-FRAME HEAT EXCHANGER CHECKLIST	15
ANNEX C	PLATE-AND-FRAME HEAT EXCHANGER DATA SHEETS.....	15
PART IV	REFERENCES	16

PART I INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for gasketed, semi-welded, and fully welded plate-and-frame heat exchangers (PHE and WPHE). This DEP does not apply to fully Welded Plate-bloc Heat Exchangers (WPBHE), for which DEP 31.21.01.33-Gen. shall be applied.

NOTE: Semi-welded PHE contain port gaskets between welded plate cassettes. A fully-welded PHE contains no gaskets.

This DEP is based on ISO 15547-1:2005. Part III of this DEP amends, supplements and deletes various clauses of ISO 15547-1:2005.

For ease of reference, the clause (or paragraph) numbering of ISO 15547-1:2005 has been used throughout this DEP. Clauses of ISO 15547-1:2005 that are not mentioned remain valid as written.

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 September 2010; see (1.5) regarding the main 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 oil refineries, chemical plants, gas plants, exploration and production facilities and supply/distribution installations. Application in other facilities may also apply.

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 TERMS AND 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 plate-and-frame heat exchangers and services to perform the duties specified by the Contractor.

NOTE: The terms Supplier and Manufacturer as used in this DEP are synonymous with the term **Vendor** (as used in ISO 15547-1) depending on the context in which the term is used.

The **Principal** is the party that initiates the project work and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant, authorised to act for the Principal.

NOTE: The term Principal as used in this DEP may be synonymous with the term Purchaser (as used in ISO 15547-1) depending on the context in which the term is used.

The word **shall** indicates a requirement.

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

The word **should** indicates a recommendation.

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 in this DEP are listed in (Part IV).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated September 2010. This revision segregated the contents into a Specification part and an Informative part, and incorporated content from DODEP 02.04D.02.02 and DEP 31.21.01.32-SCAN.

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://www.shell.com/standards> and on the main page of the DEPs DVD-ROM.

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.

The use of SI units on the data/requisition sheets shall be in accordance with DEP 00.00.20.10-Gen. It shall always be indicated whether a pressure is absolute or gauge pressure.