BAY CITY ELECTRIC WORKS

KOHLER®

LOFTIN EQUIPMENT CO.

Information Sheet # 56

Types of Generator Set Mounted Enclosures

Your Reliable Guide for Generator Maintenance

1.0 Introduction:

For today's industrial (land-based) markets, many generator sets are supplied with factory installed enclosures. Enclosures are constructed in a variety of styles and materials dependent on the manufacturer, type of installation site, and ambient conditions likely to be encountered.

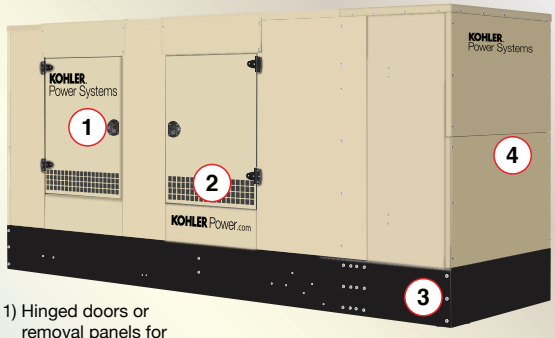
This Information Sheet takes a look at the market variations offered and available to meet a wide spectrum of installations:

2.0 Types of Enclosure:

There are two types of enclosures - free-standing and mounted enclosures. Free-standing enclosures are walk-in enclosures, mounted on the floor and encompasses the generator set(s) with space for control panels, switch gear, monitoring equipment, lighting, fuel tanks, etc. Free-standing enclosures are normally custom built. They require sufficient space at the site without interfering with access to other buildings. Any future expansion for power generator equipment should be included in the original design. This Information sheet discusses base mounted generator enclosures, the most common type of enclosure. Almost all outdoor generator sets installations will be fitted with, at a minimum, a weather-proof enclosure. In other installations where the generator's noise level is of concern and/or unacceptable, it will be necessary to utilize a base mounted sound attenuated enclosure to meet such requirements. *(Continued over)*

Sample Generator Set Enclosure Structures for Weather Protection, and Added Sound Reduction

Typical and Most Common Type of Weather Protective Enclosure



1) Hinged doors or removal panels for service access

2) Ventilation vents for cooling, radiator outlet air, and engine air intake. Vents can be fitted with hoods for rain, etc.

3) Canopy mounted to steel base frame that can contain battery, fuel tank, spill containment, etc.

4) Steel sides, in some cases aluminum, bolted together with corrosion resistant fittings.

Alternator end shown, other side will have radiator outlet vent.

Canopy bolted to base frame.

Diagram 1

Sectional Drawing of Sound Reduced Enclosure

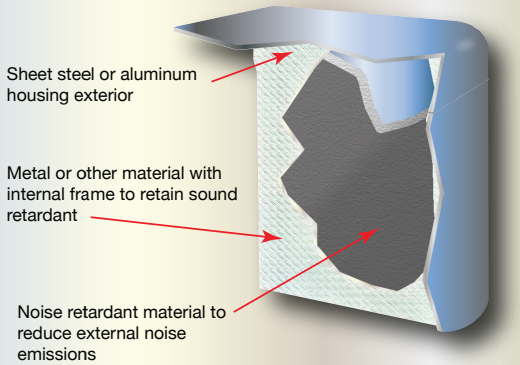


Diagram 2

Examples of Additional Accessories and Methods to Reduce Sound Emissions

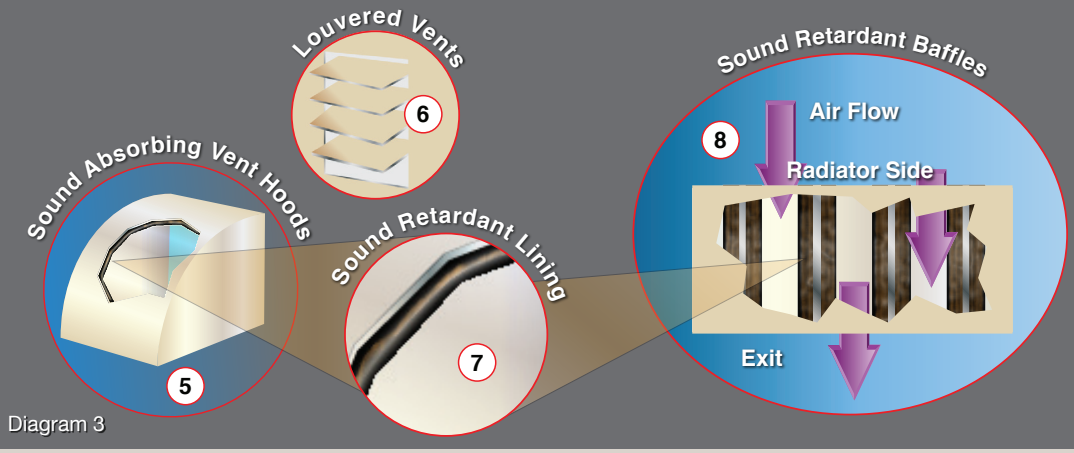


Diagram 3

5. Inlet and outlet vents can be hooded for added protection, and insulated with sound reduction material adhering to the internal surfaces.
6. Louvers fitted to vents give added protection against ingress of rain.
7. Frequently manufacturers use soft sound absorbent material that adheres to the inside surfaces on one side, and has a protective sheet on the outside.
8. Baffles lined with sound absorbent material can be used to reduce outlet noise emissions, and redirect air flow to further absorb sound emissions.

