

DEP SPECIFICATION

**ROADS, PAVING, SURFACING, CABLE TRENCHES,
SLOPE PROTECTION AND FENCING**

DEP 34.13.20.31-Gen.

February 2017

DESIGN AND ENGINEERING PRACTICE



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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.

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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.....	7
1.6	COMMENTS ON THIS DEP	7
1.7	DUAL UNITS.....	7
1.8	NON NORMATIVE TEXT (COMMENTARY).....	7
2.	ROADS	8
2.1	CLASSIFICATION	8
2.2	Road System Design	10
2.3	SUB-BASE AND SUBGRADE DESIGN	10
2.4	GEOMETRICAL DESIGN.....	11
2.5	ROAD PAVEMENT DESIGN REQUIREMENTS.....	12
2.6	DRAINAGE	16
2.7	BRIDGES, CULVERTS AND PIPE CROSSINGS.....	17
2.8	BARRIERS.....	17
2.9	TRANSITION SLABS	17
2.10	MATERIALS.....	18
3.	SURFACED PLANT AREAS	18
3.1	GENERAL	18
3.2	SURFACE SYSTEM DESIGN	18
3.3	SUBBASE AND SUBGRADE DESIGN	19
3.4	PAVEMENT DESIGN REQUIREMENTS	19
3.5	DRAINAGE	20
3.6	CONCRETE BLOCK PAVEMENT.....	20
3.7	UNPAVED AREAS	21
3.8	MATERIALS.....	21
4.	CABLE TRENCHES.....	22
5.	EROSION PROTECTION OF SLOPES INCLUDING, EMBANKMENTS, DITCHES AND OPEN DRAINS	23
5.1	GENERAL	23
5.2	DESIGN	23
5.3	MATERIALS.....	24
5.4	CONSTRUCTION	24
6.	FENCING AND GATES	25
6.1	GENERAL	25
6.2	SECURITY RISK ASSESSMENT.....	25
6.3	SELECTION OF FENCING	26
6.4	FUNCTIONAL REQUIREMENTS.....	27
6.5	DESIGN REQUIREMENTS	28
6.6	MATERIALS.....	28
6.7	TIMING OF CONSTRUCTION	29
7.	REFERENCES	30

1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the design and construction of permanent site roads, paved and unpaved areas, cable trenches, erosion protection of slopes, and fencing and gates.

For public roads, locally applicable and international accepted standards apply.

This DEP does not cover construction roads or mining roads.

The design of contaminated and non-contaminated drainage systems is not covered by this DEP. The design of these drainage systems is described in DEP 34.14.20.31-Gen.

Geotechnical and foundation engineering, including the stability of slopes, roads, bund walls, tank pits and tank pads, are not within the scope of this DEP. For these aspects, reference is made to DEP 34.11.00.11-Gen. and DEP 34.11.00.12-Gen.

Relevant standard drawings are referenced in DEP 00.00.06.06-Gen., Index to Standard Drawings.

This DEP is a revision of the DEP of the same title and number dated February 2015; 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 primarily for use in facilities related to oil refineries, chemical plants, gas plants, or any such facility related to manufacturing activities. Where applicable, it may be used in exploration, production and distribution.

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.

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

1.3.2 Specific definitions

Term	Definition
Base	The layer or layers of specified or selected material of designed thickness placed on a subbase or subgrade to support surface.
Battery limit	The operational boundary of individual processing or utility units.
Off-plot areas	An area designated for all facilities not in the on-plot area which may include administration buildings, workshops, laundries, warehouses, materials yards, storage tank compounds, pump stations, flares, fire-fighting station, training grounds, cooling water intake station, cooling towers, cooling water settling ponds, cooling water discharge channels, jetties, harbour, associated pipe tracks and roads.
Off-site	Areas associated with the site, but located at a distance, e.g., water wells.
On-plot area	An area designated for utility and processing units, including associated control rooms, electrical sub-stations, analyser houses, stacks, associated pipe tracks and plant roads.
Plant road	A road within in an on-plot area
Road width	The distance between the outside edges of the road pavement. This does not include the width of shoulders.
Site	An area comprising the total of all on-plot and off-plot areas, which may be located either onshore, nearshore, offshore, or at a combination of these locations.
Surface	One or more layers of a pavement structure designed to accommodate traffic load, the top layer of which resists skidding, traffic abrasion and the disintegrated effects of climate and environment.
Subgrade	The top surface of a roadbed upon which the pavement structure and shoulders are constructed.
Subbase	The layer or layers of specified or selected material of designed thickness placed on a subgrade to support a base or in case of rigid pavement to support the concrete slab.

