DEP SPECIFICATION

DILUTE PHASE PNEUMATIC CONVEYING SYSTEMS

DEP 31.27.00.27-Gen.

September 2012

(Amendment A01 has been incorporated – February 2013)

ECCN EAR99

DESIGN AND ENGINEERING PRACTICE

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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.

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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.

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Full document details: SHELL 31.27.00.27 0

TABLE OF CONTENTS

1. INTRODUCTION 4
1.1 SCOPE 4
1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS 4
1.3 DEFINITIONS 4
1.4 CROSS-REFERENCES 6
1.5 SUMMARY OF CHANGES 6
1.6 COMMENTS ON THIS DEP 6
1.7 DUAL UNITS 6

2. EQUIPMENT, MATERIALS AND SERVICES SUPPLIED BY THE CONTRACTOR 7

3. EQUIPMENT, MATERIALS AND SERVICES SUPPLIED BY THE MANUFACTURER/SUPPLIER 7

4. EQUIPMENT WARRANTY BY THE SUPPLIER 8

5. REQUIREMENTS 8
5.1 GENERAL REQUIREMENTS 8
5.2 PRODUCT FEED CHARACTERISTICS 10
5.3 SYSTEM DESIGN 10
5.4 BLOWER PACKAGE 11
5.5 FEEDERS 12
5.6 PRODUCT RECEIVERS/SEPARATORS 14
5.7 BLOWER INLET/GUARD FILTER 15
5.8 DUCT COOLER 15
5.9 DIVERTER VALVES 15
5.10 PIPING AND PIPE BENDS 16
5.11 PILOT TESTING 17
5.12 OTHER REQUIREMENTS 17

6. REFERENCES 22

Documents
Document Sharing Hub

Full document details: SHELL 31.27.00.27 0

1. INTRODUCTION

1.1 SCOPE

This new DEP specifies requirements for design and procurement of general purpose storage vessels for bulk solid products, and applies to shop and field fabricated vessels of steel and alloy construction that operate at or near atmospheric pressure. It covers the requirements for shop detailing, fabrication, shop assembly, shop coating and delivery of general purpose bulk solids bins and hoppers.

This DEP has content transitioned from former EGGS Standards 10GS-50 and EGG 10GS-51.

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 authorization 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 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.

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1.3.2 Specific definitions

Term	Definition
Arching	No-flow condition where the bulk solid forms a stable arch across the bin. Usually, this forms at the bottom outlet opening, but may form at a higher location in the hopper or bin. At a sufficiently large discharge opening, a stable arch cannot be sustained. The term “bridging” is also used to describe this condition.
Closed Loop Conveying	The gas used to transport the particulate solids is recycled directly back to the inlet of the transport gas blower. This is used when it is necessary or beneficial to use inert or process gases for transport because the transport gas is recycled and not consumed unless there is leaking in from the system.
Dilute Phase Conveying	The transport of bulk solids at velocities above that material’s “pick-up” velocity. The particles are partially or fully entrained in the gas flow.
Flowability	A characteristic of dry bulk solids to flow within channels due to gravitational or pressure forces.
Funnel Flow	Flow pattern where the product moves in a central channel about the size of the active discharge opening, and a thin “slice" of the top surface which falls into the channel. Funnel flow occurs in bins having hoppers with less steep walls and where the coefficient of friction between the walls and the product is high.
Guard Filter	A filter located at the inlet to a positive displacement blower to remove particulates from the conveying gas that may have passed the product filter/separator in a closed loop conveying system.
Mass Flow	Flow pattern where all product is in motion at substantially every point in the bin whenever any product is withdrawn from the outlet. This flow pattern prevails when the walls of the hopper are sufficiently steep and smooth. Mass flow is easily distinguished from funnel flow by product sliding along the hopper wall.
Pick-up Velocity	The velocity of the conveying gas required to entrain the bulk solids from a condition at rest.
Saltation Velocity	The velocity of the conveying gas at which entrained bulk solids just begin to fall out of the gas stream. Saltation velocity is generally less than the pick-up velocity.
Superficial Velocity	The average value of the gas velocity at any location in a flowing channel. A velocity profile will exist along a cross-section of the channel.
Terminal Velocity	The superficial velocity at the solids discharge or end point of a conveying system. Generally, it is the highest velocity “seen” by the solids being conveyed.

