

DEP SPECIFICATION

ELECTRICAL INSTALLATION FOR NORTH AMERICAN APPLICATION

DEP 63.20.08.10-Gen.

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DESIGN AND ENGINEERING PRACTICE



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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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- 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.

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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for installation, inspection and testing of the most commonly encountered electrical facilities, and is applicable to facilities in North America.

This DEP does not specify requirements or give recommendations for design of electrical facilities. Refer to DEP 33.64.20.10-Gen, for this purpose.

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 should 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.

1.3.2 Specific definitions

Term	Definition
Accredited Certification Organization	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 document, this also includes the Accredited Certification Organization in Canada.
Authority Having Jurisdiction (AHJ)	The Authority Having Jurisdiction (AHJ) is an organization, office, or individual responsible for enforcing the local regulatory requirements. Consult with the Electrical Technical Authority for the applicable AHJs for the specific installation.
Contractor	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 or maintenance of a facility. The Principal may undertake all or part of the duties of the Contractor.
Derogation	A Derogation is an authorized variance or exemption from a Process Safety requirement, with specified conditions.
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.
Location	The Location is the site where the new electrical facilities will be installed and operated.
Manufacturer/Supplier	The Manufacturer/Supplier is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.
Principal	The Principal is the party that initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant authorized to act for, and on behalf of, the Principal.
Process Safety	Process Safety is the management of hazards that can give rise to major accidents involving the release of potentially dangerous materials, release of energy (such as fire or explosion) or both. (Definition taken from the Baker Report.)
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.
Principal's Responsible Person	The Principal's Responsible Person is the inspector appointed by the Principal and is responsible for decisions related to the electrical installation.

1.3.3 Acronyms

Acronyms for terms and abbreviations in this document are found in the table below.

Term/Abbreviation	Definition
AHJ	Authority Having Jurisdiction
TAMAP/AML	Technically Approved Manufacturers Listing

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 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 INSTALLATION REQUIREMENTS

2.1 GENERAL

Installation of all electrical facilities shall conform to this DEP as well as the applicable project contract documents and drawings.

Any deviation from this DEP shall require prior written acceptance from the Electrical Technical Authority.

In the event of contradictions between this DEP and other DEPs referenced in this DEP, the Contractor shall request resolution from the Electrical Technical Authority.

Electrical facilities shall be suitable for the application and installed in accordance with the manufacturer's ratings, approvals, recommendations, and instructions.

All equipment shall be fit for purpose. This requires equipment to meet operational requirements, at minimum cost throughout its life cycle, with regard to:

- a) location
- b) environment
- c) reliability
- d) maintenance interval
- e) safety
- f) operability

If applicable, electrical facilities shall be suitable for seismic conditions.

Protective finishes that sustained damage prior to, or during, installation shall be properly repaired. The material used and method of application shall be compatible with the original equipment Manufacturer/Supplier's finish.

Electrical equipment and materials shall be handled with care to prevent mechanical and environmental damage.

Equipment identification shall be in accordance with the established project standards and location practices.

If dissimilar metals are in electrical contact, a suitable corrosion inhibitor shall be applied.

Protective covers shall be placed over open termination points.

2.2 STANDARDS, CODES, AND REGULATIONS

Electrical facilities shall comply with the National Electrical Code (NEC) for US installations or CSA Std. C22.1 Canadian Electrical Code Part I, or approved variances for Canadian installations, requirements of the Authority Having Jurisdiction (AHJ), and the applicable provisions of the latest published version of referenced codes and standards listed in the References section.

Examples of AHJs are as follows:

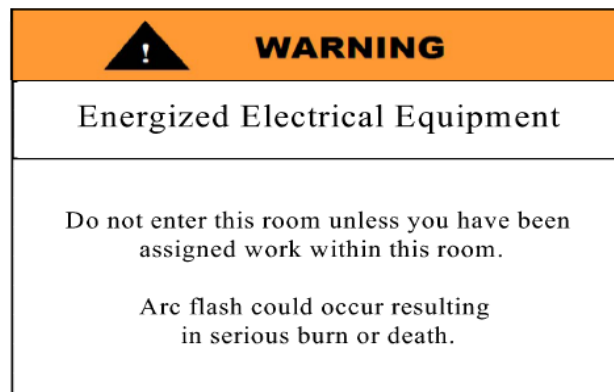
- OSHA Jurisdiction - All facilities in the US (including state waters) shall comply with the NEC and Occupational Safety and Health Administration (OSHA) standards.
- MMS Jurisdiction (primarily fixed facilities in US federal waters) - All fixed facilities in US federal waters shall comply with the United States Code of Federal Regulations (CFR) Title 30 Part 250. The MMS also references API RP 14F/14FZ and API RP 500/505.
- USCG Jurisdiction (primarily floating facilities in US federal waters) - All floating facilities in US federal waters and any other facilities under the jurisdiction of the USCG shall comply with the API RP 14F/FZ and the United States Code of Federal Regulations (CFR) Title 46 Subchapter.

