DEP SPECIFICATION

PRINTED CIRCUIT HEAT EXCHANGERS – SELECTION AND APPLICATION

DEP 31.21.01.11-Gen.

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ECCN EAR99

DESIGN AND ENGINEERING PRACTICE

DEM1

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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the selection and application of Printed Circuit Heat Exchangers (PCHEs).

Design and fabrication of PCHEs is covered by DEP 31.21.01.33-Gen.

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 January 2005; 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 oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. 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 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, 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.

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1.3.3 Abbreviations

Term	Definition
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
CHP	combined heat and power
PCHEs	printed circuit heat exchangers
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas

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 (6).

1.5 SUMMARY OF CHANGES

The previous edition of this DEP was dated January 2005. The changes made in this revision have been the separation of the DEP into this DEP-Specification and a companion DEP-Informative, as well as some updates. Because the changes in this revision are extensive, it is impractical to summarise the changes here.

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://sww.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.

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2. GENERAL INFORMATION

2.1 DESCRIPTION

Printed circuit heat exchangers are one of the compact heat exchanger types available as alternatives to shell and tube heat exchangers. The printed circuit heat exchanger can be manufactured from a variety of materials.

The basic construction of the printed circuit heat exchanger is shown in Figure 1.

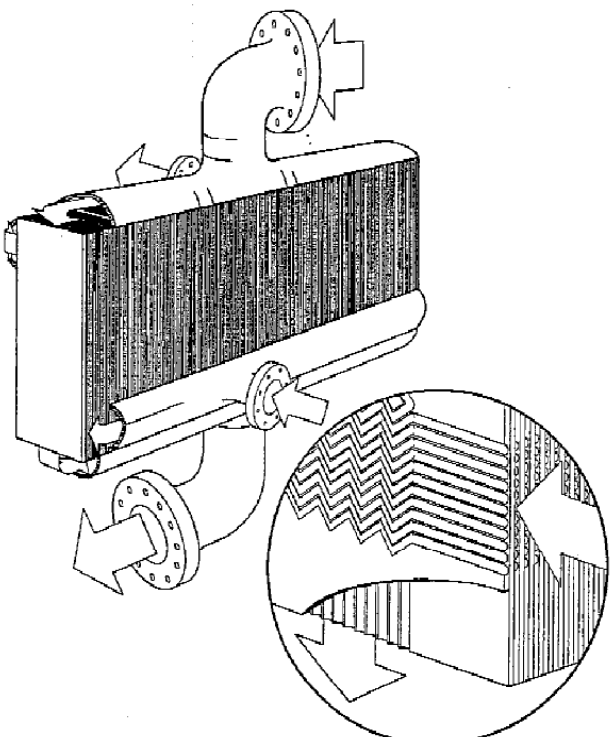

Figure 1 Basic construction of printed circuit heat exchangers, showing diffusion bonded blocks and welded headers.

Printed circuit heat exchangers have the following characteristics that differentiate them from shell and tube heat exchangers:

a) the small flow channels of printed circuit heat exchangers are more susceptible to plugging, hence they are suitable only for clean service.

b) printed circuit heat exchanger characteristics generally allow more economical handling of close temperature differences between enthalpy curves.

c) printed circuit heat exchangers have compact designs, providing a large heat transfer surface area per unit volume of block.

d) printed circuit heat exchanger designs may allow simultaneous heat exchange amongst several process streams in a single block.

e) printed circuit heat exchangers have the ability to allow streams to enter and leave the block at intermediate positions.

f) the diffusion bonded and welded construction prohibits access for mechanical cleaning and similarly compromises most typical inspection methods for corrosion rate, remaining life assessment, etc. of the plates.

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