TECHNICAL SPECIFICATION

SHOP AND FIELD FABRICATION OF ORIFICE METER RUNS

DEP 61.38.10.10-Gen.

October 1993
(DEP Circular 35/99 has been incorporated)

DESIGN AND ENGINEERING PRACTICE

USED BY

COMPANIES OF THE ROYAL DUTCH/SHELL GROUP

PREFACE

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

Shell International Oil Products B.V. (SIOP)
and
Shell International Exploration and Production B.V. (SIEP)
and
Shell International Chemicals B.V. (SIC)

The Hague, The Netherlands,

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, national and international standards and codes of practice.

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.

The right to use DEPs is granted by SIOP, SIEP or SIC, in most cases under Service Agreements primarily with companies of the Royal Dutch/Shell Group and other companies receiving technical advice and services from SIOP, SIEP or SIC. Consequently, three categories of users of DEPs can be distinguished:

1) Operating companies having a Service Agreement with SIOP, SIEP, SIC or other Service Company. The use of DEPs by these Operating companies is subject in all respects to the terms and conditions of the relevant Service Agreement.

2) Other parties who are authorized to use DEPs subject to appropriate contractual arrangements.

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, SIOP, SIEP and SIC disclaim 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. The benefit of this disclaimer shall inure in all respects to SIOP, SIEP, SIC and/or any company affiliated to these companies that may issue DEPs 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 SIOP and SIEP, 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 SIOP and SIEP. The copyright of DEPs vests in SIOP and SIEP. Users shall arrange for DEPs to be held in safe custody and SIOP or SIEP 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 SIOP.

NOTE: In addition to DEP publications there are Standard Specifications and Draft DEPs for Development (DDDs). DDDs generally introduce new procedures or techniques that will probably need updating as further experience develops during their use. The above requirements for distribution and use of DEPs are also applicable to Standard Specifications and DDDs. Standard Specifications and DDDs will gradually be replaced by DEPs.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 SCOPE

This DEP, which is a revision of the DEP of the same number dated December 1987, describes the procedures for the shop and field fabrication of orifice meter runs.

The instrumentation aspects are outside the scope of this DEP, but they shall be fully specified prior to the start of the meter run fabrication.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by SIPM, 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 and Manufacturers nominated by them (i.e. the distribution code is "F" as defined in DEP 00.00.05.05-Gen.).

It is intended for use in oil refineries, chemical plants, gas plants, exploration and production facilities and supply/marketing installations.

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

1.3.1 General 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, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

A **piping class** is a numerical code which is related to the service parameters of a piping system and specifies the materials and components to be used. The codes are compiled in DEP 31.38.01.12-Gen. and DEP 31.38.01.15-Gen.

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 (5).

2. GENERAL

Orifice meter runs from DN 15 to DN 40 shall be ordered and supplied as complete items for site installation. They are specified in the piping classes and are covered by a MESC number, MESC specification 76/026 and standard drawing S 38.134.

Orifice meter runs from DN 50 to DN 300 shall either be ordered and supplied as complete items (in accordance with MESC specification 76/027 and standard drawing S 38.132) or shop/field fabricated in accordance with this DEP.

Orifice meter runs DN 350 and larger shall be shop/field fabricated in accordance with this DEP.

Amended per Circular 35/99

Shop and field fabricated orifice meter runs shall be made as a pipe spool (shown on an isometric drawing). The total straight upstream and downstream lengths shall be in accordance with DEP 32.31.00.32-Gen.

