DEP SPECIFICATION

PACKAGED ALTERNATING CURRENT GENERATOR SETS

DEP 33.65.11.32-Gen.

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DESIGN AND ENGINEERING PRACTICE

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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the design, manufacturing, assembly, inspection, and testing of packaged unit alternating current (AC) generator sets, hereafter referred to as generator sets. The generator set consists of a synchronous AC generator, an engine driving the generator, their control, protection and relay panels, auxiliary equipment and a baseplate. Generator sets may be driven by either gas or diesel engines.

The intent of this DEP Specification is to specify requirements for package generators that are autonomous and self contained. The preferred execution is an aircooled generator with engine water cooled with conventional radiator.

The applicable project requirements are given in requisitions DEP 33.65.11.94-Gen., DEP 31.29.80.93-Gen. and DEP 33.65.11.93-Gen. The type of engine is specified in requisition DEP 33.65.11.94-Gen.

The equipment and services to be provided in accordance with this DEP excludes the supply of:

a. civil engineering such as buildings, cable floors, trenches, foundations and protective fences;

b. cabling between skids;

c. cable tray systems, except as fitted on the package;

d. switchboards, including the generator circuit breaker.

This is a revision of the DEP of the same number dated February 2013; 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 oil refineries, gas plants, chemical plants, oil and gas production facilities (both onshore and offshore) and supply/marketing 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.

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The **Packager** is the party that designs, manufactures, assembles, inspects and tests the complete generator set.

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
air-to-air cooled machine	Closed machine with an integral or machine mounted heat exchanger, using air as the primary and secondary coolant
air-to-water cooled machine	Closed machine with a heat exchanger using air as primary coolant and water as secondary coolant
Certificate	Document issued by a recognised authority certifying that it has examined a certain type of apparatus and, if necessary, has tested it and concluded that the apparatus complies with the relevant standard for such apparatus
Certificate of Conformity	Certificate stating that the electrical apparatus complies with the relevant standards for apparatus for potentially explosive atmospheres
Declaration of Compliance	Document issued by the Manufacturer stating that the electrical apparatus complies with the requirements of IEC 60079-15
hazardous area	Area in which an explosive gas mixture is or may be expected to be present in a quantity such as to require special precautions for the construction, installation and use of electrical apparatus
land installation	Installation located at sufficient distance from open saliferous water to minimize the effect of a salt-laden atmosphere
lifetime	Time during which the generator set remains suitable for the application for which it was made, provided it is regularly inspected, examined and serviced in accordance with the Manufacturer's instructions, with replacement of lubricants and of parts subject to wear
low voltage	Set of voltage levels used for the distribution of electricity and whose upper limit is 1000 V AC
marking	Data put on the electrical apparatus by the Manufacturer giving information for the safe use of the apparatus
rated value	Quantity value assigned, generally by the Manufacturer, to a specific operating condition of a component, device or equipment
site conditions	External factors, e.g., altitude, air temperature, wind velocity, vibration, earthquake, black body temperature and relative humidity, which may influence the operation of a machine or apparatus
test report	Document prepared by the Manufacturer indicating in detail the tests and verifications to which the apparatus has been subjected, and their results
vital service	Service which, when failing in operation or when failing if called upon, can cause an unsafe condition of the process and/or electrical installation, jeopardize life, or cause major damage to the installation

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Term	Definition
voltage deviation	Difference, generally expressed as a percentage, between the value at a given instant at a point in the system, and a reference voltage such as a nominal voltage, a mean value of operating voltage or a declared supply voltage
Zone 1 (in the classification of hazardous gas areas)	Area in which an explosive gas atmosphere is likely to occur in normal operation
Zone 2 (in the classification of hazardous gas areas)	Area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occurs it will exist for a short period only

1.3.3 Abbreviations

Term	Definition
AC	alternating current
AISI	American Iron and Steel Institute
AVR	automatic voltage regulator
CT	current transformer
ESD	emergency shut down
IP	Degree of ingress protection of an enclosure according to IEC 60529 (for example: IP 41)
LED	light emitting diode
RMS	root-mean-square
VA	voltage-ampere
VT	voltage transformer

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 in this DEP are listed in (13).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated Feburary 2013. The following are the main, non-editorial changes.

Section/Clause	Change
1.1	“Shall” statements removed from scope
3.1	Added the following: “The maximum rating shall be agreed with the Principal.”

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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.

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2. BASIC REQUIREMENTS

2.1 GENERAL

The generator set shall be the product of a Packager regularly engaged in the production of such sets. The generator set shall be of modern design using up to date technology and proven performance. Design and construction of the generator set shall provide accessibility for all components requiring routine operational attention and maintenance.

The requirements in (2) to (7) apply to all generator sets. The requirements for specific modes of operation are given in (8).

For certain special applications it may be necessary to deviate from this DEP. Any special requirements shall be stated in the requisition.

The intention of this DEP Specification is to define requirements for package generators which are autonomous and self contained. The preferred execution is an aircooled generator with water cooled engine with a conventional radiator and self contained starting system. If this type of execution is selected, then this specification may be used for sets in excess of 1250kVA.

