DEP SPECIFICATION

HUMAN FACTORS ENGINEERING – APPLICATION DURING CONSTRUCTION

DEP 30.00.60.14-Gen.

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DESIGN AND ENGINEERING PRACTICE

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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 respons bility, consult the Principal.

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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.

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

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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the Human Factors Engineering (HFE) aspects to be applied during the construction stage of projects in order to comply with the Human Factors Engineering requirement contained in the Shell Group HSSE & SP Health Standard and the HSSE & SP Control Framework Health Manual Section, 'Human Factors Engineering'.

In particular, this DEP covers requirements and gives recommendations for Human Factors Engineering (HFE) activities during a project's construction phase as outlined in Section 3.3.3 in DEP 30.00.60.10-Gen. Its aim is to:

- ensure that what was in 3D model or on drawings is actually being built, i.e., protect the design; and
- ensure that no new HFE risks are being introduced due to field routed or installed equipment by ensuring that construction workers are made aware of the operational and maintenance difficulties that might surface later, and that they are given the knowledge, tools, and time to avoid them.

This DEP is applicable both to projects where construction management is a responsibility of the Principal and to projects where that responsibility is delegated to an EPC Contractor. It is relevant for the Principal's project and construction managers, construction supervisors, operations and maintenance staff, and construction Contractors.

This DEP applies to new facilities and modifications to existing facilities; it is not intended to apply to existing facilities that are not being modified.

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 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.

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 word **should** indicates a recommendation.

1.3.2 Specific definitions

Term	Definition
HFE Coordinator	Person acting as a manager and focal point for Human Factors Engineering (HFE) on a project. See Appendix 1 in DEP 30.00.60.10-Gen.
HFE Technical Authority	The individual assigned as Technical Authority for HFE on the project in compliance with Business Unit and Group standards.
Human Factors Engineering	A multidisciplinary science that focuses on the interaction between the human and the work system in order to design human-machine interactions that optimize human and system performance. See ISO 6385.
Validation	Validation is intended to check that development and verification procedures for a product, service, or system (or portion thereof, or set thereof) result in a product, service, or system (or portion thereof, or set thereof) that meets initial requirements, specifications, and regulations. Will it fulfil its intended purpose?
Verification	Verification is intended to check that a product, service, or system (or portion thereof, or set thereof) meets a set of initial design requirements, specifications, and regulations.

1.3.3 Abbreviations

Term	Definition
CAD	Computer Aided Design
DCAF	Discipline and Controls Assurance Framework
EPC	Engineering, Procurement and Construction
FSI	Flawless Start-up Initiative
O&M	Operations and Maintenance
ORA	Operational Readiness Assurance
ORM	Opportunity Realisation Manual
TA	Technical Authority

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 (3).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated January 2005. Background and explanation content in the previous DEP has been moved to the companion Informative. Some minor editorial changes have been made. The following are the main, non-editorial changes.

Old section	New section	Change
Section 2	-	Removed and moved some of the information to Informative.
Section 3	Section 2	Simplified and removed some information no longer pertinent
Appendix 1		Deleted
Appendix 2		Deleted and some details included in Section 2

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be submitted to the Administrator using the DEP Feedback Form by:

- Entering comments directly in the DEP Feedback System on the Technical Standards Portal http://sww.shell.com/standards (mandatory for users with access to Shell Wide Web);
- Clicking on the DEP Feedback Form button on the DEPs DVD-ROM main page (for users without access to Shell Wide Web);
- Requesting a copy of the DEP Feedback Form from the Administrator at standards@shell.com (for users without access to Shell Wide Web).

For the last two options, the completed DEP Feedback Form can be attached to an email and submitted to the Administrator at standards@shell.com. Only feedback that is entered into the Feedback Form will be considered.

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.

2. HFE ACTIVITIES

2.1 GENERAL

For projects conducted under the Opportunity Realisation Manual (ORM), an HFE Plan for Construction shall be produced, specifying the HFE quality control activities to be conducted during the construction phase and the roles, responsibilities and reporting, including those of the EPC Contractor and Suppliers that shall be put in place. The plan shall be produced as early as practical during the EXECUTE phase, so that it can be included in construction contracts.

