Machine Room Less (MRL) elevators are an emerging yet proven technology and should be seriously considered for low- to medium-rise residential and commercial construction. For the building science and design community, this means learning about this innovative product line to fully understand the impact on the design, construction and maintenance of building stock.

Although elevators have been in use for over 100 years, in just the last 10 years, MRL elevators have become a dominant force in North America. Market share for MRL elevators is anticipated to continue growing in the coming years as well. In a business that has been traditionally conservative in embracing new approaches, the growth of MRL elevators has been unprecedented. There are good reasons for this: specifying and installing MRL elevators offers tangible advantages for everyone — the design community, the environment, users and owners.

As the name implies, MRL elevators avoid the need for the more conventional machine room above the hoistway by locating the hoist motor in the overhead machinery space and employing a smaller controller cabinet that can be positioned with some flexibility near the elevator hoistway. Depending on code requirements or customer preference, the controller equipment can be installed within a simple closet or cabinet adjacent to or near the hoistway.

MRL elevators have the usual components — cab, doors, motors, rails, etc — but because of the smaller footprint and more efficient motors, the equipment can be adjusted accordingly without any compromise in safety, engineering and quality. Everyone in the elevator supply chain benefits.

Providing convenience for the design community
Some manufacturers of MRL elevators have standardized their product line offerings to deliver cost efficiencies. By standardizing the product line, they have reduced the need for one-time or seldom-used parts that could add to potential costs and service and inventory problems in the field. For example, because there are limited options available with a standard MRL elevator, production time tends to be shorter; in an industry where long lead times are the norm, it is a refreshing change. As in the restaurant business, the shorter menu doesn’t necessarily mean less choice — it is just a well thought-out menu that focuses on delivering reliable on-time products!

The design community has listened to their customers and created a ‘short menu’ that generally offers what the building community needs. MRL elevators are available in a range of speeds, typically 200 and 350 fpm with some slower for low-rise applications, and in some cases higher for the top end of mid-rise market. Capacities rival most traditional traction elevator offerings, covering the bulk of the market, so different building applications and uses can be easily serviced by an MRL elevator. Buildings in the upper end of the mid-rise segment can be serviced with an MRL elevator, depending on the manufacturer and the configuration. Always check with the manufacturer for the latest available configurations and a complete list of design specifications.
The ‘menu’ may be shorter than with other types of elevator, but there is still plenty of creativity on the plate! The cab and door choices include baked enamel, stainless steel, or bronze. A range of ceiling designs and finishes also can reinforce the aesthetics that the designer demands. Handrails, as required by ADA, typically come in complementary finishes such as stainless steel, bronze or aluminum, with other non-standard options available upon request.

In most cases, MRL elevator manufacturers do not supply the finish flooring of the cab, as often the designer will want to use the same flooring in the elevator cab that is used in the lobbies or hallways. As a result, the sill of the cab may sit 3/8” above the floor of the cab to accommodate either tile or carpet. For thicker materials, such as marble flooring, deeper recesses may be available.

The control space can often be as simple as a small closet or cabinet (42” x 80”) on the top floor, located either directly on one wall of the hoistway or a short distance away, depending on the suppliers offerings and the building layout. Generally equipped with a light, phone line connection, main power disconnect and car lighting disconnect, the control space is secured by a self-locking door. Additional ventilation (heating or air conditioning) may also be required to remove the heat released by the elevator equipment. For example, the design specification may require that the control space cabinet be maintained between 55˚ and 90˚ F at a relative humidity of less than 95% non-condensing.

A tangible example of convenience is the on-line design tools offered by leading MRL elevator manufacturers. Based on feedback from architects, one MRL manufacturer claims that using these on-line tools can save over 6 hours of costly architect time — time that can be better used for other design tasks. By entering the design parameters, such as application, service, door type, capacity, speed, length of travel and other variables, drawings can be easily generated and then imported into the design drawings. Preparing MRL elevator specifications are just as easy: enter the basic configuration, cab and hoistway variables, as well as any other options and the CSI-conforming specification can be downloaded.

Once the design has been finalized and the MRL elevator contract issued, some manufacturers also offer project management tools. Updated in real time, the designer can log into a secure password-protected site to view the on-line job tracking and scheduling of the MRL elevator and other vertical transportation equipment specified in the contract.

