

DEP SPECIFICATION

THERMALLY SPRAYED ALUMINIUM COATINGS

DEP 30.48.40.31-Gen.

February 2017

ECCN EAR99

DESIGN AND ENGINEERING PRACTICE



© 2017 Shell Group of companies

All rights reserved. No part of this document 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. Part 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. Part 744).

This document has been supplied under license by Shell to:
UOP Honeywell ted.fuger@honeywell.com 19/01/2018 06:26:11

AVA Documents
Document Sharing Hub

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 typically 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.

TABLE OF CONTENTS

1.	INTRODUCTION	4
1.1	SCOPE	4
1.2	DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS	4
1.3	DEFINITIONS	5
1.4	CROSS-REFERENCES	6
1.5	SUMMARY OF MAIN CHANGES.....	6
1.6	COMMENTS ON THIS DEP	7
1.7	DUAL UNITS.....	7
1.8	NON NORMATIVE TEXT (COMMENTARY).....	7
2.	GENERAL REQUIREMENTS	8
2.1	GENERAL	8
2.3	SAFETY	8
3.	MATERIALS	8
3.2	THERMAL SPRAY COATING	8
3.3	SEALER	9
3.4	TOP COAT	9
4.	SURFACE PREPARATION	9
4.1	GENERAL	9
4.2	CLEANING	9
4.3	ABRASIVE BLAST CLEANING	10
5.	COATING APPLICATION	11
5.1	GENERAL	11
5.2	EQUIPMENT	12
5.4	HOLDING PERIOD	12
5.5	MASKING	12
5.6	THERMAL SPRAYING	12
5.7	COATING THICKNESS	13
5.8	SEALER AND TOPCOAT	13
6.	QUALIFICATION	13
6.1	GENERAL	13
6.2	TSA-APPLICATOR QUALIFICATION	14
6.3	THERMAL SPRAYER QUALIFICATION	14
6.4	QUALIFICATION TESTS	14
7.	QUALITY ASSURANCE AND CONTROL	16
7.1	GENERAL	16
7.2	RESPONSIBILITY OF CONTRACTOR AND APPLICATOR	16
7.3	QUALITY PLAN	16
7.4	TESTING OF COATING PROPERTIES	16
7.7	INSPECTION PERSONNEL AND EQUIPMENT	18
7.8	FINAL INSPECTION	18
8.	COATING REPAIR	19
8.1	GENERAL	19
8.2	FIELD WELD AREAS	19
9.	STORAGE AND HANDLING	19
10.	REFERENCES	20

1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for thermal sprayed aluminium coatings for the purpose of corrosion control for both atmospheric conditions and beneath insulation or fireproofing as applied to onshore and offshore structures, equipment and piping.

Thermal sprayed aluminium (TSA) coatings are used when the period to first coating maintenance is 15 years or more, or where protection against corrosion under insulation (CUI) is required.

The following aspects of the thermal sprayed aluminium coating system are covered:

- surface preparation;
- thermal spraying;
- coating materials;
- prequalification;
- quality assurance and control, and;
- repair procedures.

This DEP may also be applied when thermal spray coatings are specified for corrosion control on immersed and buried surfaces, equipment and structures. TSA coatings may be used between -45 °C – 540 °C (-50 °F – 1,004 °F).

This is a revision of the DEP of the same number dated February 2014; 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 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 **Applicator** is the party that applies the thermal spray coating.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
AFC Drawing	Approved for Construction Drawing
Arc spray	A form of thermal spraying where two consumable metal wires are fed independently into the spray gun. These wires are charged and an arc is generated between them. The heat from this arc melts the incoming wire, which is then entrained in air jet from the gun and deposited onto a substrate.
Bend test	180° bending of a sample on a mandrel.
Companion coupon	Rectangular steel coupon, prepared for qualification of thermal spray coating materials and coated concurrently with the workpiece for quality control and inspection.
Dew point	The temperature of a given air/water-vapour mixture at which, under atmospheric pressure, condensation starts.
DFT	Dry Film Thickness
Flame spray	A form of thermal spraying where the wire spray material is melted in a gaseous oxygen-fuel flame and deposited onto a substrate.
Feather	Smooth tapered transition between thermal spray coating and the adjacent non-coated surface.
Holding period	Time between the completion of the final surface blasting and completion of the thermal spraying.
ITP	Inspection Test Plan
Overspray	The portion of the thermal spray deposit that is not deposited on the desired area of the workpiece.

Term	Definition
Rust bloom	Discoloration indicating the beginning of rusting, bleeding through the interconnecting pores of the thermal spray coating.
Sealer	A thin paint coating, about 40 µm thick, that is absorbed into the pores of the thermal spray coating and seals the coating surface.
Shift	Production run of which the beginning and end coincide with a change in personnel.
Soluble salt contaminants	Water-soluble salts, such as chlorides and sulphates, which contaminate the steel surface and cause rust bloom and premature coating failure.
Thermal spray	Application of metallic coating by means of arc- or flamespray equipment.
Topcoat	Paint coat applied over a sealed thermal spray coating.
TSA	Thermally Sprayed Aluminium
CRA	Corrosion Resistant Alloy

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section or clause number is shown in brackets (). Other documents referenced by this DEP are listed in (10).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a minor revision of the DEP of the same number dated February 2014. The following are the main, non-editorial changes.

Section/Clause	Change
All	Restructured and clarified requirements, enforced shall/should.

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be submitted to the Administrator using one of the following options:

Shell DEPs Online (Users with access to Shell DEPs Online)	Enter the Shell DEPs Online system at https://www.shelldeps.com Select a DEP and then go to the details screen for that DEP. Click on the "Give feedback" link, fill in the online form and submit.
DEP Feedback System (Users with access to Shell Wide Web)	Enter comments directly in the DEP Feedback System which is accessible from the Technical Standards Portal http://swwww.shell.com/standards . Select "Submit DEP Feedback", fill in the online form and submit.
DEP Standard Form (other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

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.

1.8 NON NORMATIVE TEXT (COMMENTARY)

Text shown in italic style in this DEP indicates text that is non-normative and is provided as explanation or background information only.

Non-normative text is normally indented slightly to the right of the relevant DEP clause.