

DEP SPECIFICATION

DESIGN AND FABRICATION OF DC UNINTERRUPTIBLE POWER SUPPLIES FOR NORTH AMERICAN APPLICATIONS

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DESIGN AND ENGINEERING PRACTICE

DEM1



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1. INTRODUCTION

1.1 SCOPE

This new DEP specifies requirements and gives recommendations for design, fabrication, inspection, testing, shipment, and documentation for DC Uninterruptible Power Supplies (UPS) for application in North America.

Also included in this specification are the requirements for the stationary batteries.

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

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorized 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 regard 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 authorized to act for, and on behalf of, the Principal.

The lower-case word **shall** indicates a requirement.

The capitalized term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

Term	Definition
Accredited Certification Organization (ACO)	Accredited Certification Organization is an organization that has been accredited by the Standards Council of Canada, in accordance with specific criteria, procedures, and requirements, to operate, on a continuing basis, a certification program for electrical equipment. When a reference is made to a NRTL in this DEP , this also includes the Accredited Certification Organization in Canada.
Backup Time (of a battery)	Backup time (of a battery) is the duration for which the battery can supply its rated load within its specified voltage limits, following a prolonged period of battery float-charge operation.
Battery Life	Battery life is the life of the battery (in years) at the time when the battery capacity is reduced to 80 % of the original design capacity at the design discharge rate and design ambient temperature.
Critical Service	Critical services are services that are required to ensure a safe and orderly shutdown of the facility, safety of personnel, and protection of the environment in the event that the normal power supply is lost.
DC UPS	A system containing an AC/DC battery charger, and battery that provides uninterrupted DC power to loads.
Electrical Technical Authority	The Electrical Technical Authority is the discipline engineer appointed by the Principal and is responsible for all technical decisions associated with the work. The Electrical Technical Authority is responsible for technical integrity.
Equalize Voltage	A high dc charging voltage applied to batteries which has the property of equalizing the voltages of the battery cells.
Float Voltage	A low dc charging voltage applied to batteries to replace internal losses and maintain a fully charged condition.
Full Float Operation	Operation of a DC system with the battery charger and load cell connected in parallel and with the battery charger supplying the normal DC load, plus any self discharge or charging current or both required by the battery. (The battery will deliver current only when the load exceeds the battery charger output.)
Nationally Recognized Testing Laboratory (NRTL)	The Nationally Recognized Testing Laboratory (NRTL) Program is a part of OSHA's Directorate of Technical Support and Emergency Management. The Program recognizes private sector organizations as NRTLs, and recognition signifies that an organization has met the necessary qualifications specified in the regulations for the Program. The NRTL determines that specific equipment and materials ("products") meet consensus-based standards of safety to provide the assurance, required by OSHA, that these products are safe for use in the U.S. workplace. See DEP 33.64.20.10-Gen., Appendix 5 for additional information on NRTLs.
Ripple	The alternating current component from a direct current power supply arising from sources within the power supply.

1.3.3 Abbreviations

Term	Definition
EMI	Electromagnetic Interference
EPROM	Erasable Programmable Read Only Memory
MTBF	Mean Time Between Failures
MTTR	Mean Time to Repair (Recovery)
SPDT	Single Pole, Double Throw
VLRA	Valve-Regulated Lead–Acid Battery

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 (9).

1.5 COMMENTS ON THIS DEP

Comments on this DEP may be sent to the Administrator at standards@shell.com, using the DEP Feedback Form. The DEP Feedback Form can be found on the main page of “DEPs on the Web”, available through the Global Technical Standards web portal <http://www.shell.com/standards> and on the main page of the DEPs DVD-ROM.

1.6 DATA SHEETS

Use Data Sheet DEP 33.65.50.96-Gen. to specify DC UPS.

The applicable Data Sheet sections shall be completed and returned by the Manufacturer/Supplier as part of the quotation.

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.

2. GENERAL REQUIREMENTS

2.1 BASIC STANDARDS

The DC UPS unit shall be designed, constructed, and tested in accordance with NEMA PE 5, CAN/CSA 22.2 No. 107.2, this DEP and Data Sheet. For electronic system applications (e.g., control systems, communications systems monitoring systems), the DC UPS shall be designed, fabricated, and tested in accordance with NEMA PE 7.

Robust and reliable UPS supply units and distribution systems SHALL [PS] be used to supply safety critical systems, e.g., process safeguarding systems.

Robust UPS systems in this context are those with an overall availability of greater than 99.95 %, an overall MTBF in excess of 150,000 hours and a MTTR of 8 hours. These figures exclude outage time for battery discharge testing and assume spare parts are available at site.

