

DEP SPECIFICATION

ANALYSER HOUSING

DEP 32.31.50.13-Gen.

February 2019

DESIGN AND ENGINEERING PRACTICE

DEM1



© 2019 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.

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	5
1.1	SCOPE	5
1.2	DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS	5
1.3	DEFINITIONS	5
1.4	CROSS-REFERENCES	8
1.5	SUMMARY OF MAIN CHANGES.....	8
1.6	COMMENTS ON THIS DEP	8
1.7	DUAL UNITS.....	8
1.8	NON NORMATIVE TEXT (COMMENTARY).....	8
2.	GENERAL	9
2.1	INTRODUCTION	9
2.2	ANALYSER HOUSING TYPES AND SELECTION.....	9
2.3	BASIC DESIGN REQUIREMENTS	10
2.4	HEALTH, SAFETY AND ENVIRONMENTAL (HSE) CONSIDERATIONS	10
3.	LOCATION OF ANALYSER HOUSING	11
4.	CIVIL ENGINEERING ASPECTS OF ANALYSER HOUSING	11
4.1	GENERAL.....	11
4.2	CONSTRUCTION AND LAYOUT REQUIREMENTS.....	12
4.3	ADDITIONAL FOR PRE-FABRICATED ANALYSER SHELTERS.....	12
5.	ELECTRICAL ENGINEERING.....	13
5.1	GENERAL.....	13
5.2	AREA CLASSIFICATION	13
5.3	DISTRIBUTION SWITCHBOARDS.....	13
5.4	POWER SUPPLY CONNECTIONS	14
5.5	EARTHING	14
5.6	LIGHTING IN ANALYSER SHELTERS.....	14
6.	HEATING, VENTILATION AND AIR CONDITIONING OF CLOSED AND PRESSURISED ANALYSER SHELTERS.....	14
6.1	GENERAL.....	14
6.2	ARTIFICIAL VENTILATION FOR CLOSED AND PRESSURISED ANALYSER SHELTERS.....	15
6.3	AIR INTAKE SYSTEM AND DUCTING FOR CLOSED AND PRESSURISED ANALYSER SHELTERS.....	15
6.4	VENTILATION FANS.....	16
7.	ANALYSER CLOSED AND PRESSURISED SHELTER PROTECTION.....	16
7.1	GENERAL.....	16
7.2	CLOSED ANALYSER SHELTERS.....	16
7.3	PRESSURISED ANALYSER SHELTERS.....	16
7.4	ANNUNCIATION, SAFEGUARDING AND SIF CLASSIFICATION	17
8.	UTILITY/VENT HEADERS.....	17
8.1	GENERAL.....	17
8.2	INSTRUMENT AIR	17
8.3	NITROGEN HEADER.....	18
8.4	COOLING WATER	18
8.5	FLARE HEADER	19
8.6	STEAM HEADER.....	19
8.7	DRAIN HEADER.....	19
8.8	ATMOSPHERIC VENT	20
8.9	COMPRESSED GAS CYLINDER AND LIQUID CALIBRATION SYSTEM.....	20
8.10	CYLINDER RACK AND HEADER DETAILS.....	20
8.11	HEATED STORAGE.....	21
8.12	LIQUID RECOVERY.....	21
8.13	GAS/VAPOUR RECOVERY	21

9.	INSPECTION AND TESTING	22
9.1	GENERAL.....	22
9.2	UTILITIES, VENT AND DRAIN SYSTEMS	22
9.3	HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS	22
10.	MARKING FOR IDENTIFICATION AND INFORMATION.....	22
10.1	ANALYSER SHELTER AND CABINET NAMEPLATE.....	22
10.2	ANALYSER SHELTER AND CABINETS WARNING NOTICES.....	23
10.3	NAMEPLATES FOR VENT, DRAIN AND CONDENSATION SYSTEMS	23
10.4	NAMEPLATES FOR STEAM SUPPLY	23
10.5	NAMEPLATES FOR DETECTION OF LOW-FLOW VENTILATION AIR (FOR PRESSURISED SHELTERS ONLY).....	23
11.	PREPARATION FOR SHIPPING.....	24
12.	REFERENCES	25

APPENDICES

APPENDIX A	FLOW DIAGRAM FOR SELECTION OF ANALYSER HOUSINGS	27
APPENDIX B	FLOW DIAGRAM FOR SELECTION OF HEATING/COOLING	28

1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the design, construction and climatic conditioning of analyser housing.

Laboratories are outside the scope of this DEP; refer to DEP 34.17.10.31-Gen. for the requirements for laboratories.

This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual (DEM) 1 - Application of Technical Standards.