2.2 PRE-MANUFACTURING MEETING

If deemed necessary, a pre-manufacturing meeting shall be arranged with all parties concerned. This shall be stated on the requisition or may be initiated by the Packager.

The purpose of this meeting is to define the scope and parameters of the order and the responsibilities of each party involved. The final list of deviations to the specification shall be agreed. Agreement shall be reached with respect to administrative, production and test procedures.

Minutes of the pre-manufacturing meeting shall be made by a mutually agreed party and be sent to the Principal for approval within 14 days. After the Principal has approved the draft minutes, the final minutes shall be issued within 14 days.

2.3 SAFETY

The generator set shall be designed to minimize any risk of internal short circuits and to ensure personnel and plant safety under all prescribed conditions of operation, inspection and maintenance.

The generator set shall be designed to withstand the thermal and dynamic stresses and transient mechanical torques such as those resulting from a short circuit and circuit switching operations. Damage arising from component failure shall be confined to the component concerned.

Products that are very toxic (see DEP 01.00.01.30-Gen.) shall not be used.

All exposed rotating or moving parts shall be protected by guards which shall prevent contact with personnel and their clothing. The guards shall be readily removable for plant maintenance purposes.

Exposed surfaces which attain a temperature in excess of 70 °C under normal operation and which are a potential hazard to personnel shall be screened.

All flexible drive belts shall be of anti-static material in accordance with ISO 1813.

2.4 SERVICE CONDITIONS

2.4.1 General

The site environmental conditions will be given in the requisition. The equipment shall in all respects be suitable for operation in a saliferous and dusty atmosphere. The possibility of condensation on equipment surfaces shall be taken into account and adequate mitigation measures applied, e.g., drain holes where required shall be included, no concave areas where water may collect, heating in enclosures, etc.

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The generator set shall be suitable for unattended operation.

Unless otherwise specified in the requisition, the following conditions shall apply:

2.4.2 Seismic conditions

Generator sets for installation offshore shall be designed for shock accelerations of 20 m/s^2 whilst in operation, without interference to operation.

2.4.3 Hazardous areas

Normally the generator sets will be installed in a non-hazardous area. However, if the circumstances of the installation dictate that the installation will be in a hazardous area, it will be stated in the requisition. All equipment in the package shall then be suitable for operation in the hazardous area.

See DEP 31.29.90.30-Gen. for gas engine fuel gas systems with respect to hazardous areas.

2.5 MATERIALS

All components shall be of a quality commensurate with the requirements of a secure power supply system. Component materials shall be flame retardant, and moisture and fungus resistant whenever practicable. Equipment destined for humid tropical environments shall be compatible with these environments.

2.6 SCOPE OF SUPPLY

The generator set shall, in general, consist of:

a. engine complete with all necessary auxiliaries;
b. synchronous AC generator complete with excitation equipment;
c. combined baseplate;
d. engine and generator control panel(s);
e. all necessary noise and vibration suppression equipment;
f. engine starting system;
g. engine and generator cooling systems;
h. lubrication system;
i. combustion air intake system;
j. exhaust system;
k. engine fuel system;
l. fuel day tank (diesel engines);
m. couplings and guards;
n. all necessary interconnecting pipe work and valves, including drain connections
o. terminating at the edge of the baseplate;
p. local gauge panel and instrumentation;
q. all CTs and VTs (incl. those for installation in the switchboard).

The Packager shall advise in its tender any deviation from this DEP.

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3. PERFORMANCE REQUIREMENTS

3.1 RATING

The generator set rating shall be the total net output rating at the generator terminals. The component (e.g., engine, generator, coolers, etc.) with the lowest individual rating shall provide the limit for defining the net output of the generator set. The rating of any significant electrical auxiliaries, such as electric cooling fans, shall be deducted from the output rating. The generator set shall have a continuous power rating as stated on the requisition, at a power factor of 0.8 lagging.

The maximum rating shall be agreed with the Principal.

3.2 NOISE

Noise control requirements in accordance with DEP 31.10.00.31-Gen. shall be adhered to. The Principal will specify the noise limitations of the generator set, using data sheet DEP 31.10.00.94-Gen., which forms part of the requisition.

The Packager shall submit guaranteed sound power levels and sound pressure levels of the packaged unit, together with any other relevant information in accordance with DEP 31.10.00.94-Gen. The Packager shall indicate what special silencing measures, if any, are proposed in order to meet the specified levels.

3.3 TORSIONAL VIBRATIONS

The Packager shall perform a torsional vibration analysis. The necessary remedial measures shall be implemented in accordance with DEP 31.29.90.30-Gen. or DEP 31.29.80.30-Gen.

3.4 LATERAL VIBRATIONS

The lateral vibration severity of the complete generator set shall not exceed 4.5 mm/s RMS in accordance with ISO 10816-1, ISO 10816-5, and ISO 10816-6.

The vibration levels of individual auxiliary low voltage electric motors shall be in accordance with DEP 33.66.05.31-Gen.

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