UPS systems which are designed and manufactured in accordance with this specification are deemed to meet these requirements.

The Manufacturer/Supplier shall comply with regulatory requirements applicable to the equipment for the location in which it will be installed.

In the quotation, the Manufacturer/Supplier of the UPS and its ancillary equipment shall confirm that the equipment fully complies with the quotation and the whole system is manufactured in accordance with this specification and suitable for the specified duty.

In the event of conflicts between and/or among documents, the Manufacturer/Supplier shall contact the Principal for resolution.

If deemed necessary by one of the parties involved, a pre-ordering meeting shall be arranged to define clearly the overall scope of supply, individual responsibilities and test methods.

If equipment proposed by the Manufacturer/Supplier cannot fully meet the requirements of this DEP, such exceptions shall be clearly stated in Manufacturer/Supplier's proposal with cross-references to the specific sections and subsections to which exceptions are taken. No exceptions shall be allowed unless approved by the Electrical Technical Authority in writing.

If no exceptions are taken to these specifications or drawings, a specific statement to that effect shall be included.

If any one of the components or the whole system does not comply with the specification and any agreed amendments, the Manufacturer/Supplier shall rectify and re-test the UPS within a mutually agreed time.

2.2 DESIGN BASIS

The design of the UPS shall be such as to minimize risk of short circuits and ensure personnel and operational safety at all times.

If specified on the Data Sheet, UPS shall be NRTL listed or ACO certified.

All equipment, components, and materials furnished shall be new, field-proven, meet the requirements of this specification, and be suitable for industrial service. Obsolete components or components scheduled for discontinuation shall not be used.

Replacement parts and service shall be readily available.

Components shall be capable of withstanding the thermal and dynamic stresses resulting from internal and external short circuits and circuit switching operations, etc. Damage arising from component failure shall be confined to the component concerned. Component materials shall be non-flame propagating, wherever practicable.

2.3 OPERATING PRINCIPLE

The performance requirements as specified in (3) shall be based on the following basic operating principle of the DC UPS unit:

The output of the battery charger shall, during normal operation, continuously supply the power requirements of the load while simultaneously maintaining the battery charge in the float charge mode. In the event of an interruption or depression in the AC supply voltage to the battery charger, the battery shall supply the load requirements for not less than the autonomy time as specified on the Data Sheet while maintaining the output voltage within the permissible limits. The battery capacity selected by the Manufacturer/Supplier in order to achieve this shall, henceforth, be referred to as its 100 % nominal capacity.

Upon restoration of the AC supply voltage, the battery charger shall automatically resume supply of the load requirements while simultaneously recharging the battery. Where high rate charging is necessary to fulfill this requirement, then this shall only be possible by manual initiation.

The battery charger shall be suitable for operation in parallel with one or more identical units that may have unsynchronized AC supplies.

2.4 UNIT RATING

The UPS input supply rating and output rating shall be specified on the Data Sheet.

2.5 SERVICE CONDITIONS

Site conditions shall be as specified on the Data Sheet.

The UPS shall be located inside a freely ventilated, conditioned room or module.

Where relevant, the Manufacturer/Supplier shall apply de-rating and ageing factors to take account of temperature.

2.6 PRIMARY POWER SUPPLY

The UPS shall be capable of operating with the nominal voltage and frequency as specified on the Data Sheet and on the basis of the following:

During normal system operation and under steady-state conditions, the supply voltage shall not deviate from the rated voltage by more than 10 % and the system frequency shall not deviate from the rated frequency by more than 5 %.

The primary power supply to the UPS will be symmetrical and sinusoidal within the limits defined by Electrical Technical Authority, although the input voltage may be subject to transients comprising short term voltage depressions of up to 20 % of nominal during motor starting, and to voltage interruptions during system short circuits. Transient high frequency voltages of up to 2 kV may also be superimposed on the input voltage as a consequence of system switching operations.

2.7 TIE-IN OF UPS UNIT TO PRIMARY POWER SUPPLY SYSTEM

The Principal shall provide all the interconnecting cables between the UPS and external equipment such as the primary power source(s) and battery.

The Manufacturer/Supplier shall specify the size of the conductor required for the battery cables, based on a cable length not exceeding 20 m (65 ft).

2.8 INFORMATION TO BE SUBMITTED WITH THE TENDER

The Manufacturer/Supplier shall submit a technical specification of the UPS, which shall include a description of the design, operation, construction, performance and maintenance aspects of the equipment, and list all deviations from this specification.

The Manufacturer/Supplier shall also submit the information requested on the Data Sheet by completing the document as specified and returning this with the tender.