DEP SPECIFICATION

# HUMAN FACTORS ENGINEERING – LABELLING OF FACILITIES, EQUIPMENT AND PIPING

DEP 30.00.60.21-Gen.

February 2012

ECCN EAR99

**DESIGN AND ENGINEERING PRACTICE**

© 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).

Documents
Document Sharing Hub

Full document details: SHELL 30.00.60.21 0

## 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 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.

Documents
Document Sharing Hub

Full document details: SHELL 30.00.60.21 0

## TABLE OF CONTENTS

**1. INTRODUCTION ..... 5**
1.1 SCOPE ..... 5
1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS ..... 5
1.3 DEFINITIONS ..... 6
1.4 CROSS-REFERENCES ..... 7
1.5 COMMENTS ON THIS DEP ..... 7
1.6 DUAL UNITS ..... 7

**2. LABELS - GENERAL ..... 8**
2.1 GENERAL REQUIREMENTS ..... 8
2.2 CONTENT AND DESIGN ..... 8
2.3 MATERIALS AND LOCATION ..... 10

**3. EQUIPMENT AND COMPONENT IDENTIFICATION LABELS ..... 13**
3.1 SPECIFIC REQUIREMENTS ..... 13
3.2 MATERIALS AND LOCATION ..... 14

**4. CABLE IDENTIFICATION LABELS ..... 16**
4.1 GENERAL REQUIREMENTS ..... 16
4.2 CONTENT AND DESIGN ..... 16
4.3 MATERIAL AND LOCATION ..... 16

**5. PANEL AND CONSOLE LABELS ..... 18**
5.1 GENERAL REQUIREMENTS ..... 18
5.2 CONTENT AND DESIGN ..... 18
5.3 LOCATION AND MATERIALS ..... 19

**6. PIPE MARKERS ..... 22**
6.1 GENERAL COLOUR-CODING REQUIREMENTS ..... 22
6.2 METHOD OF IDENTIFICATION ..... 23
6.3 MARKER MATERIAL ..... 24
6.4 MARKERS APPLIED DIRECTLY TO PIPES ..... 24
6.5 PIPE MARKER PLACEMENT ..... 24

**7. HAZARD IDENTIFICATION LABELS ..... 26**
7.1 HAZARD LEVEL SELECTION CRITERIA ..... 26
7.2 FORMAT ..... 26
7.3 DANGER LABELS ..... 26
7.4 CAUTION LABELS ..... 27
7.5 MATERIALS ..... 27
7.6 MOUNTING LOCATION ..... 27

**8. INFORMATION LABELS ..... 28**
8.1 CRITERIA FOR USE ..... 28
8.2 GENERAL ..... 28
8.3 INSCRIPTION ..... 28
8.4 LETTER SIZE ..... 28
8.5 CHARACTER/BACKGROUND COLOUR ..... 28
8.6 MATERIALS ..... 29
8.7 MOUNTING LOCATION ..... 29

**9. SAFE WORKING LOAD IDENTIFICATION LABELS ..... 30**
9.1 REQUIRED MOUNTING LOCATIONS ..... 30
9.2 COLOUR ..... 30
9.3 WORDING ..... 30
9.4 CHARACTER SIZE ..... 30
9.5 MATERIAL ..... 30

**10. VISUAL AIDS FOR IMPROVING EQUIPMENT EFFECTIVENESS ..... 31**
10.1 GENERAL ..... 31
10.2 LIST OF TECHNIQUES ..... 31

Documents
Document Sharing Hub

Full document details: SHELL 30.00.60.21 0

**11. LABEL CATALOGUE .....32**
11.1 CONTENTS .....32
**12. REFERENCES .....33**

Documents
Document Sharing Hub

Full document details: SHELL 30.00.60.21 0

# 1. INTRODUCTION

## 1.1 SCOPE

This new DEP specifies Human Factors Engineering (HFE) requirements for the content, design and layout and positioning requirements for signs, labels and markings to be applied for the following:

1. Equipment, component and cable identification;
2. Panel and console labels;
3. Pipe markers;
4. Hazard identification signs;
5. Information signs;
6. Safe working load identification labels;
7. Visual aids for improving equipment effectiveness.

Development of Equipment Tag Numbers is outside the scope of this DEP. Tag numbers shall be developed in accordance with DEP 31.10.03.10-Gen., DEP 32.10.03.10-Gen. and industry standards such as API RP 14C and ISO 10418, as appropriate.

Safety signs and markings as well as product safety labels are also outside the scope of this DEP.

This DEP ensures that signs, labels and markings are designed, sized and located in a way that:

1. Facilitates visibility and legibility;
2. Clearly indicates the presence of hazards and dangers;
3. Supports users (installers, operators, maintainers) in identifying equipment and the safe and efficient execution of tasks;
4. Minimizes the risk of errors caused by equipment misidentification.

## 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 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.

Documents
Document Sharing Hub

Full document details: SHELL 30.00.60.21 0

## 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.

NOTE: The term **Vendor** is used in this DEP and has the same meaning as Supplier.

