TECHNICAL SPECIFICATION

STEEL STACKS (AMENDMENTS/SUPPLEMENTS TO CICIND MODEL CODE)

DEP 34.24.26.31-CSPC

November 2001

****** This DEP has been amended to be project specific and is based on DEP 34.24.26.31-Gen., dated October 1995 incorporating DEP Circular 19/00.

Revisions to the original DEP are highlighted by underlining new text, striking through deleted text and adding a revision line in the right hand margin ******

DESIGN AND ENGINEERING PRACTICE

PREFACE

DEPs (Design and Engineering Practice) publications reflect the views, at the time of publication, of:

Shell Global Solutions International B.V. (Shell GSI)

and

Shell International Exploration and Production B.V. (SIEP)

and

Shell International Chemicals B.V. (SIC)

and

other Service Companies.

They are based on the experience acquired during their involvement with the design, construction, operation and maintenance of processing units and facilities, and they are supplemented with the experience of Group Operating companies. Where appropriate they are based on, or reference is made to, international, regional, national and industry standards.

The objective is to set the recommended standard for good design and engineering practice applied by Group companies operating an oil refinery, gas handling installation, chemical plant, oil and gas production facility, or any other such facility, and thereby to achieve maximum technical and economic benefit from standardization.

The information set forth in these publications is provided to users 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 companies 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 the quality of work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, the Principal will expect them to follow those design and engineering practices which will achieve 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 or its technical advisor.

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

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PART I INTRODUCTION

1.1 SCOPE

This DEP, ~~which replaces the DEP of the same number dated May 1983~~, specifies requirements for and gives guidance on the design, engineering, fabrication and erection of **self-supporting steel stacks**. DEP 34.00.01.30-~~Gen.~~CSPC and DEP 34.28.00.31-~~Gen.~~CSPC shall also apply.

This DEP is based on the CICIND Model Code for Steel Chimneys, May 1988 (including the Commentaries dated March 1989). Part II of this DEP amends, supplements and deletes various clauses/paragraphs of this Code. Clauses of this Code that are not mentioned in this DEP shall apply as written.

For inspection and maintenance aspects of steel stacks, reference is made to CICIND Manual for Inspection and Maintenance of Brickwork and Concrete Chimneys, February 1993.

This DEP shall be used in conjunction with the applicable building regulations of the country or district in which the steel stack will be erected and in particular the mandatory requirements of clauses 8.5 and 8.6 of People's Republic of China standard GBJ 51.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by ~~SIOP~~ Shell GSI and SIEP, the distribution of this DEP is confined to companies forming part of the Royal Dutch/Shell Group or managed by a Group company, and to Contractors nominated by them (i.e. the distribution code is "C" as described in DEP 00.00.05.05-~~Gen.~~CSPC).

This DEP is intended for use ~~in oil refineries, chemical plants, gas plants, exploration and production facilities and supply/marketing installations~~on the CSPC Project.

If national and/or local regulations exist in which some of the requirements may 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 as regards 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 with the object of obtaining agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

The **Contractor** is the party which 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 which manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party which 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 the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.4 CROSS-REFERENCES

Where cross-references are made, the number of the section or sub-section referred to is shown in brackets. All publications referred to in this DEP are listed in (Part III).

PART II AMENDMENTS/SUPPLEMENTS TO CICIND MODEL CODE

1. SCOPE

Add to this Clause:

Together with the enquiry the Principal will provide the necessary data and information, including, where applicable, one or more instruction drawings required as a basis for the design and engineering of the stack.

~~For offshore stacks, additional requirements (e.g. fatigue during tow) shall be taken into consideration.~~

6.2. STRUCTURAL STEELS

Add to Clause 6.2.2.:

Steel grade Fe 510 shall not be used unless approved by the Principal.

7.3. EARTHQUAKE LOADING

Add to this Clause:

In addition to the design of the stack sections in accordance with this DEP, the stack shall be designed for the applicable earthquake load.

7.4. THERMAL EFFECTS

Add to this Clause:

The deformations and stresses caused by differences in temperature shall be taken into account.

7.6 INTERNAL EFFECTS GOVERNING THE CHIMNEY DESIGN

7.6.1 High Temperature Flue Gases

Add to this Clause:

The design of the stack should be based on minimum flue gas velocities of 5 m/s for the minimum operating case of the plant; stack outlet velocities should be between 10 and 15 m/s for the maximum (design) operating case.

9.3 THE SUPPORT AT THE BASE

9.3.1 Anchor Bolts

Delete from this Clause:

Alternative satisfactory methods may be used at the designer's decision if no response to vortex shedding is anticipated.

Add to this Clause:

Anchor bolts, nuts and sleeves shall be in accordance with S 10.045, and the maximum bolt load shall not exceed the allowable load stated therein.

9.3.2 Grouting

Add to this Clause:

The load on the concrete foundation for steel stacks shall not exceed 8 N/mm^2 on concrete with non-shrink cement-based ready-mixed grout.

10.3 FLANGES, STIFFENING RINGS AND OPENING REINFORCEMENT

Change Heading to:

"Flanges, stiffening rings, cleats or studs and opening reinforcement"

Add to this Clause:

The cleats or studs, etc., required for the anchoring of the lining to the stack shall be shop welded.

