

DEP SPECIFICATION

LABORATORIES

DEP 34.17.10.31-Gen.

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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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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the design of laboratories. This DEP covers two types of laboratories typically utilized in oil and gas production facilities, refineries, chemical plants and gasification plants as described in (2):

- main laboratory;
- plant laboratory.

This DEP is a revision of the DEP with the same title and number dated September 2012. A summary of changes since the previous edition is given in (1.5).

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

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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.

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

1.3.2 Specific definitions

Term	Definition
Finger-type bench	A U-shaped bench that is normally positioned as a standalone bench. The outside part of the bench can be accessed from all sides but the inside part of the bench can be accessed only from one end
Island-type bench	A rectangular shaped bench that is positioned as a standalone bench and can be accessed from all sides
Main laboratory	A laboratory that is typically located outside the plant (i.e., separate building), operated by laboratory staff for process control and product release
Oxygen	For the purposes of this DEP, oxygen is defined as any fluid containing more than 23.5 vol% oxygen with the balance being inert.
Plant laboratory	A laboratory that is typically located inside the plant (e.g., control room building), operated by operational staff (operators) for process control
Very toxic (substances)	Refer to DEP 01.00.01.30-Gen. for additional details concerning the definitions of "very toxic - acute", "very toxic - chronic", and "very toxic - environment".
Wall-type bench	A rectangular shaped bench that is positioned along a wall and can be accessed only on one side

1.3.3 Abbreviations

Term	Definition
ABS	Acrylonitrile Butadiene Styrene
ATEX	The name commonly given to the two European Directives for working with explosive atmospheres: • Directive 99/92/EC (also known as 'ATEX 137' or the 'ATEX Workplace Directive') on minimum requirements for improving the health and safety protection of workers potentially at risk from explosive atmospheres. • Directive 94/9/EC (also known as 'ATEX 95' or 'the ATEX Equipment Directive') on the approximation of the laws of Members States concerning equipment and protective systems intended for use in potentially explosive atmospheres.
CFR	Combustion Fuel Reference
HRC	High Rupture Capacity
HVAC	Heating, Ventilation and Air Conditioning
PMMA	Poly (methyl methacrylate)
PVC	Poly (vinyl chloride)
RAL	Reichs-Ausschuß für Lieferbedingungen und Gütesicherung

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 (12).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated September 2012. Other than editorial changes, the following are the major changes to the previous edition.

Section/Clause	Change
Entire DEP	DEP500 review to improve requirement quality and clarity of shall/should/may 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://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.

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

In general, there are two common types of laboratories in oil and gas production facilities, refineries, chemical plants and gasification plants, a main laboratory and a plant laboratory. A main laboratory (sometimes called a general site laboratory) is located in a separate building. A plant laboratory is part of the control building.

1. A main laboratory shall not be located in a major hazard area.
Preferably, the location is not far away from the main control room.
2. Refer to DEP 34.17.00.32-Gen. for the requirements for the design of the main laboratory.
3. Refer to DEP 34.17.10.30-Gen. and DEP 34.17.00.32-Gen for the requirements for the design of the plant laboratory.
4. For research or other laboratories not located in oil and gas production facilities, refineries, chemical plants and gasification plants, refer to DEP 34.17.00.32-Gen..
Examples of such laboratories include laboratories located at corporate technology centres.
5. Risk assessments and hazardous area classifications shall be done to enable the selection of appropriate equipment to be used in laboratory areas.
 - a. For installations outside North America, ATEX guidelines (ATEX 95) shall be used for the purpose of area classification.
This is of particular importance for sites where hazardous materials are handled (ATEX 137).
Normally, the working areas in a lab are not classified (with regards to explosive atmospheres) given the amounts and nature of flammable substances present. Specific areas, however, could be given an area classification as the result of a risk assessment.
The retained sample storage, gas storage or sample reception area could be classified hazardous areas.
 - b. For North American installations, refer to DEP 80.00.10.13-Gen. for the requirements for the classification of laboratories.
6. Main and plant laboratories that are "occupied buildings", as defined in DEP 80.00.10.11-Gen., should maintain indoor temperatures between 20 °C and 26 °C (68 °F and 79 °F) and a relative humidity of between 30% and 70%.
 - a. Laboratory instruments that are required to operate outside these environmental ranges shall be placed in a separate enclosure or room.
7. Heating, ventilating and air conditioning (HVAC) of a main laboratory shall be in accordance with the principles specified in ASHRAE Publication 4514 and ASHRAE Handbook – HVAC Applications related to laboratory and Engine Test Facilities.
8. For HVAC in non-laboratory space in the building, refer to DEP 34.17.10.32-Gen.
9. For HVAC of a plant laboratory in a control building, refer to DEP 31.76.10.10-Gen.
10. Requirements arising from health, safety and environment risk assessment studies relevant for the laboratory shall be implemented in the design.
11. The illumination level in laboratories should be at least 400 lux.
12. Refer to DEP 31.10.00.31-Gen. for the requirements for ambient noise limits within the laboratory.

