

'Design Requirements Manual (DRM) News to Use' is a monthly ORF publication featuring salient technical information that should be applied to the design of NIH biomedical research laboratories and animal facilities. NIH Project Officers, A/E's and other consultants to the NIH, who develop intramural, extramural and American Recovery and Reinvestment Act (ARRA) projects will benefit from 'News to Use'. Please address questions or comments to: shawm@mail.nih.gov

Generator Physical Installation and Mechanical Requirements

Generators usually support critical electrical loads in many National Institutes of Health (NIH) facilities in case of loss of normal electrical power. Reliability of generator power source is crucial for supporting the NIH mission to health and research. As a result, generator design, installation, and operation must ensure a high degree of reliability and availability.

Generator installations shall meet NFPA 110: Standard for Emergency and Standby Power Systems and various provisions of the NIH Design Requirement Manual (DRM) and the following requirements:

- Locate generator where it easily accessible for service and future replacement.
- Provide at least 1.2 m (4 ft.) of clearance around the generator set and access for replacing the generator without moving the generator set accessories, such as a day tank.
- Locate generator away from high ambient temperatures. Provide protection from the weather and from vandalism and avoid structure-borne vibration.
- Locate generator close to the main normal power source.
- Location of the engine exhaust discharge shall be determined by wind wake and dispersion analysis.
- Locate generator where it will be acceptable to tolerate the noise generated from engine, radiator fan, and exhaust system.

Engine exhaust system shall not create excessive back pressure on the engine and shall not be connected to any other exhaust system serving other equipment. Engine exhaust piping shall comply with the following:

- Refer to the DRM Exhibit X6-3-A for requirements of the engine exhaust pipes.
- Exhaust pipes shall be freestanding, not supported by the engine or muffler.
- Pipes shall use vibration-proof flexible connectors and shall be guarded to prevent contact with personnel, and avoid personnel injuries and burns.
- Exhaust pipes shall be routed to avoid fire detection devices and automatic sprinkler heads.
- Engine exhaust shall be directed up to maximize sound attenuation.
- Exhaust pipes shall be vented to the atmosphere away from building doors, windows, and ventilation intake vents to avoid covering walls and windows with soot.
- Insulated thimble pipe fittings shall be used at the point where the exhaust pipe penetrates the exterior wall or roof.

- A hinged rain cap shall be provided on the vertical discharge.
- Horizontal exhaust pipes shall be pitched downward and away from the generator set. At the end of the horizontal run, a condensate drain trap with hose connection shall be provided. A drain valve shall be provided at the bottom of each vertical section of the exhaust piping.

The optimal generator location is outdoors in a sound-attenuated enclosure that provides 70 to 79 dB maximum noise level 6 m (20 ft.) from the enclosure at rated output, regardless of generator size. The generator exhaust silencer, or muffler, shall be rated for minimum residential use or quieter to achieve the required sound rating. Muffler shall be installed as close as possible to the generator.

For indoor generator installation, the following design requirements apply:

- Sound attenuated room shall be provided to suit the generator being installed and the surrounding occupancies.
- Include a ventilation system to remove heat and fumes dissipated by the engine, electrical generator, accessories, load bank and other equipment located in the room. A maximum 11°C (20°F) room temperature rise above ambient shall be utilized in designing the ventilation air system. The design shall take into account the additional cooling air if load bank is unit mounted.
- Air intake louvers to ventilate the generator room shall be sized to accommodate the amount of combustion air needed by the engine, the amount of cooling air that flows to the radiator and any other amount of air needed to ventilate the room.
- Air intake louvers shall require fast opening before pressurization of the intake plenum to avoid damage to louvers. The combustion and ventilation air intake shall be coordinated so that they do not draw in engine exhaust.
- The air for either cooling or combustion purposes shall be primary filtered as it enters the building from outside. The engine filter shall be considered a second and final filter for indoor units.

The paragraphs above only highlighted some of the important guidelines of the DRM. Refer to the DRM and NFPA 110 for additional requirements on generator installations. Most importantly, generator installations shall ensure a high degree of reliability and availability to support the vital NIH missions.