This DEP is a revision of the same number dated February 2018; 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 refineries, upgraders, chemical plants, gas plants, exploration and production facilities and supply/distribution installations. 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 capitalised term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

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

1.3.2 Specific definitions

Term	Definition
Alarm	A notification that either a Critical or Standard limit has been exceeded. The occurrence of an alarm requires a defined action to be taken to deal with the exceedance. If no action is required, the notification is called an alert.
Analyser cabinet	A small enclosed housing in which analysers are installed singly or grouped together. Maintenance is carried out from outside the cabinet with the door(s) open.
Analyser case	An enclosure forming part of the instrument.
Closed analyser shelter	Analyser shelter with artificial ventilation but without pressurisation. The area classification of the interior is typically classified. The maintenance of the analyser is normally performed in the protection of the shelter.
Pressurised analyser shelter	Analyser shelter with artificial ventilation, and pressurisation. The area classification of the interior is general purpose (i.e., unclassified) under normal operating conditions. The maintenance of the analyser is normally performed in the protection of the shelter.
Analyser shelter	Dedicated shelter with several complex analysers connected to process lines by individual fast loop with sample conditioning systems and associated instruments, electrical equipment and auxiliary safety devices.
Area Classification	Method of analysing and classifying the environment where explosive gas atmospheres or combustible dusts could occur so as to facilitate the proper selection and installation of equipment to be used safely in that environment. Area classification considers the probability that explosive gas atmospheres can be present and the ignition characteristics of such gases.
Artificial ventilation	Method of mechanical movement of air to reduce the potential concentration of flammable gases or vapours in the analyser shelter. Such ventilation can also be used to maintain the pressure inside the analyser shelter above the external ambient pressure.
Panic bar	A device for unlocking a door during emergency conditions.
Purging	Operation of passing a quantity of air or inert gas through an analyser case, an analyser cabinet or the analyser room of a pressurised analyser shelter by associated ducts, in order to reduce any concentration of flammable or toxic gas or vapour which can be present to a safe level, or to prevent gas or vapour from entering the housing.

Term	Definition
Safety Instrumented Function (SIF)	A function comprising one or more sensors, a Logic Solver and one or more Final Elements whose purpose is to prevent or mitigate hazardous situations. A SIF is intended to achieve or maintain a safe state for the process, in respect of a specific hazardous event. A SIF is designed to achieve a required SIL which is determined in relationship with the other protection layers participating in the reduction of the same risk. Previously referred to as an Instrumented Protective Function (IPF).
Total cost of ownership	A type of cost calculation designed to assess both direct and indirect costs and benefits related to the purchase of goods and services.
Ventilation failure	Situation where the required air flow and, if applicable, the required pressure cannot be maintained inside the analyser housing.
Ventilation system	Complete installation required to produce artificial ventilation.
Very toxic (substances)	Refer to DEP 01.00.01.30-Gen. for definitions of "very toxic - acute", "very toxic - chronic", and "very toxic - environment".

1.3.3 Abbreviations

Term	Definition
CCR	Central Control Room
CEMS	Continuous Emission Monitoring System
EMC	Electro Magnetic Compatibility
FAR	Field Auxiliary Room
GRP	Glass-Reinforced Plastic
IPF	Instrumented Protective Function, now known as SIF (Safety Instrumented Function)
LEL	Lower Explosive Limit
MCB	Miniature Circuit Breaker
MCT	Multi Cable Transit
PGC	Process Gas Chromatograph
SIF	Safety Instrumented Function
UPS	Uninterruptible Power Supply

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 (13).

1.5 SUMMARY OF MAIN CHANGES

This is a revision of the DEP of the same number dated February 2018. This is an administrative update only to correct references to DEPs that have been involved in either a merge or a split.

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. GENERAL

2.1 INTRODUCTION

The main purpose of an analyser housing is to ensure that analyser systems have high reliability, continuity of operation and maintainability by providing an improved operating environment by protecting them from outside ambient conditions.

This DEP distinguishes between the following types of installation of analysers:

- *Analyser case;*
 - *Analyser cabinet;*
 - *Closed analyser shelter;*
 - *Pressurised analyser shelter.*
1. The analyser housing type shall be selected using the decision tree from (Appendix A) in conjunction with the total cost of ownership determined by considering the following:
 - a. area classification;
 - b. the suitability of the analyser case for the environmental conditions, mainly temperature, dust, saliferous ambient air and humidity;
 - c. maximum analyser response time;
 - d. required reliability;
 - e. sample handling, conditioning and recovery;
 - f. anticipated maintenance;
 - g. commonality of utility requirements (e.g., power, instrument air, carrier gases, flare connection).

2.2 ANALYSER HOUSING TYPES AND SELECTION

2.2.1 Analyser case

1. Analysers such as pH and conductivity meters may be installed directly in the open (enclosed only by the transmitter case) provided they comply with the hazardous area classification and environment specifications.

2.2.2 Analyser cabinet

Analyser cabinets provide a low cost of improving environmental protection for analysers and are typically used for individual analysers.

1. Analyser cabinets shall be designed to perform maintenance with the doors open.
2. The installed equipment shall comply with the hazardous area classification of the location.
3. When required, purging shall meet the requirements of the applicable regional codes and standards such as IEC 60079-13 or NFPA 496.
4. If climate conditions in the cabinet do not comply with the analyser specifications, then heating and/or air conditioning shall be selected, using the decision tree in (Appendix B), and installed.

2.2.3 Closed analyser shelter

1. Closed analyser shelters may be used when the analysers are grouped together, and the installed equipment complies with the hazardous area classification of the location.

Closed analyser shelters are deemed to be unoccupied buildings.