

DEP SPECIFICATION

**DESIGN AND INSTALLATION OF CHEMICAL-RESISTANT
PROTECTION SYSTEMS FOR CONCRETE SURFACES
(BASED ON EN 14879-PARTS 1, 3, 5 AND 6)**

DEP 30.48.60.12-Gen.

September 2012

DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the design, installation, testing and inspection of chemical-resistant protection systems for concrete surfaces used in the petroleum, chemical and gas industries, based on EN 14879-parts 1, 3, 5 and 6.

This DEP covers the following chemical resistant protection systems:

- Coatings on concrete components (as mentioned in EN 14879-3)
- Linings on concrete components (as mentioned in EN 14879-5)
- Combined systems with tile and brick layers (as mentioned in EN 14879-6)

The Contractor shall provide detailed design and construction specifications, based on his final selection criteria, supplemented by Manufacturer's requirements and specifications.

Excluded from the scope of this DEP are rubber linings, for which reference is made to DEP 30.48.60.10-Gen., and (acid-resistant) refractory bricks and shapes, for which reference is made to DEP 44.24.90.31-Gen. Chemical-resistant linings for process equipment are covered by DEP 30.48.60.13-Gen.

All clauses of EN 14879-parts 1, 3, 5 and 6 not modified by this DEP Specification remain valid as written. This DEP is not applicable for use in North America, but should be used as basis for developing a project specification.

This DEP is a revision of the DEP of the same number dated August 1999. A summary of the main changes since the previous edition of this DEP is given in (1.5).

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 refineries, chemical plants, gas plants, and, where applicable, in supply/marketing installations and exploration and production facilities. 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
Applicator	This is the party which applies the chemical-resistant linings specified by the Contractor.

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 in this DEP are listed in (9).

1.5 SUMMARY OF MAIN CHANGES

The previous edition of this DEP was dated August 1999. There have been significant editorial and technical changes in this edition. Technical requirements are now based on and covered by EN 14879, Parts 1, 3, 5 and 6. DIN 28062 has been withdrawn and replaced by EN 14879-6 and the title of the DEP has been changed.

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://swwww.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 TECHNICAL DEFINITIONS

For technical definitions reference is made to EN 14879, Parts 1, 3, 5 and 6, Sections 3.

1.8 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. SELECTION CRITERIA FOR CHEMICAL-RESISTANT LININGS

2.1 SELECTION

The selection criteria for chemical-resistant protection systems for concrete surfaces shall be based on:

EN 14879-1	Organic coating systems and linings for protection of industrial apparatus and plants against corrosion caused by aggressive media - Part 1: Terminology, design and preparation of substrate
EN 14879-3	Organic coating systems and linings for protection of industrial apparatus and plants against corrosion caused by aggressive media - Part 3: Coatings on concrete components
EN 14879-5	Organic coating systems and linings for protection of industrial apparatus and plants against corrosion caused by aggressive media - Part 5: Linings on concrete components
EN 14879-6	Organic coating systems and linings for protection of industrial apparatus and plants against corrosion caused by aggressive media - Part 6: Combined linings with tile and brick layers

The selection criteria shall be as such that the most economical and maintenance free system shall be obtained. The Contractor shall prove the most economical and maintenance free system, and submit for review to the Principal.

The selection of the chemical resistant protection system shall be based on the criteria as mentioned in (2.2) and:

- EN 14879-1;
- EN 14879-3;
- EN 14879-5;
- EN 14879-6;

The requirements of the concrete surfaces shall comply with EN 14879-1, Section 4.2 and as mentioned in the EN 14879, Part 3, 5 and/or 6.

2.2 DESIGN AND MATERIALS

The Contractor shall design and select the materials for concrete surfaces, as indicated in EN 14879, Parts 3, 5 and 6.

2.3 APPLICATION

The Contractor shall, based on material selection and design, provide general and detailed drawings, along with detailed method statements to ensure application in line with the safety and quality requirements of the Principal, and EN 14879, Parts 1, 3, 5 and 6. The Contractor shall also take into account:

- The requirements of the surface conditions of the subject to be protected;
- The required skills for the job;
- Planning/scheduling of the job;
- Any test requirements (e.g., water tight testing) by others and themselves for the subject to be protected are executed.

If any deviation of above is observed the Contractor shall notify the Principal.

3. ADDITIONAL REQUIREMENTS

3.1 GENERAL

This section shall provide information and requirements not covered in EN 14879, Parts 1, 3, 5 and Part 6.

3.2 JOINTLESS (FLOOR) PROTECTION SYSTEMS

3.2.1 General

Although the following descriptions mainly relate to application on floors, they can also be applicable to adjacent walls, corbels, foundation blocks, columns, etc., which are subject to the same chemical loads.

Chemical-resistant floors are subdivided as follows:

- Floors without continuous chemical attack
Concrete constructions, e.g. floors, without a finish layer can produce considerable dust when they are dry. Moreover, they are vulnerable to incidental spillage of e.g., oils, fat and various chemicals. For such conditions an epoxy lining system, optionally fibre-reinforced, shall be used. See (3.2.3) and (3.2.4).
- Acid-resistant floors
Floors for acid service only and not exposed to traces of alkali, steam or hot water shall be provided with a layer of bricks or tiles, which are laid in silicate-cement-based bedding mortar on the selected sealing layer. The thickness of the mortar layer shall be 3 mm - 5 mm (1/8 in – 1/5 in)

In case of acid setting potassium silicate mortar acidification of the pointing is required after curing and setting. This should be carried out after 3 to 4 days after curing with 3 coats of a 10 % solution of hydrochloric acid. The requirements of the acidification shall be obtained from the Manufacturer/Supplier, including the requirements how to handle before and during commissioning of the (tank or basin) floor.
- Acid-resistant and alkali-resistant floors
Floors exposed to alkali or alkaline solutions, and to acids, shall be provided with acid-resistant bricks or tiles, which shall be laid in synthetic-resin-based mortar on the selected sealing layer.

In case acid setting synthetic mortar acidification of the pointing is required after curing and setting. This should be carried out after 3 to 4 days after curing with 3 coats of a 10 % solution of hydrochloric acid. The requirements of the acidification shall be obtained from the Manufacturer/Supplier, including the requirements how to handle before and during commissioning of the (tank or basin) floor.
- Acid-resistant, alkali-resistant and solvent-resistant floors
Thermoplastic materials, if resistant against the specified solvents, may be used.

Generally a mortar based on polyester, vinyl-ester or epoxy resin, or a mortar of the same base material as used for laying the bricks or tiles, shall be applied as the sealing layer.
- Floors for mildly to moderately aggressive conditions
For exposure to mildly aggressive conditions or for temporary service, two methods of protection are recommended:
 - a layer of bricks or tiles which are embedded in a hydraulic mortar and joined with a synthetic-resin-based mortar, or
 - a jointless floor based on synthetic resin.

NOTE: Laboratory floors shall be included as well.