To fulfill our commitment to be the leading supplier in the power generation industry, the Loftin Equipment and Bay City Electric Works teams ensures they are always up-to-date with the current power industry standards as well as industry trends. As a service, our **Information Sheets** are circulated on a regular basis to existing and potential power customers to maintain their awareness of changes and developments in standards, codes and technology within the power industry.

3.0 Weather-Protective Enclosures:

These are not specifically designed to reduce operational noise levels and can be fairly basic with sheet metal sides and canopy constructed in an adequate gauge (thickness) bolted or welded together to form a shell over the engine/alternator, cooling system and controls. Characteristics of weather protective enclosures include:

- **Base Mounted -** The enclosure frame is bolted to the generator base frame or sub-base fuel tank.
- **Access Doors -** Access to the generator is via doors that provide servicing access to all engine, alternator, sub-base fuel tank (if fitted) and control components. Doors can be hinged or supplied as removal panels. (See diagram 1)
- **Ventilation -** A suitable number and size of louvers will allow for proper air circulation and flow for the engine's intake air as well as system cooling. The enclosure design must provide sufficient airflow to allow the unit to properly cool and develop its rated power at a given ambient air temperature - normally 122°F (50°C).
- **Lifting Point -** A single point lifting device (bale) normally is made available at the center of gravity point to allow the sets to be lifted by a crane hook into its final location as an alternative to lifting with the forklift holes provided in the sub-base.
- **Degree of Weather Protection -** It Is preferable that these enclosures be as weather proof as possible to prevent any elements like rain water, ice, snow, unauthorized entry, animal intrusion and/or debris from entering inside the enclosure. Engine and generator components, if left exposed, can be subject to corrosion, and electrical circuits could short circuit. To avoid ingress of excessive driving rain or snow, louvres are fitted in ventilation inlets and outlets. (See diagram 3)
- **Service Access -** The doors/panels should be designed to allow the technician's ready access to all service points and permit the unimpeded changing of maintenance items like filters. (See diagram 1)
- **Exhaust Mounting -** The exhaust silencer is often mounted on the roof of the enclosure but sometimes inside the canopy.
- **Additional Protection -** The manufacturer's standard weather protective canopy provides adequate protection for most outside installations. However the following type of installations may require additional protection:
    1. **In Storm Prone Areas -** Several authorities in hurricane prone areas require an enclosure to withstand wind speeds of 150 mph (240 kph). If the manufacturer's standard canopy does not meet these specifications a reinforced, braced canopy may be called for.
    2. **Seismic Resistance -** In earthquake prone areas, a seismic IBC certified enclosure and generator layout may be required.
- **Finish & Fittings -** The majority of aluminum or steel enclosures are painted with a suitable primer and top coat that are resistant to heat, cold, and weather. To prevent corrosion of fittings and adjacent metal surfaces, reputable manufacturers use fittings (bolts, nuts, washer, hinges, etc) that are resistant to corrosion.

4.0 Sound-Attenuated Enclosures:

While a weather protective enclosure provides protection to the generator set and its components, it is not designed to meet strict noise ordinances such as a sound-attenuated enclosure (See diagrams 2 & 3)

- **Healthcare Facilities -** The noise level of an open generator can be distracting and unacceptable - especially close to such installations as hospitals, nursing care clinics, etc.
- **Residential -** Today's residential market for generators installed outdoors indicates that the majority will be selected with sound-attenuated enclosures as opposed to weather enclosures.
- **Local Noise Codes -** There are numerous bodies that influence and set local codes to limit the noise level permitted. Some government agencies see noise as an pollutant.

When an outside generator installation is located in areas sensitive to noise a different type of enclosure is supplied that is designed to reduce noise emissions that emanate from all sources, not just the exhaust. To achieve the required noise reduction, enclosures are designed and constructed to reduce noise from the following areas:

- **Radiator -** Cooling air is ducted through louvres lagged with sound absorbent material (See diagram 3)
- **Baffles -** Baffles (See diagram 2) line both intake and exhaust plenums.
- **Door Seals -** Weather proof doors seals protect ingress and also noise emission.
- **Enclosure Lining -** Sheet metal in itself is not a good noise retardant, so all metal surfaces are covered with noise absorbing material. The material is located in frames or fixed with an adhesive.
- **Exhaust Silencer -** There are various grades of exhaust silencer. In noise sensitive areas a critical grade should be used.
- **Vertical Discharge -** In some locations it is desirable (and less expensive) to exhaust the cooling air through the top of the enclosure and above ear level.

The degree of noise reduction is largely dependent on cost. The standard sound attenuation of most generator manufacturers usually reduces noise below 77dBA, which addresses a high percentage of noise sensitive areas. However, for critical sound reduction areas such as movie locations, much more noise deadening material and redirection of cooling air flow is required which can significantly increase cost.

5.0 Enclosure Materials:

Sheet metal. A very large percentage of both weather and sound attenuated enclosures are fabricated in sheet metal of a sufficient thickness to provide a rigid canopy that does not bend or flex with normal use. The bare metal needs to be thoroughly cleaned removing any oil, grease or similar deposits prior to painting. Painting is carried out using a normal spray paint base suitable metal application on sheet metal without 'runs' or other defects which could affect the appearance and finish. Some manufacturers or packagers prefer to powder coat the metal enclosure, which has a higher resistance to fading, scratches, corrosion and damage from knocks and bumps.

Aluminum. Recommended for consideration in high humidity regions and/or high saline ambient air content found in coastal areas where corrosion may be a concern.

Sound attenuation material like non-hygroscopic and fire retardant foam sheets, or other such methods, are applied to the Interior surfaces of the enclosure and ducts with adhesive to absorb the noise waves.

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