1.3.3 Abbreviations

Term	Definition
ACI	American Concrete Institute
CBR	Californian Bearing Ratio
SPDM	Shell Pavement Design Method

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 in this DEP are listed in (7).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated February 2015. The changes followed a requirements quality review and were not a full technical update. The following are the main, non-editorial changes.

Section/Clause	Change
All	Restructured and clarified requirements, enforced use of shall / should / may for normative statements.

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://www.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)

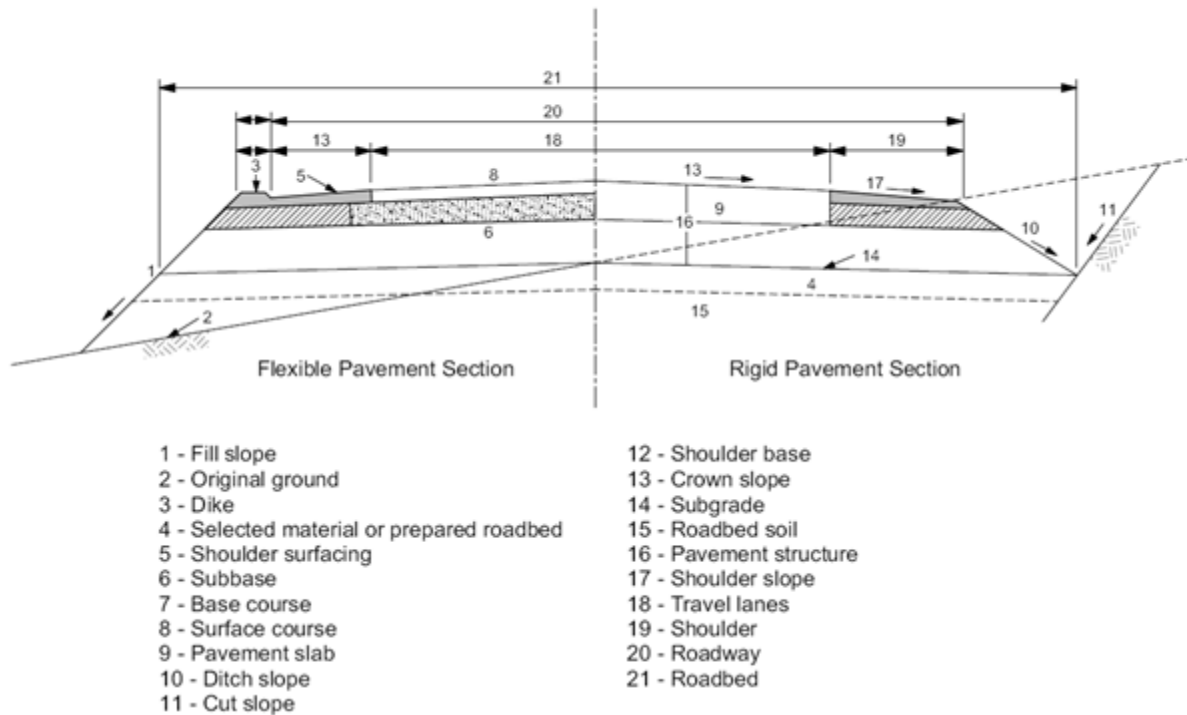
Text shown in italic style in this DEP indicates text that is non-normative and is provided as explanation or background information only.

