

DEP SPECIFICATION

EXTERNAL MONEL CLAD RISER PIPE

DEP 37.81.40.40-Gen.

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DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This new DEP specifies the minimum requirements for the fabrication, inspection and testing of external Monel clad protection for riser pipe. It is only applicable for Monel cladding that is integrally roll-bonded to the base carbon steel material.

This DEP references specific requirements in DEP 31.40.20.37-Gen., which are applicable to the base material on which the monel cladding is applied. In addition, specific requirements in DEP 61.40.20.30-Gen. are referenced as applicable to welding.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

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This DEP is intended for use in facilities related to exploration and production facilities. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process should 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
CE _{IW}	Carbon Equivalent, based upon the International Institute of Welding equation
CMTR	Certified Material Test Report
CTOD	Crack Tip Opening Displacement
GMAW	Gas Metal Arc Welding
GTAW	Gas Tungsten Arc Welding

HIC	Hydrogen Induced Cracking
ITP	Inspection Test Plan
MPS	Manufacturing Procedure and Specification
NDT	Non Destructive Testing
PQR	Procedure Qualification Record
QA	Quality Assurance
SAW	Submerged Arc Welding
SSC	Sulphide Stress Cracking
WPS	Welding Procedure Specification

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 (8).

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://www.shell.com/standards> and on the main page of the DEPs DVD-ROM.

2. MATERIALS SPECIFICATION

2.1 BASE METAL

The steel plate shall be manufactured from fully killed steel. Grades X52, X60 and X65 only shall be used, in accordance with DEP 31.40.20.37-Gen.

The product analysis for sour and non-sour service shall conform to the requirements specified in DEP 31.40.20.37-Gen. CE_{IIW} is determined by Table H1 for sour service and Table J1 for non-sour service in ISO 3183:2007.

If specified by the Principal, sulphide stress cracking (SSC) and hydrogen induced cracking (HIC) test shall be conducted as required by Appendix H in ISO 3183:2007.

The Contractor shall submit a report of the product analysis of the finished steel.

2.2 CLADDING MATERIAL

The cladding material shall be ASTM B127 UNS N04400 and be supplied in the annealed condition before cladding.

Chemical analysis shall be conducted in accordance with ASTM E1473.

2.3 HEAT TREATMENT

Clad steel plate heat treatment shall be carried out as part of the plate cladding process and shall be in accordance with the Manufacturer's procedures.

2.4 CLAD STEEL PLATE INSPECTION

2.4.1 Visual inspection

Visual inspection of the clad steel plate shall be performed over 100 % of the clad surface.

A defect is unacceptable when any of the following limits are exceeded.

Defects	Limit	
Scratches	Maximum depth	0.5 mm
Pits	Maximum depth	0.5 mm
Surface Roughness	Maximum Ra	12.5 micrometer (centre line average method)

2.4.2 Ultrasonic inspection

Refer also to section (4.10).

Ultrasonic scanning of the clad steel plate shall be carried out over 100 % of the clad surface to inspect for laminations and unbonded areas.

Non-bonded areas are not permitted within 100 mm of any of the edges; see also (4.10.3.2.)

For the remainder of the plate any single non-bonded area shall not exceed 1000 mm². Within any 1 m² of plate, the number of non-bonded areas between 100 mm² and 1000 mm² in size shall not exceed 10. Over the total area of the plate the number of non-bonded areas between 100 mm² and 1000 mm² in size shall not exceed 5 per m².

The plate thickness shall be checked over a grid pattern covering at least 25 % of the plate surface. The thickness of the clad layer shall be checked by electromagnetic or other technique over a grid pattern covering at least 25 % of the surface.

2.4.3 Dye penetrant inspection

All plate edges to be welded (both longitudinal and girth) shall be dye penetrant inspected for cracks, laminations and disbonding in accordance with ASTM E165.

No cracks, laminations or disbonding shall be allowed on the plate edges to be welded.

For site weld edges, DPI shall be applied and the Principal shall agree on the acceptance criteria.

2.4.4 Repair to clad layer

Repair welding of CRA shall be carried out in accordance with ASTM A265.