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Guidance on Practice for Electrical for Packaged Equipment

GP 12-45

BP GROUP
ENGINEERING TECHNICAL PRACTICES

Foreword

This is the first issue of Engineering Technical Practice (ETP) GP 12-45. This Guidance on Practice (GP) is based on the following heritage documents from merged BP companies:

BP (RPSE)

GS 112-16	Guidance for Specification 112-16 Electrical Requirements for Packaged Equipment
RP 12-18	Electrical Systems for Modular and Packaged Units

BP Chemical-US

CP 17-13-1	Electrical Standards for Packaged Equipment
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BP GOMDW

EL-SP-4004	Electrical Installation for Packaged Equipment
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1. Scope

This GP provides guidance for the design, fabrication, and installation of electrical for packaged equipment.

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

American Petroleum Institute

BP Engineering Technical Practices (ETP)

GP 12-05	Guidance on Practice for Transformers & Reactors
GP 12-10	Guidance on Practice for Switchgear & Controlgear
GP 12-20	Guidance on Practice for Motors
GP 12-15	Guidance on Practice for Wire & Cable
GP 12-25	Guidance on Practice for Earthing/Grounding
GP 12-30	Guidance on Practice for Lighting and Small Power
GP 12-35	Guidance on Practice for Uninterruptible Power Systems (UPS) and D.C. Power Supplies
GP 12-40	Guidance on Practice for Electric Heat Tracing
GP 12-60	Guidance on Practice for Hazardous Area Electrical Installations
GP 12-65	Guidance on Practice for Electromagnetic Compatibility
GP 12-75	Guidance on Practice for Cable Trays & Conduits
GP 32-50	Guidance on Practice for Inspection and Testing of Electrical Equipment

International Electrotechnical Committee (IEC)

IEC 60204-1	Safety of machinery – Electrical equipment of machines – Part 1: General requirements
IEC 60204-11	Safety of machinery – Electrical equipment of machines – Part 11: Requirements for HV equipment for voltages above 1000 V a.c. or 1500 V d.c. and not exceeding 36 kV
IEC 60529	Degrees of protection provided by enclosures (IP code).

International Standards Organisation (ISO)

ISO 3864-1	Graphical Symbols - Safety Colours and Safety Signs - Part 1: Design Principles for Safety Signs in Workplaces and Public Areas
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National Electrical Manufacturers Association (NEMA)

NEMA 250	Enclosures for Electrical Equipment (1000 volts maximum)
NEMA ICS 1	Industrial Control and Systems General Requirements



3. Design and installation

3.1. Service conditions

Packaged equipment should be designed to operate in a petro-chemical environment without derating.

Normal site conditions include a temperature range of -15 °C (5 °F) to 40 °C (104 °F) and altitude <1000 m (3300 ft). The supplier should be made aware of special environments including offshore or extremes of temperature. Use of sunshades or enhanced ventilation for high temperatures, or the effects of snow loading on enclosures or cable tray in low temperatures, shall be taken into account by the supplier, where applicable. Guidance is given in IEC 61892-1 or API 14F for offshore environments.

3.2. Equipment rating

- a. Equipment shall be rated for the maximum continuous duty and for any overload duties specified.
- b. Batteries shall be rated for the minimum surrounding temperature for discharge duty.
- c. Apparatus shall be rated for operation with a surrounding air temperature of 40°C (104°F), or the predicted local temperature within the enclosure or cabinet, assuming the maximum ambient temperature, if this is greater.

Ventilation should ensure that battery lifetime is not appreciable shortened due to excessive local temperatures.

- d. The supplier should provide details of electrical loads and allowable tolerances on voltage and frequency.

3.3. Layout

- a. Electrical apparatus should be located in such a manner as to enable ease of maintenance when in service.
- b. Location of electrical equipment within the package unit should ensure adequate access for cabling and routing and should be detailed on supplier's drawings.
- c. Suppliers should provide space on cable tray or racking for cables within package unit boundaries.
- d. Items requiring external cable connections should be located on perimeter of packaged skid (unless a direct connection to equipment within the package is more convenient for installation and for maintenance).
- e. Installation should also satisfy all relevant statutory and regulatory requirements applicable at the installation site.

If possible supplier should arrange removable covers, panel doors etc. that may have to be removed or opened during maintenance to have sufficient space left within package boundaries. If space is required outside package boundaries supplier should indicate extent of clear space required making due allowance for any specialist equipment.

- f. Gland plates should be located to ensure adequate space to manipulate incoming cables using cable manufacturers minimum bending radii for cables to be terminated.
- g. Adequate space should be left between gland plates and terminal strips to ensure termination of each cable is practicable once all other cables have been terminated.
- h. Protection should be provided for cables, electrical equipment, devices, and conduits when installed in areas subject to physical damage or vibration. Protection should also be



provided to protect cables, electrical equipment and conduit from damage during fabrication.

- i. Electrical equipment should be installed in a neat and workman-like manner. Trays, channels and cables should be routed horizontally and vertically, parallel to one another or at right angles to equipment line.
- j. Working space around equipment should as a minimum, be in accordance with manufacturers recommendations. Sufficient aisle space should be provided to allow for the removal of equipment.
- k. Control panels or local controls should be constructed and sited to prevent physical damage or inadvertent operation.
- l. Details of possible future extensions should be provided. The supplier should make allowance for these extensions when planning the layout.
- m. Motors or generators should not be mounted in a position where airflow is obstructed or where the hot air discharge of one machine is directed at the air intake of another.
- n. Conduits should be arranged to allow for low point drains.

3.4. Labelling

- a. Equipment, including external weatherproof enclosure, should be adequately labelled with nameplates indicating tag (equipment) number and function. Internal components, relays, switches, terminal blocks etc. should be labelled adjacent to component with references as detailed on schematic/wiring drawings.
- b. Electrical field operating devices should be clearly labelled with function i.e. 'Stop', 'Start', 'On', 'Off', etc. They should be clearly identified with plant being monitored or controlled.
- c. External, function, warning and identification labels should be engraved laminated plastic (e.g. 'Traffolyte', laminated lexan or similar) with letter and background colour selected to meet statutory or site regulations.
- d. Equipment identification labels should be of white-black-white engraved laminated plastic ('Traffolyte', laminated lexan or equivalent).
- e. Labels should be fixed by stainless steel rivets or self-tapping screws. Labels fixed with normal adhesives and paper labels are **not** acceptable. Label attachment should **not** affect certification, IP or NEMA rating of enclosure.
- f. Fuses should be labelled with their current rating. Fuses should be labelled with their phase colour when colour coded wiring to fuses is not visible from front of fuses.

3.5. Hazardous (classified) areas

- a. Electrical equipment for use on packages located within a hazardous (classified) area shall comply with the requirements of GP 12-60.

Equipment should normally be selected on the basis of apparatus or systems according to zone of risk. However, where total life costs indicate a more economic selection, there may be instances where equipment suitable for the zone classification above the actual installation, (i.e. equipment certified for a zone 1 [division 1] area installed in a zone 2 [division 2] area) should be used. This may be the case when considering, for example, maintenance requirements, end user spares holding or where savings can be made in the purchase of bulk materials such as junction boxes or luminaries.

