

Chapter 8 Engine-Generator Set

8-1. General

Engine-generator sets are provided as a source of emergency electric power when there is a loss of station service power. The requirements for an emergency engine generator is dependent on the reliability of station service power and usually is justified for plants without station service generators. The decision for or against providing an engine-generator set should be made during the preliminary design memorandum stage. The power requirement is normally moderate, being confined to the required power to return a main unit to service along with critical control and pumping requirements. The mechanical design responsibility includes location; engine specifications; and exhaust, cooling, and fuel and ventilation provisions. Further guidance is provided in Corps of Engineers Guide Specifications CE-16263 and 16264.

8-2. Location

a. General. To determine a suitable location for an engine-generator set, access, space for maintenance, noise, ventilation, exhaust piping, fuel piping, humidity, and temperature are all factors that must be considered. A location within the powerhouse structure with dependable, controlled temperature conditions and moderate noise isolation from the main working areas and other occupied areas is preferred. An above tailwater gallery location is frequently used.

b. Access. Personnel access should be reasonably convenient for routine inspections. Access for installation or replacement of the complete unit need not be convenient but should be practicable, and it should be verified that future powerhouse construction or equipment installation will not preclude replacement of the complete diesel-generator unit.

c. Maintenance. Space for normal in-place maintenance and overhaul should be provided.

d. Noise. Practically all unit operation will occur during routine testing; therefore extensive sound isolation provisions are unnecessary. A gallery location or other location away from principal working areas will usually be satisfactory as far as noise problems are concerned. Vibration isolators for mounting of the engine-generator set should be provided in the procurement contract.

e. Ventilation. A location where normal ventilation with the engine nonoperational can be provided from the general powerhouse system.

f. Exhaust piping. The location should permit a short, direct routing of the exhaust pipe to an outdoor termination which will not exhaust directly on personnel nor near an intake vent.

g. Fuel piping. The engine-generator location relative to the outside oil storage tank should permit practical routing of the oil supply piping of reasonable length and free of unnecessary offsets and changes in slope. The fuel transfer pump is normally located at the engine, limiting maximum allowable suction losses.

h. Humidity. The generally high-humidity characteristic of below tailwater galleries is undesirable for long-term maintenance. An above tailwater location is preferred.

i. Temperature. A location free from subfreezing temperatures is preferred for all installations but is essential when heat exchangers utilizing river water for engine cooling are used.

8-3. Engine

a. General. The engine should be a diesel, a standard product of the manufacturer, and should be a model which has performed satisfactorily in an independent stationary power plant for a minimum of 8,000 hr in a two-year period of base-load operation. Options should be permitted in the type of engine and number of cylinders.

b. Detail requirements. Typical detail specification requirements pertinent to the engine and auxiliaries procured with the engine can be found in "Piping-Cleaning, and Flushing," Appendix B-1, which is an excerpt from an existing diesel-generator procurement specification. To determine the requirements for a new installation, all of the provisions noted should be considered and modified as appropriate for the size of unit required, powerhouse location, and cooling water conditions. Each requirement specified should be consistent with equipment normally available as standard or optional in the industry.

8-4. Exhaust Provisions

The muffler should be furnished with the diesel-generator unit, and exhaust pipe size should be as recommended by

the engine supplier. Black steel pipe is satisfactory. That portion of the exhaust pipe located within the powerhouse should be insulated. The muffler is usually located outdoors, and protection provided as required for personnel safety.

8-5. Cooling

Powerhouse locations usually provide reasonable access to cooling water from a piping system, pool, or tailwater making the heat exchanger the preferred option for engine cooling water heat rejection. An exhaust fan removing air heated by engine surfaces and generator-exciter unit may discharge to either outdoors or main generator room, depending on the most practicable fan and ducting installation.

8-6. Fuel System

a. General. The engine-mounted portion of the fuel system, day tank, and transfer pump are specified and provided with the engine-generator set. The storage tank, piping from storage tank to the transfer pump-day tank unit, piping from day tank to engine, and day tank installation details are normally mechanical design responsibilities.

b. Storage tank. The storage tank is preferably a commercial steel aboveground tank coated externally and internally with suitable epoxy paint for corrosion protection. Capacity for approximately 24 hr of full-load diesel-generator operation is normally provided. Auxiliaries include a foot-valve, fuel level indicator with remote indication transmitter, and magnesium anodes for external corrosion protection. Underground tanks should be avoided because of environmental concerns caused by leaking tanks.

c. Piping. Piping from the storage tank to the day tank and from the day tank to the engine should be hard

drawn copper tubing with solder joint fittings. If the line is buried, it should be coated and the couplings insulated at the tank connections (see paragraph 19-2). Size should limit suction lift on transfer pumps to 4.6 m (15 ft). No galvanized pipe or fittings should be used in the fuel piping system. The capacity of unenclosed day tanks should not exceed a total of 2,498 L (660 gal) in accordance with National Fire Protection Association (NFPA) Standard 37 (see paragraph 6.3.2.3.1).

8-7. Installation

a. General. The installation of the engine-generator set and all auxiliaries is normally accomplished under a general powerhouse construction or installation contract. Contract drawings and specifications should be coordinated with the installation recommendations of the engine-generator supplier.

b. Engine. The engine should be supplied on a common base with the generator. Anchor bolts and vibration isolating pads should follow the supplier's recommendation.

c. Fuel oil storage tank. This tank should be installed as close to the engine-generator set as possible and at an elevation limiting maximum suction lift on the fuel oil transfer pump to 4.6 m (15 ft). If installed underground, the tank should be installed in sand bedding material and have a total containment system as required by Environmental Protection Agency (EPA).

d. Day tank. The fuel oil day tank should be located near the engine at an elevation with maximum tank oil level 127 mm (5 in.) below the injector pump.

e. Piping-ventilation. Piping and ventilation installation provisions should be generally in accordance with Chapter 17 of this manual.