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 word **should** indicates a recommendation.

### 1.3.2 Specific definitions

| Term | Definition |
|---|---|
| **Caution Label** | Indicates a potentially hazardous situation, which, if not avoided, may result in minor injury to a person, minor damage to the equipment, or a minor pollution problem. A caution label should not be used when there is a possibility of death or serious injury. |
| **Danger Label** | Indicates a hazardous situation, which, if not avoided, could result in death or serious injury to a person, serious damage to vital equipment, or a major environmental pollution problem. |
| **Hazard Label** | A type of label used to identify and provide information about situations that may be hazardous to personnel, equipment or the environment. The types of labels to be used are "DANGER" and "CAUTION". |
| **Identification Label** | A type of label used to identify piping contents, vessel contents, and individual equipment, (e.g., valves, gauges, junction boxes, filters, pumps, transmitters, controls), or places (e.g., rooms, buildings, etc.). |
| **Information Label** | A type of label used to present non-procedural information of a general nature. |
| **Independent Symbols** | Symbols that alone provide information to the user without requiring elaboration by supporting text (e.g., earmuffs to indicate a high noise area requiring hearing protection). |
| **Instruction Label** | A type of label used to present instructions for accomplishing a specific task or tasks, along with any hazard or safety information related to performing the task(s). |
| **Label** | Any plate, sign, placard, inscription, legend, symbol, marking or combination thereof, which is used to impart visual information, warnings or instructions to a reader. |
| **Label Catalogue** | A list of all labels placed in a facility, such that persons at the facility could use the list to purchase, or have made, the same label if the original labels required replacement or additional labels of a particular type were needed at the facility. |
| **Marking** | Painted (e.g., stencilled) information that conveys visual information, warnings or instructions to a reader. |

Documents
Document Sharing Hub

Full document details: SHELL 30.00.60.21 0

| | |
|---|---|
| **Notice** | Signs used to indicate a statement of company policy directly or indirectly related to the safety of personnel or protection of property. This signal word should not be associated directly with a hazard or hazardous situation and shall not be used in place of “DANGER” or “CAUTION.” |
| **Panel and Console Labels** | Labels that appear on operator consoles and panels to identify individual or groups of controls or displays. |
| **Sign** | See “Label”. |
| **Tag** | Physical plate, sign or placard that is attached to an item by lanyard, chain or similar, and contains visual information for the reader. |
| **Tag Number** | Unique alphanumeric identifier used to identify assets or an equipment item (valve, instrument, vessel, pipeline, etc.). |

### 1.3.3 Abbreviations

| Term | Definition |
|---|---|
| **ANSI** | American National Standard |
| **API** | American Petroleum Institute |
| **ASME** | American Society of Mechanical Engineers |
| **ISO** | International Organization for Standardization |
| **P&ID** | Piping and Instrumentation Diagram |
| **UV** | Ultra-violet |

## 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 (12).

## 1.5 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.

## 1.6 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.

Documents
Document Sharing Hub

Full document details: SHELL 30.00.60.21 0

## 2. LABELS - GENERAL

### 2.1 GENERAL REQUIREMENTS

Labels, tags, legends, placards, signs, markings or a combination of these shall be provided to support users (installers, operators, maintainers) in the safe and efficient execution of tasks.

Labels shall be provided whenever personnel must identify items, or be aware of hazards.

All labels of a similar type shall be consistent in appearance, presentation of information and format throughout the facility.

Labels shall use language, words, symbols, abbreviations, number formats and acronyms that are familiar to the work force expected to be at the facility.

Labels shall conform to the relevant linguistic stereotype, i.e., be read from left to right (preferred) or top to bottom (allowed), for English language.

#### 2.1.1 Label glossary

Projects shall produce and maintain a glossary defining the following characteristics of information that may be included on labels:

1. Abbreviations
2. Acronyms
3. Number formats
4. Units of measurement
5. Symbology
6. Meaning of colour

The project Label Glossary shall be initiated at the start of DEFINE phase, and maintained throughout EXECUTE phase.

All labels developed for the project shall comply with the definitions contained in the project Label Glossary.

### 2.2 CONTENT AND DESIGN

#### 2.2.1 Abbreviations

All wording on labels shall be spelt out wherever possible. Abbreviations shall be used only if the following conditions exist:

- There is insufficient space to spell out the words needed for the label, or
- The abbreviation is more commonly known and understood than the spelt out word (e.g., ESD instead of Emergency Shutdown; AFFF instead of Aqueous Film Forming Foam).

Where used, abbreviations shall be standardized and used consistently across all labels.

#### 2.2.2 Units of measurement

Units of measurement shall be used consistently across all units, equipments and Suppliers, as defined in the project Label Glossary.

#### 2.2.3 References

References to other documents or sources of information should not form part of any label. All information required to complete a task, recognise or avoid a hazardous situation, or understand the label shall be included in the label.