3. LOCATION AND LAYOUT

1. Refer to DEP 80.00.10.11-Gen. for the requirements for the location laboratories within a facility. .
2. The following, as applicable, shall be shown on the general design drawings, including cross-sections, of laboratories:
 - a. laboratory testing rooms;
 - b. offices;
 - c. internal chemical instrument and glass stores;
 - d. sample receiving area;
 - e. bottle wash room;
 - f. combustion fuel reference (CFR) engine room;
 - g. HVAC;
 - h. machine room;
 - i. gas cylinder area;
 - j. instrument/maintenance workshop;
 - k. pantry;
 - l. wash/locker room;
 - m. toilets;
 - n. cleaners' cupboard;
 - o. archive room;
 - p. all additional requirements for specialised laboratory equipment, such as:
 - i. venting;
 - ii. room environmental conditions;
 - iii. utilities;
3. To minimise the risk of fire flash-over and to minimize the extent of explosion damage, retained samples, bulk solvents, compressed gases, chemicals and fuels shall be stored in a separate building located at least 15 m (50 ft) from the laboratory.
4. The CFR engine room (8) shall be located so that noise and vibrations are kept outside the laboratory rooms.
 - a. Separation shall be achieved by means of fire resistant walls and doors.
 - b. If it is located in a separate building next to the laboratory, and if there is a corridor connecting the two buildings, then the corridor shall have an air lock.
5. Gas supply cylinders shall be located outside the building (5.3.8).
6. The storage area of gas supply cylinders shall be classified Zone 1 (Class I, Division 1) and adequately ventilated near the ceiling and the floor to prevent accumulation vapors that are either flammable or "very toxic" (1.3.2).
7. Ventilation and spillage containment facilities shall be provided where chemicals, solvents or fuels are poured.

4. ARCHITECTURAL DESIGN

4.1 WALLS, CEILINGS AND FLOORS

1. The layout and maximum area of a laboratory unit should be determined by formal risk assessments and hazardous area classifications per (2, item 5).
2. All internal walls, ceilings and floors of rooms, where flammable substances are stored or used, shall have a fire resistance of at least one hour.
 - a. Doors in these walls shall be self-closing and have a fire resistance of at least one hour.
 - b. For the fire resistance requirements of other building elements, refer to DEP 34.17.10.32-Gen.
3. Adequate space in the ceiling shall be provided to accommodate utilities piping, cable services, drainage, ventilation ducts and laboratory equipment, including space for future services as determined by the design class for the project.
4. If annular spaces above ceilings are unavoidable (e.g. pitched roofs), these spaces shall be ventilated to prevent accumulation of gases.
5. If there is a flat concrete roof, the acoustic and fireproof ceiling panels may be glued to the underside of the concrete ceiling.
 - a. The underside shall be flat to prevent dead corners where light gases could accumulate.
6. If a perforated ceiling is required for an evenly distributed supply of air from the HVAC system, then the ceiling panels shall be chemical resistant finished.
7. In sample storage areas, ventilation shall be such that:
 - a. gases lighter than air cannot accumulate near the ceiling (i.e., extraction at the highest point of the room)
 - b. gases heavier than air cannot accumulate on the floor (i.e., extraction at the lowest point of the room).

*Refer to the ventilation arrangement in a typical analyser house,
DEP Standard Drawing S 17.001.*

4.2 DOORS

1. Each laboratory room containing flammable or explosive substances shall have each of the following:
 - a. at least two doors located at opposite sides of the laboratory room ;
 - b. at least one door opening directly to the outside of the building.
2. Doors shall be sized so that the largest piece of anticipated equipment can enter the building and the room in which it will be installed.
3. Access to the laboratory shall be such that unobstructed transport of samples is possible through a dedicated entrance.
4. The distance of travel from within the laboratory to the nearest final exit or exit serving a story should be no more than 15 m (50 ft).
5. The emergency exit door in a plant laboratory that is located in a pressurised control building shall be protected against opening from the outside and be self-closing, to prevent loss of over-pressure in the control building.
6. The main entrance door to the laboratory shall open outwards.