

# Emergency Power Systems – Future Upgrades/New Installations

## Overview of Issue

Emergency power systems play a critical role in providing reliable power supply. Over time, parts of the emergency power system (such as generators, fuel pumps, transformers, etc.) or the whole system require replacement or upgrade due to normal wear and tear, deterioration, and/or changes in power requirements. To mitigate inherent risks with emergency power systems, risk management practices are best incorporated during project planning and design stages.

This document does not address environmental pollution concerns, fuel storage tank installations (especially underground storage tanks) and uninterruptible power supply systems.

### Key Points

To mitigate inherent risks with emergency power systems, risk management practices are best incorporated during project planning and design stages.

## Things to Consider

### Project Design

- Design all new power systems in accordance with appropriate building/fire codes, provincial and local regulations and applicable codes, including national standards. Ensure jurisdictional authorities are involved as required in the project design and coordination. Property insurers may provide valuable insight into best practice designs.
- Locate power systems and their associated fuel supply systems outside buildings, where possible.
- When located inside buildings, provide fuel pump(s) and generator(s) located at grade level with an appropriately designed fire-rated (minimum one-hour fire rating), liquid-tight cutoff room located along an outside wall with openings accessible to firefighters. For other levels within the building, provide a 3-hour fire-rated, liquid-tight, concrete or masonry vault.
- Consider locating multiple generators into dedicated one-hour fire-rated rooms to ensure continuous and reliable operation in the event of fire.
- Provide adequate automatic sprinkler protection and automatic fire detection systems in the tank room/vault, pump rooms/vaults, and generator rooms. Ensure the design is for a low flashpoint ignitable liquid hazard when diesel fuel oils are used.
- Consider installing an approved fixed special protection system in addition to automatic sprinkler protection (to limit fire) and/or as an alternative to an emergency drainage system.
- Provide a dike around day tanks designed to contain the entire contents of the tank plus two inches of freeboard.
- Provide adequate fireproofing to building structural elements and tank supports exposed to hydrocarbon pool fires.
- For sites exposed to earthquake, provide appropriate seismic design including but not limited to providing approved emergency shutoff valves designed to close automatically and shut down fuel supply during a seismic event.

- Locate electrical switchgear and transfer switches in a separate room (minimum of 1-hour fire rating) from generators and fuel supply systems. If the electrical room is adjacent to the generator or pump room, provide liquid-tight construction to prevent exposure from a fuel spill or sprinkler discharge into the electrical room.

## Fuel Distribution System

- Refer to the Emergency Power Systems – Existing Installations Risk Notes (Fuel Distribution System section) for recommendations pertaining to emergency shutoffs, leak detection, etc.
- Design the fuel pumps such that in case of a broken pipe or leak, fuel will not be able to flow out of the pipe due to gravity. Consider the following:
  - Use positive displacement pumps and weld the supply side of the pump to the tank's supply pipe.
  - Elevate the piping and pumps above the top of the fuel tank or provide an anti-siphon valve. Locate the anti-siphon valve as close to the tank outlet as possible.
  - Provide a pressure-relief valve downstream of the positive displacement pump, piped back to the supply tank.
- Arrange piping located inside buildings as follows:
  - Provide appropriately sized steel pipe and fittings. Provide welded fittings (do not use threaded fittings) in all areas outside of the tank room, pump room, and generator room.
  - Minimize the use of flexible hoses in fuel supply systems at day tanks and generators. All-metal flexible hose construction is preferred. When necessary, use high-strength, noncombustible flexible hoses that are resistant to decomposition or melting when exposed to a fire and compatible with the liquid in use. A reinforced rubber hose with a synthetic liner and a metal-braid covering is acceptable when needed to meet operational requirements.
  - Design hose joints to comply with all rigid pipe joint recommendations.
  - Design flexible hoses and fittings to have a bursting strength that is greater than the maximum expected working pressure with a safety factor of at least four.
  - Install flexible hoses in accordance with the manufacturer's recommendations.

## References

- Canadian Standards Association. (2006). Ontario installation code for oil-burning equipment.
- Canadian Standards Association. (2011). Z8000-11 Canadian health care facilities.
- FM Global. (2012). Emergency and standby power systems [Data Sheet].
- National Fire Protection Association. (2015). NFPA 99 - health care facilities code.