3. SELECTION OF PIPE AND ORIFICE ASSEMBLY

The pipe to be used for fabrication of the orifice meter runs, specified in the piping class and covered by MESC number and MESC specification, shall comply with the following requirements:

- The pipe shall be of the required size, schedule and material as specified on the relevant isometric drawing.
- The pipe shall be visually inspected to verify that the pipe is straight and internally smooth and that there has been no shipping/storage damage or internal corrosion which may have adversely affected its straightness and smoothness.
- The pipe shall not have any weld joints ("jointers").
- At the ends of the pipe to be welded to the orifice flanges the maximum difference between any two measurements of the inside diameter shall be as specified in the pipe material specification, but in any case shall not exceed the following:

	Size	Maximum difference between two ID measurements
Upstream pipe	DN 100 and smaller	2%
	DN 150 and larger	1% or 2 mm, whichever is the lesser
Downstream pipe	DN 50 and larger	2% or 4 mm, whichever is the lesser

- The mean diameter of the pipe end to be welded to the downstream orifice flange shall not differ by more than 3% from the mean pipe end diameter which is to be welded to the upstream orifice flange. For compliance with these requirements, it may be convenient to take both the upstream and downstream pipes from one pipe length. The orifice flanges to be used for the fabrication of the orifice meter runs shall be of the required size, pressure class, bore and material as specified on the relevant isometric drawing.

The orifice flanges are covered by a MESC number, MESC specification 76/025 and standard drawings S 38.130 and S 38.131.

Bolting and gaskets shall be as specified on the isometric drawing in accordance with the relevant piping class.

4. FABRICATION

For fabrication, DEP 31.38 01.31-Gen. and DEP 30.10.60.18-Gen. shall apply.

Before welding flanges to the pipes, the inside diameter of the flanges shall be machined to the mean inside diameter of the connecting pipe ends, within a tolerance of ± 0.1% or ± 0.2 mm, whichever is the greater.

The mean inside diameter of the pipe ends shall be calculated on the basis of four inside diameter measurements, spaced at approximately equal angles to each other. Inside diameters shall be measured with an accuracy not worse than 0.1% or 0.2 mm, whichever is the greater.

After machining the flanges, the holes for the pressure tappings shall be sharp and free from burrs.

After welding, the internal transition between flange and pipe shall be made smooth by carefully grinding away any protruding weld material, without removing any of the base pipe material.

After fabrication of the orifice meter run, at least two measurements shall be taken of the inside diameter of the upstream flange. The measurements of the diameter shall be perpendicular to each other and taken near to the facing of the flange. Each measurement shall be accurate to no worse than 0.1% or 0.2 mm, whichever is the greater. From these measurements the mean diameter shall be calculated and shall be marked in millimetres on the upstream flange rim, near the pressure tap, as in the following typical example:

D = 257.4 mm

5. 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.

Amended per Circular 35/99

SHELL STANDARDS

Index to DEPs and standard specifications	DEP 00.00.05.05-Gen.
Index to standard drawings	DEP 00.00.06.06-Gen.
Welding of metals	DEP 30.10.60.18-Gen.
MF piping classes	DEP 31.38.01.12-Gen.
EP piping classes	DEP 31.38.01.15-Gen.
Shop and field fabrication of steel piping	DEP 31.38.01.31-Gen.
Instruments for measurement and control	DEP 32.31.00.32-Gen.

STANDARD DRAWINGS

NOTE: The latest revisions of Standard Drawings are identified in DEP 00.00.06.06-Gen.

Orifice flanges, raised faced, with flange tappings ANS class 300 to 2500 incl. Nom. size DN 50 to DN 600 incl.	S 38.130
Orifice flanges, raised faced, with corner tappings ANS class 300 and 600 incl. Nom. size DN 50 to DN 600 incl.	S 38.131
Orifice meter runs with flange tappings ANS class 300 to 2500 incl. Nom. size DN 50 to DN 300 incl.	S 38.132
Orifice meter runs with flanged ends ANS class 150 to1500 incl. Nom. size DN 15 to DN 40 incl.	S 38.134
Orifice flange sets, ASME/ANSI B16.36, modified	MESC Spec. 76/025
Orifice meter runs with flange ends, DN 15 - DN 40	MESC Spec. 76/026
Orifice meter runs with butt-weld ends, DN 50 - DN 300	MESC Spec. 76/027