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

2. ROADS

- General terms used to describe roads and pavements are illustrated in the cross sections presented in (Figure 1).

Figure 1 Schematic drawing showing example of cross sections of roads



2.1 CLASSIFICATION

2.1.1 General

- Roads shall be classified based on the loading, location of the road or pavement, and intended use.

Classification definitions are given in (2.1.2) through (2.1.4).

2.1.2 Functional classification

The following functional classifications are adopted based on location of the road or pavement and intended use:

- Main roads
- Off plot roads
- Plant roads
- Maintenance roads
- Patrol roads (2.5.5)
- Construction roads

The functional classification determines the required width, turning curves, horizontal and vertical gradients, minimum number of lanes, shoulder requirements, design speeds, etc.

2.1.3 Load duty classification

1. The following load duty classifications are adopted:

- a. Light;
- b. Heavy.

The load duty classification determines the number and location of wheels and load distribution, maximum allowable settlement, maximum crack width, design life, performance criteria, traffic load combinations including number of axle movements, etc.

2. The following roads shall be classified as heavy duty:
 - a. Main roads on site and all roads in and around processing units, utility areas and yards;
 - b. Roads to and around main buildings and loading facilities;
 - c. Main access roads to the site whose construction and maintenance are not the responsibility of government authorities.

All other roads are classified as light duty.

2.1.4 Surface type classification

1. The following surface type classifications are adopted:
 - a. flexible pavement;
 - b. rigid pavement;
 - c. concrete block pavement;
 - d. graveled;
 - e. unpaved.
2. Refer to DEP 34.14.20.31-Gen. for the load and permeability requirements to determine the service type classification.

2.2 Road System Design

2.2.1 General

1. All components and elements of a road shall be designed and constructed to be fit for purpose during the lifetime of the site.
2. Roads and tracks shall provide stable and durable access:
 - a. to all locations of the site which require vehicle transport means;
This may include cars, trucks, cranes and other mobile equipment such as snow ploughs, fire engines or road sweepers that are required during the lifetime of the plant.
 - b. for heavy vehicles transporting equipment and materials onto the construction site;
 - c. to all installations and buildings for fire-fighting equipment and other emergency vehicles via at least two independent routings under all conditions; see DEP 80.47.10.33-Gen.
3. In the selection of pavement material, shall be based on the operational requirements during the life of the plant as well as the cost of construction and maintenance of the pavement.
4. The climate, topography, soil conditions and local requirements shall be used for the design of the road as well as the specific requirements of the Principal.
5. Other requirements to be used for the design of the road shall be specified by the Principal (e.g. requirement to install or access underlying services).
With underlying services, paving slabs, brickwork or block work may provide a suitable low maintenance flexible pavement system.
6. Refer to DEP 80.00.10.11-Gen. and site specific layout strategy for the road layout requirements.

2.2.2 Design standards and manuals

1. Construction and pavement design shall be in accordance with one of the following:
 - a. AASHTO Guide for Design of Pavement Structures, or;
 - b. design Manual for Roads and Bridges of the Highway Agency (UK).
2. Design factors that are prescribed by, but not quantified in, the guidelines, standards and manuals described in (2.2.2, Item 1) shall be subject to approval by the Principal.
3. Calculations shall be prepared in accordance with applicable international methods referenced in (7).
Applicable methods include the modified Westergaard's formulae and the Shell Pavement Design Method (SPDM).

2.3 SUB-BASE AND SUBGRADE DESIGN

1. Refer to DEP 34.11.00.11-Gen and DEP 34.11.00.12-Gen. for the requirements of the design of the subgrade, subgrade improvement, the settlement criteria and mitigation of the expected settlement.
2. If the CBR value of the sub-grade is less than 10, the pavement system shall be designed to ensure a stable and durable design throughout the life of the plant.
3. The design shall include measures to prevent intermixing of sub-grade material into the sub base during construction and during the design life of the pavement.