10.6 ERECTION TOLERANCES

Change Heading to:

"Erection"

Add to this Clause:

For general erection requirements, reference is made to DEP 34.28.00.31-~~Gen.~~CSPC.

15. AIRCRAFT WARNING LIGHTS

Add to Clause 15.1:

~~If required by local regulations, s~~Stacks shall be provided with aviation warning lights and day-time warning facilities in accordance with GBJ 51 clause 8.5.

Aviation warning lights shall be installed in accordance with the requirements of Volume 1 Chapter 6 of Annex 14 to the Convention on International Civil Aviation. The luminaires shall consist of a double lamp unit with automatic changeover to the stand-by lamp upon failure of the operating lamp.

Add New Section:

16. ACCESSORIES

The following items are considered to form part of the steel stack, unless otherwise specified by the Principal.

- Condensate pan and drain connection.
- Access door. (S 24.304)
- Soot door, where applicable.
- Climbing steel with safety guide rail.
- Painter's trolley.
- Flue duct connection(s).
- Instrument connections, e.g. for oxygen analyser, draught gauge and temperature indicator. (S 24.603)
- Ladder and platform(s), where applicable. (S 28.011 and S 28.012.)
- Landings where applicable.
- Provisions for fixing obstruction lights, where applicable. (S 28.107)
- Cleats or studs required for the refractory lining.

Add New Section:

17. FOUNDATION

Reinforced concrete foundations shall comply with DEP 34.19.20.31-~~Gen.~~CSPC.

Piling, if required, shall be in accordance with DEP 34.11.00.12-~~Gen.~~CSPC.

Add New Section:

18. EARTHING AND LIGHTNING

Earthing and lightning shall comply with DEP 33.64.10.10-~~Gen.~~CSPC.

APPENDIX 3 LININGS, INSULATION AND PROTECTION HEAT LOSSES

Add to this Clause:

Amendment to Sub-section A3.6 :

For Heat Recovery Steam Generation Stacks, lining is normally not required.

For other kinds of steel stacks the following applies:

Lining shall be considered if the metal temperature of structural steel is higher than 400 °C.

If the design of the stack is based on a medium or high degree of chemical load and/or on the basis that no dew point reductions will be made by firing methods, then the sulphurous acid dew point of the flue gases shall be taken as 160 °C.

Lining shall be considered if the minimum metal temperatures in contact with flue gas will be less than 160 °C.

Lining shall be applied if a flue gas contains halogens exceeding the limits mentioned in 7.6.3 note 5.

Amendment to Sub-section A3.9.1 :

Choice and application of lining, if required, shall be in accordance with DEP 64.24.32.30-~~Gen.~~CSPC.

Amendment to Sub-section A3.11 :

Surface preparation and painting shall be in accordance with DEP 30.48.00.31-~~Gen.~~CSPC.

PART III REFERENCES

In this DEP reference is made to the following publications:

NOTE: Unless specifically designated by date, the latest edition of each publication shall be used, together with any amendments/supplements/revisions thereto.

SHELL STANDARDS

Index to DEP publications and standard specifications	DEP 00.00.05.05-~~Gen.~~CSPC
Painting and coating of new construction projects	DEP 30.48.00.31-~~Gen.~~CSPC
Electrical engineering guidelines	DEP 33.64.10.10-~~Gen.~~CSPC
Minimum requirements for structural design and engineering	DEP 34.00.01.30-~~Gen.~~CSPC
Geotechnical and foundation engineering	DEP 34.11.00.12-~~Gen.~~CSPC
Reinforced concrete foundations and structures	DEP 34.19.20.31-~~Gen.~~CSPC
Steel structures	DEP 34.28.00.31-~~Gen.~~CSPC
Insulating and dense refractory concrete linings	DEP 64.24.32.30-~~Gen.~~CSPC

STANDARD DRAWINGS

Anchor bolts with sleeve for concrete foundations and structures	S 10.045
Access door	S 24.304
Sample connection for flue gas analyser	S 24.603
General arrangement for cage ladder to columns, steel stacks and steel structures	S 28.011
Sliding/fixed connections for ladder	S 28.012
Obstruction lights	S 28.107

INTERNATIONAL STANDARDS

CICIND Model Code for Steel Chimneys	May 1988
CICIND Commentaries for the Model Code for Steel Chimneys	March 1989
CICIND Manual for Inspection and Maintenance of Brickwork and Concrete Chimneys	February 1993

Issued by:
Comite International des Cheminées Industrielles
Talacker 50, CH-8001 Zurich
Switzerland

Annex 14 to the Convention on International Civil Aviation Aerodromes	ICAO July 1990

Issued by:
International Civil Aviation Organisation (ICAO)
International Aviation Building
1080 University Street, Montreal
Canada

PEOPLE'S REPUBLIC OF CHINA STANDARDS

Code for Design of Chimneys	GBJ 51

Issued by:
China State Bureau of Technical Supervision
No.4 Zhichun Road
Haidian District
Beijing
100088
People's Republic of China