For non-ORM projects, the development of a HFE Plan for Construction is left to the discretion of the Project Manager and HFE TA for the project. The decision should be made dependent upon the complexity of the project, level of HFE verification done during detail engineering, and amount of field fitting to be done during construction.

2.2 ORGANIZATION AND RESPONSIBILITIES

The HFE organizational arrangements for implementation the HFE Plan for Construction shall be identified. This shall include ensuring that the appropriate HFE competence is available within the project team or any other individuals responsible for HFE activities during construction.

The Principal is responsible for confirming the appointment of the HFE Coordinator and the HFE Technical Authority (TA) for the construction phase. Responsibilities for executing and supporting the HFE activities identified in the plan shall be allocated to construction team (including construction contractor) members as appropriate.

2.3 DESCRIPTION OF ACTIVITIES

2.3.1 Specifications for application of HFE by Contractors

The Contractor shall include the list of HFE designs standards or specifications referenced in the project HFE Strategy or project's standards baseline as appropriate for the construction phase. If no HFE design requirements were included in the standards baseline, the Contractor shall determine with the support of a HFE TA, whether HFE specifications or requirements should be introduced for application by construction Contractors.

2.3.2 HFE competency training

The HFE plan for construction shall include details regarding the HFE competency training to be presented to construction staff. This may include, but is not limited to the following:

- HFE orientation training for all construction workers coming to site (Part of Orientation of Workers coming to site);
- HFE in construction awareness training to all construction personnel down to and including Field Supervisors. This should include flawless surveillance, as well as ORA team members as appropriate.

2.3.3 HFE verification and validation

The HFE plan for construction shall include details regarding HFE verification and validation activities during the construction phase. It can be combined with O&M surveillance activities, when deemed practical, but shall include as a minimum:

- Who will be conducting the HFE walk downs, inspections or surveillance activities, as well as HFE competency required
- Frequency of activities
- Details of checklist(s) or recording form(s) to be provided as tool for HFE walk downs, inspections or surveillance activities
- Design and installation details to be made available as tools to those responsible

for surveillance or inspection activities, e.g., 3D CAD model, drawings, etc.

2.3.4 HFE action log

HFE non-compliances or punch list items raised during HFE walk downs or Flawless (O&M) surveillance rounds shall be recorded in an action log, or punch list data base, as part of the overall punch list item control, or whatever work process or procedure is being followed during construction for dealing with Non Conformance Reports. The plan shall include who will be responsible for inputting, editing, and maintaining data in the HFE action log or punch list data base.

2.3.5 HFE non-compliance issues

The plan shall include or reference an appropriate work process for dealing with HFE non-compliances or punch list items raised during HFE walk downs or FSI (O&M) surveillance rounds, as well as obtaining the necessary approvals from the project HFE SME or TA.

2.3.6 HFE in construction report

The plan shall include the requirement for a HFE in the construction report to be prepared by the HFE Coordinator at the end of the construction phase. This report shall cover the following items and shall serve as input to the overall HFE close-out report for the project:

Competence	Did the construction team have access to adequate resource in terms of HFE competent people? Were steps taken to ensure appropriate HFE awareness among construction staff?
Implementation	Did the construction team effectively implement the agreed HFE Plan for Construction? Were technical HFE deviations/variances or non-compliances approved by the appropriate HFE TA?
Actions	Have all HFE actions raised or HFE punch list items, been completed or closed?
Remaining Risks	Are there significant HFE risks that have not been reduced to an acceptable level and that may require additional organisational controls?

3. REFERENCES

In this DEP, reference is made to the following publications:

NOTES:
1. Unless specifically designated by date, the latest edition of each publication shall be used, together with any amendments/supplements/revisions thereto.
2. The DEPs and most referenced external standards are available to Shell staff on the SWW (Shell Wide Web) at http://sww.shell.com/standards/.

SHELL STANDARDS

Human factors engineering in projects	DEP 30.00.60.10-Gen.

INTERNATIONAL STANDARDS

Ergonomic principles in the design of work systems	ISO 6385