2.3 SAFETY

Adherence to the Principal's electrical safety rules is required.

All electrical distribution equipment (e.g. switchgear, motor control centers, and panel boards) shall be labeled with regard to electrical incident energy and appropriate PPE as recommended by CSA Z462, CSA, NFPA 70E, and NFPA 70 (NEC).

A safety sign as shown below or one with similar intent shall be posted on the exterior door to rooms with electrical equipment.



For US Upstream facilities, installation practices shall be in compliance with HSE0038-PR01.

For US Downstream facilities, installation practices shall be in compliance with NFPA 70E and the NEC.

2.4 PROTECTION AGAINST EXPLOSION AND FIRE HAZARDS

Electrical facilities in hazardous (classified) areas shall be in accordance with this DEP and DEP 80.00.10.13-Gen.

2.5 STANDARDIZATION OF EQUIPMENT AND MATERIALS

Standardization of materials and equipment is desired.

Equipment of similar nature and incorporating similar or identical components and of similar or identical construction should be of the same manufacturer. This applies to power and convenience outlets, to luminaries, and bulk materials.

If a replacement product has little or no operating history, the Electrical Technical Authority shall be contacted for guidance.

If the project work is on an existing facility, the materials should match the existing facility.

2.6 CERTIFICATES, DECLARATIONS, AND TEST REPORTS

Contractor shall obtain the Manufacturer/Supplier's test reports and certificates in accordance with the equipment specifications.

Equipment shall be approved, listed, labeled, certified or otherwise determined to be safe by a NRTL in accordance with nationally recognized product safety standards for the application and the environment in which the equipment is installed (hazardous locations, wet locations, etc.).

Equipment of a type that no NRTL (US), Certification Body (Canada) or Inspection Body (Canada) accepts, certifies, lists, labels, or determines to be safe shall be approved by the AHJ or Electrical Technical Authority. The Electrical Technical Authority may require additional inspection, testing and documentation from the manufacturer or testing labs to verify the equipment is safe for its intended use and is acceptable for the area in which it is installed.

2.7 QUALITY ASSURANCE AND CONTROL

Contractors and Suppliers shall demonstrate to the Principal that they implement quality control and assurance systems that conform to the ISO 9000 series.

2.8 TESTING

Electrical systems and equipment shall be inspected and tested in accordance with this DEP and the Project Inspection and Testing Plan.

All electrical facilities shall be subject to inspection and tests by the Principal prior to acceptance.

2.9 EQUIPMENT MAINTENANCE DURING STORAGE AND CONSTRUCTION

The Contractor shall protect equipment from damage caused by weather, corrosion, water, dirt, heat, physical abuse, or other detrimental conditions that may occur during storage or construction. As a minimum, the Manufacturer/Supplier's storage recommendations shall be adhered to.

Space heaters furnished with equipment such as generators, motors, and control panels shall be energized during the storage and construction phases of a project. Once equipment is energized, The Principal's Lockout and Tagout Procedures shall be followed. Any exceptions to this requirement shall be approved by the Electrical Technical Authority. A temporary yellow warning sign with black lettering indicating that space heater voltage is present shall be provided on the space heater terminal box cover as follows:

CAUTION [Operating Voltage] AT SPACE HEATER REMOVE POWER AT SOURCE BEFORE ENTERING ELECTRICAL SHOCK COULD RESULT

NOTE: Substitute nominal voltage (typically 120 VAC) for [Operating Voltage] on tag.

All outdoor enclosures should have desiccant bags to prevent damage from moisture.

3. EQUIPMENT INSTALLATION

3.1 GENERAL

Electrical equipment, such as switchgear, motor control centers, transformers, main generators, motors, and ASDs shall be installed in accordance with the project contract documents and drawings, and the appropriate equipment Manufacturer/Supplier's recommendations. If necessary, a Manufacturer/Supplier's representative shall be present to advise on installation and commissioning.

Any changes in the electrical design during installation shall be approved through the project MOC process prior to implementation. All modifications shall be recorded and the information incorporated into the 'as-built' drawings.

Prior to installation, the physical and mechanical condition of all equipment shall be inspected, and the nameplate data shall be compared to the project drawings and specifications. The Electrical Technical Authority shall be notified immediately upon discovery of damage or a discrepancy.

Equipment shall be installed level and plumb, and shall be properly grounded utilizing one of the methods specified in this DEP.

For offshore facilities, equipment installed outdoors shall be secured in place with stainless steel hardware.

Once installation is complete, it shall be verified that all shipping brackets, braces, straps, and other aids have been removed.

3.2 TRANSFORMERS

Proper transformer frame and enclosure grounding shall be verified.

All bolted electrical field connections shall be tightened to the proper torque using a calibrated torque wrench in accordance with Manufacturer/Supplier's recommendations. For offshore facilities, torque paint shall be applied in the presence of the designated Principal's Responsible Person.

Transformer tap setting shall be as specified in the contract documents.