Documents
Document Sharing Hub

Full document details: SHELL 30.00.60.21 0

### 2.2.4 Irrelevant information

Information not directly required by the user to accomplish the operational tasks (e.g., trade names and company logos), should be avoided on the face of the following:

1. Consoles;
2. Control panels;
3. Displays;
4. Any other location in direct line of sight of the user.

Non-task oriented information should be placed on the side or back of the display or console when viewed from the expected working position.

### 2.2.5 Characters to avoid

Characters, letters and symbols which are highly confusable should not be used in combinations or situations where incorrect reading could lead to a significant misunderstanding. For example, when labels are in English, the number “1” should not be used in combination with the letters “L” or “I”, and the number “0” should not be used in combination with the letters “O” or “Q”.

### 2.2.6 Character and numerals

Characters shall be simple block type format, using a font such as Arial or Helvetica. Numerals shall be Arabic (as opposed to Roman).

### 2.2.7 Character and background colour

Vessel, equipment, component, instrument device and cable identification labels shall be provided with black characters on a white background.

### 2.2.8 Surface colour contrast

Label background colour shall contrast with the colour of the surface to which the label will be attached. Safety colour specification should follow ANSI Z535.1 or ISO 3864-4 as appropriate unless compliance with an equivalent local national or regulatory standard is required.

### 2.2.9 Character heights

The height of letters and numerals shall be determined by the expected reading distance and illumination level.

The recommended height for letters and numerals at varying viewing distances with illumination levels above 10 Lux (1 Foot-candle) is provided in Table 1. Minimum character heights apply to the lower case characters without ascenders and descenders (e.g., a, m and c).

**Table 1: Minimum character heights (for lower case characters) by viewing distances**

| Viewing Distance in metre (ft) | Full Tag Number (First Line) Character Height in mm (in) | Functional Description (Second / Third Lines) Character Height in mm (in) |
|---|---|---|
| < 1 m (3 ft) | 7 mm (0.3 in) | 5 mm (0.2 in) |
| 1 m to 3 m (3 ft to 10 ft) | 21 mm (0.8 in) | 14 mm (0.6 in) |
| > 3 m (10 ft) | 42 mm (1.7 in) | 28 mm (1.1 in) |

(Source: Adapted from ISO 11064-4)

Documents
Document Sharing Hub

Full document details: SHELL 30.00.60.21 0

### 2.2.10 Justification/alignment

Tag Numbers (upper line) shall be aligned centrally.

Functional descriptions shall be left aligned when only one language is used (see Figure 1). For bilingual labels, functional descriptions shall be left aligned for the first language and central aligned for the second (see Figure 2).

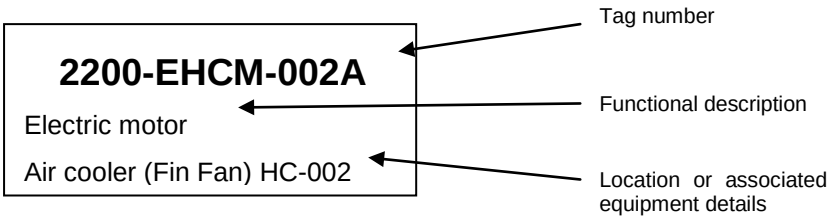


**Figure 1: Label justification/alignment example (one language)**

**AA-2201-PAZ-002A**

| | |
|---|---|
| Centrifugal Pump | Центробежный Насос |
| Oil Processing – Train 1 | Обработка Нефти – Обучается 1 |

**Figure 2: Label justification/alignment example (bilingual)**

### 2.2.11 Use of case

All capital letters shall be used for full and shortened tag numbers.

Functional descriptions should be written with leading capitals only (e.g., “Compressor”).

### 2.2.12 Line spacing, word and line separation

Minimum space between characters (within words) shall be maintained with a compression rate of no more than 40 %.

Minimum space between words shall be the width of one character.

Minimum space between lines on the functional description shall be ½ character height, and minimum separation between the top of a character on a lower line and the bottom of the lowest character on an upper line shall be at least one stroke width.

Minimum vertical space between tag numbers and the functional description shall be the height of the largest character of the functional description character height.

## 2.3 MATERIALS AND LOCATION

### 2.3.1 Materials and manufacturing process for labels

Labels shall be made from materials, and manufactured by a process that provides a permanent label suitable for all environments in which the facilities might operate. The label material shall also be compatible with the material on which it is attached. Labels, when attached, shall not trap air or moisture between the label and surface to which it is attached, nor compromise the surface coating and thus accelerate the rate of corrosion. All labelling materials shall withstand direct contact with all process chemicals, contact temperatures as defined in material specifications, and prolonged exposure to direct sunlight without deterioration for a minimum of 5 years.

### 2.3.2 Locating labels – General

Labels shall be located to be legible from the expected operator working position when interacting with the equipment. If there is no obvious expected working position, labels shall

Documents
Document Sharing Hub

Full document details: SHELL 30.00.60.21 0