1.3.3 Abbreviations

Term	Definition
AGMA	American Gear Manufacturers Association
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
AWS	American Welding Society

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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 (6).

1.5 SUMMARY OF CHANGES

Amendment A01

Section	Change
1.6	Updated DEP feedback process.
5.5.3	Reference to pressure vessel DEPs have been updated to the new pressure vessel DEP 31.22.00.31-Gen.
5.6.1	Reference to pressure vessel DEPs have been updated to the new pressure vessel DEP 31.22.00.31-Gen.
5.6.2	Reference to pressure vessel DEPs have been updated to the new pressure vessel DEP 31.22.00.31-Gen.
5.6.3	Reference to pressure vessel DEPs have been updated to the new pressure vessel DEP 31.22.00.31-Gen.
6	Reference to pressure vessel DEPs have been updated to the new pressure vessel DEP 31.22.00.31-Gen.
6	Added DEP feedback form - DEP 00.00.05.80-Gen.

1.6 COMMENTS ON THIS DEP

Amendment A01

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://sww.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.

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2. EQUIPMENT, MATERIALS AND SERVICES SUPPLIED BY THE CONTRACTOR

The Contractor shall supply the following equipment, materials and services:

1. Process design and pipe routing design and the selection of major conveying system components.
2. Preparation of control scheme and general arrangement drawings.
3. Instruments and controls. Exceptions, if any, will be shown on the data sheets. Configuration and structural design and the selection of materials of construction.
4. Determination of the relevant product properties and data sheet showing the system configuration including all required equipment and general arrangement drawing.
5. Unloading, storage and erection at the job-site, of shop-assembled equipment unless specified for the Supplier's account.
6. All piping design, piping, pipe bends, pipe couplings, and piping fabrication.
7. Inlet and discharge chute work not specified in this document.
8. Electrical equipment shall be suitable for the hazardous area classification in which it will be installed. This equipment shall be driven by an electric driver(s) that complies with DEP 33.66.05.31-Gen. The equipment and its driver shall be suitable for continuous operation. The driver nameplate power, exclusive of service factor, shall be at least 110 % of the power required for any specified operating condition.

   For suitable bearing life expectancy, drivers shall be provided with grease lubricated bearings. All bearings, including those of the motor and gearbox, if fitted, shall be anti-friction and shall have a minimum ISO 281 L-10 rating life of 40,000 hours in continuous operation at rated operating conditions. The re-greasing interval shall be 4,000 hours, if an L-10 lifetime of 40,000 hours is not possible.

   The drive-end bearing of the driver shall be capable of accepting the forces associated with driven equipment.
9. Foundation design, foundations, structural piping supports, columns and pipe rack, anchor bolts, and selection/provision of materials of construction.
10. Plant air supply and other utilities. Manufacturer/Supplier to specify the required quantities and qualities of plant air and other utilities and indicate tie-in point on the drawings, as required in (Item no. 1) above.
11. Selection of insulation materials and their installation shall be in accordance with DEP 30.46.00.31-Gen.

3. EQUIPMENT, MATERIALS AND SERVICES SUPPLIED BY THE MANUFACTURER/SUPPLIER

Equipment, materials and services supplied by the Supplier are as follows.

1. All specified equipment and associated chutes and supports identified by item number and made a part of this specification.
2. All conveying system mechanical components, piping components, and associated chutes and supports identified by item number made a part of this specification.
3. Mechanical components include complete drive assemblies, guards, pulleys, filters, feeders, bins and hoppers, blenders, valves, pressure and vacuum relief devices and other items required for a complete and operable conveyor system.
4. Pre-assembled blower packages.
5. Sampling devices where shown on the attached drawings made a part of this specification.
6. Instruments and control devices where shown on the data sheets made a part of this specification.

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