3.3 SWITCHGEAR AND MOTOR CONTROL CENTERS

If switchgear/MCCs are installed in field fabricated buildings or rooms, the following shall apply:

- a) Switchgear/MCCs should be installed after the switchroom is completed, so as to minimize the ingress of dust and dirt during or after erection.
- b) After assembly and alignment, switchgear busbar joints shall be tightened to the Manufacturer/Supplier's recommended torque settings using a calibrated torque wrench. For offshore facilities, torque paint shall be applied in the presence of the Principal.
- c) After installation, busbar joints shall be insulated in accordance with the Manufacturer/Supplier's instructions.
- d) All withdrawable switching devices shall be checked for free movement and correct alignment.
- e) After installation, area clearances, correct alignment, proper operation of doors, mechanisms, and removable components shall be verified.

3.4 LIGHTING PANELS

Panel board mounting height shall be in accordance with NEC/CEC maximum mounting height and location requirements. All circuits shall be legibly identified as to purpose or use on a circuit directory located on the face or inside of the panel door.

3.5 BATTERY SYSTEMS

All bolted electrical connections shall be verified for tightness using a calibrated torque wrench, to the values required by the manufacturer. The Manufacturer/Supplier's approved corrosion-inhibiting grease shall be applied on the contact surfaces of all cell-to-cell and terminal connection points.

3.6 ENCLOSURES

All explosion-proof enclosures shall be provided with NRTL listed breather/drain fittings to prevent the accumulation of moisture inside the enclosure.

All non-explosion proof enclosures shall be provided with one of the following two methods to prevent accumulation of moisture inside the enclosure:

- The preferred method for onshore facilities is two 4.7 mm (0.1875 inch) diameter holes drilled in opposite bottom corners of the enclosure. This method requires approval for offshore facilities.
- A drain fitting. In no case shall the drain allow water to accumulate in the bottom of the enclosure.

Unless otherwise specified, all penetrations shall be located on the bottom or sides of an enclosure. Top entry penetrations are acceptable on indoor enclosures. Top entry penetrations are not allowed on outdoor enclosures.

If top entry penetrations on an outdoor enclosure are unavoidable, each entry shall first be approved in writing by the Electrical Technical Authority. In no case shall a top entry penetration be above energized parts. A hot or cold shrink tubing, with an adhesive coating, shall be installed over the hub. For offshore facilities only, a UV-resistant silicone shall be applied to the hub and cable terminator or conduit before the hot or cold shrink tubing.

All enclosures shall be grounded in accordance with the drawings.

All enclosures shall be labeled in accordance with clause (3.7).

For offshore facilities:

- Aluminum plates, boxes, and enclosures shall be isolated from steel with 3 mm (0.125 inch) thick fiberglass isolators and secured using 316 stainless steel hardware.
- In areas of high humidity, enclosures shall include a properly sized corrosion inhibitor (corrosion-inhibiting desiccant device). The inhibitor shall be installed inside the enclosure with a maintenance program in place to replace the emitter at intervals no greater than one year.
- Enclosures provided with plastic plugs installed in the cable penetration hubs for shipping shall have all plastic plugs removed. All cable penetration hubs shall be occupied with cable terminations or properly sized NRTL approved, stainless steel plugs before being put into service.
- Cable or conduit entrances into enclosures shall be made with stainless steel hubs that include integral grounding lugs (for non-metallic enclosures) or welded stainless steel half-couplings.

3.7 LABELING AND NAMEPLATES

3.7.1 General

All electrical equipment (including enclosures, panels, and junction boxes) shall be provided with a nameplate that displays a text name, a description, and an identifying number. For Offshore installations, Appendix 1 shall be followed.

All gauges, controls, lights, etc. on a panel, box, or other enclosure shall also be labeled.

For offshore facilities, nameplates shall be color coded in accordance with Appendix1 and Appendix 2. For onshore facilities, nameplates shall be color-coded in accordance with ANSI Z535.4, Section 7.

3.7.2 Label plates

All panel-mounted label plates shall be 3-ply phenolic or 2-plex labels with engraved lettering.

- Unless otherwise specified, label plates shall be attached with stainless steel screws and aircraft-type self-locking nuts. Screw holes in the plate shall be slightly oversized to allow for expansion and contraction of the plate.
- For offshore and downstream facilities, label plates for explosion-proof enclosures shall be attached using silicone or other UV resistant adhesives that provide permanent adhesion.
- For Canadian facilities, label plates shall be attached to the mounting of the panel or be attached to the support or the wall next the enclosure. Silicone or other UV-resistant adhesives is not allowed.

3.7.3 Equipment tags

Equipment shall be labeled with stainless steel tags with embossed or debossed lettering. Tags shall be secured to the equipment with black UV resistant nylon or stainless steel cable ties.

3.7.4 Indoor tags

Labeling for items installed indoors not subject to dirt or abuse may be the vinyl "peel-and-stick" type. The color and size requirements given above shall apply.