

Four Considerations for Implementing Sustainable Elevator Design

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Elevators might take up little space in buildings. Still, they play a significant role in a building's energy consumption and can benefit from implementing more efficient and cost-effective systems.

Gannett Fleming's vertical transportation team incorporates sustainable design practices and energy conservation into vertical transportation projects. Informed decision-making in all project phases guides the design team or building operator through implementing sustainable technologies.

Here are four ways our vertical transportation team recommends incorporating sustainable elevator design practices.

1. Reduce Power Consumption with Machine-Room-Less Elevators

Machine-room-less (MRL) elevators provide an energy-efficient and smooth ride. Traction MRL elevators incorporate smaller, gearless machines, typically using variable-speed and variable-frequency drives with the latest digital technology. MRL elevators are more easily installed than traditional overhead traction elevators. They have a smoother, quieter ride than a hydraulic elevator.

These smaller and more efficient machines represent a significant reduction in power consumption by as



much as 70% over hydraulic elevators. With elevators [accounting for 2% to 5% of energy consumption](#) in a building, clients can gain significant energy savings using MRL vertical transportation solutions.

An MRL elevator's lower overhead requirement reduces the elevator's footprint, resulting in a sleeker roofline appearance and reduced heating and cooling loads. Using ropes and belts instead of standard steel hoist cables eliminates lubrication requirements.

Points to consider about MRL elevators:

- » Traction MRL uses smaller, more efficient machines.
- » Traction MRL power consumption reduced as much as 60% compared to hydraulic elevators.
- » May avoid machine room, allowing for sleeker rooftop appearance.

- » Reduced footprint within building.

BENEFITS OF MRL ELEVATORS

MRL technology delivers higher energy efficiency within the hoistway, resulting in:

- » Reduced electrical consumption.
- » Lower lifecycle costs.
- » Eliminated need for overhead penthouse construction.
- » Minimized heating and cooling requirements.
- » Improved durability and maintainability eliminate the need for soil/water contaminating hydraulic fluid.

DRAWBACKS OF MRL ELEVATORS

Unlike the commonly acceptable hydraulic and traction elevator standards, sizing and space requirements differ among the various MRL manufacturers.

- » Various hoistway plans and elevation footprints make it challenging to provide a design that enables the participation of each MRL elevator manufacturer.
- » MRL technology can be highly proprietary, resulting in a forced long-term relationship for preventive maintenance between the owner and MRL elevator manufacturer.
- » Customizing elevator designs is limited to a manufacturer's standard options for car enclosures, entrances, and operating/signal fixtures.

2. Be Wary of Leaky Hydraulic Elevators

Hydraulic elevators pump hydraulic fluid to a cylinder/plunger assembly that vertically moves the piston that raises the elevator cab and lowers it back down. The conventional cylinder/plunger assembly resides in a well hole directly beneath the elevator.

Years ago, these assemblies were installed with little or no protection from the subsurface elements. Without the ability to inspect the assembly beneath the surface, damage to the cylinder that would result in a hydraulic

fluid leak could go unnoticed. The consequences could be soil and groundwater contamination. Fortunately, leaks have become less common as these elevators are replaced or modernized.

A maintenance contract does not cover the hydraulic leak repair. The cylinder/plunger assembly cost, including the required remediation of contaminants, can range from \$30,000 to greater than \$100,000. Prices vary due to the unknown condition of well holes and the drilling necessary to incorporate polyvinyl chloride (PVC) liner protection.

Hydraulic elevators must be housed in a controlled environment, requiring heating and possibly air conditioning. Remote piping running underground is another potential problem for temperature control and leakage.

Hydraulic elevators have a shorter life expectancy than traction elevators. They are subject to repair or improvements that do not apply to traction elevators. However, hydraulic elevators have a lower price point and are popular for lower-rise applications.

Points to consider about hydraulic elevators:

- » Shorter life expectancy and additional maintenance than traction elevators.
- » Reduced costs compared to traction elevators.
- » Poorer ride quality than traction elevators.
- » Requires a controlled environment.

3. Enjoy the Smooth Ride of Traction Elevators

Traction elevators are driven by a geared or gearless machine incorporating steel hoist cables that ride over a drive sheave. They typically are affixed to a counterweight assembly and car crosshead. In the case of overhead traction elevators, you must provide a penthouse structure that encloses the elevator equipment and supports the elevator loads. Traditional overhead traction elevators require a machine room at the hoistway's top.


With a basement traction machine room, the machine

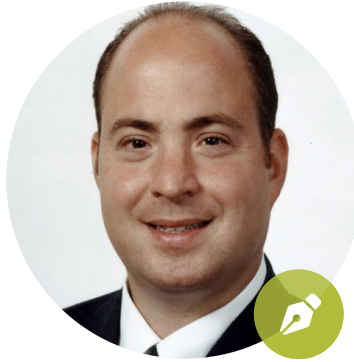
is located at a lower level. A basement room can be an option when a roof-mounted machine room is impossible or not desired. Traction elevators that are not MRL have larger capacities available. In certain applications, it is easier to control the machine environment with the machine located in a separate machine room than in the hoistway.

Points to consider about traction elevators:

- » Machine room required.
- » Larger capacities available than traction MRL.
- » Smoother, quieter ride than hydraulic.
- » Easier to control machine environment in machine room.

4. Consider Following LEED® Practices

The U.S. Green Building Council's green building rating system, Leadership in Energy and Environmental Design (LEED), distinguishes sustainable building projects that meet the highest performance standards. By design, MRL elevators save space, reduce waste, and are the most energy-efficient elevators, resulting in lower operating costs. They are a natural fit for those concerned with eco-friendly elevator design. Even if facility owners are not interested in pursuing a LEED-certified project, they can be interested in learning how they can save energy and money. 



About the Author

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About the Article

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