On-line, time-saving design tools include drawings and specs, available to download or use from CD-ROM.
For contractors, site preparation is also easier with MRL elevators. Depending on the elevator manufacturer, interfaces and cutouts into the building structure can be limited just to essential items like the hoist beam and overhead support. Some MRL elevators even come equipped with the floor indicators, direction arrows and call button all mounted in the corridor entrance jamb. And even the installation is simpler: in some cases, the MRL elevator can be installed through the lower hoistway, eliminating the need for a costly overhead crane to lower the elevator into place.

To ensure a successful design and subsequent installation, however, it is critical that designers partner early with MRL elevator manufacturers as each manufacturer offers slightly different sizes (such as hoistway dimensions, clearances, and pit depth) and installation procedures.

**Addressing environmental demands**

Today, minimizing the environmental footprint has become a determining factor in many decisions and the criteria for selecting elevators should also consider the environmental impact.

The energy costs that arise from operating elevators are a concern, especially with the rising cost of electricity. Electricity is used to power the hoist motors, used to raise and lower the elevator car, as well as ventilate the hoistway and control space cabinet. Although each MRL elevator manufacturer has slightly different variations, generally gearless motors with ACVF technology control the permanent magnet synchronous motors, requiring up to 40% less energy than more traditional geared traction motors. And because the motors are smaller, they generate less heat, thereby further reducing the HVAC load. Smaller energy demand also requires less emergency generator capacity; further reducing construction and operational costs.

Like traditional traction elevators, MRL elevators do not require the use of hydraulic oils to move the elevator, so there is never an issue with hydraulic oil leakage or corresponding site contamination.

Using a control space cabinet instead of a dedicated machine room not only allows for more rentable space, but also requires fewer roof penetrations. Installing a large, expansive, ‘green’ roof with plantings is now a viable option with MRL elevators.

‘Green’ initiatives will continue to make inroads in the marketplace. More and more buildings are also applying for Leadership in Energy and Environment Design (LEED®) certification, a design initiative of United States Green Building Council (USGBC). Using a building system approach, various components contribute to ‘credits’ or points that help the building achieve different certification levels. Elevators are not exempt; they can also contribute credits in a number of areas — from using low VOC materials to allowing the use of green roofs. Again, to maximize the allowable credits, partner early with MRL elevator manufacturers to ensure the necessary supporting documentation and sustainable strategies are in place.
Meeting building code requirements
In the past, one of the main obstacles to using MRL elevators has been limitations in the governing codes. The technology of MRL elevators was not reflected in earlier editions of the A17.1 Safety Code for Elevators and Escalators. As a result, significant work was required to obtain the necessary documentation and approval on a case-by-case basis every time an MRL elevator was specified.

Thanks to the diligent work by the design community over the last 10 years, MRL elevators are now directly referenced in the codes. In 2005 the American Society of Mechanical Engineers, ASME issued a special supplement to the model elevator safety code called A17.1S that addresses MRL elevators and the associated safety requirements. Last year, this supplement was incorporated in the joint publication by ASME and the Canadian Standards Association ASME A17.1/CSA B44-2007 Safety Code for Elevators and Escalators.

With more and more states and municipalities adopting the ASME A17.1/CSA B44-2007 standard, the need for supporting documentation and approval on a case-by-case basis is slowly becoming a thing of the past. However, in states that are still using the A17.1-2004 or earlier codes, the MRL manufacturers can easily support and supply the required documentation for the approval process.

In locations where seismic or earthquake protection is required, most MRL elevator manufacturers offer appropriate safety packages like on traditional traction elevators. For example, if a seismic event is detected by a seismic sensor, the car will stop at the nearest available floor and open its doors. Any elevators not in operation will remain at their current landing. Additional hardware, such as guide rail retainers and rail bracket protectors, may also be required in these jurisdictions.

Always contact the local jurisdiction early in the design process to confirm if any additional documentation, installation requirements or approvals are required. For example, some jurisdictions may require a work platform in the upper hoistway or on top of the elevator cab to ensure the safety of the elevator service technicians.

Delivering customer satisfaction
Customer satisfaction is paramount for both the user and the building owner, and MRL elevators consistently meet or exceed the expectations of both.

For the user of an MRL elevator, the quality of the ride is immediately apparent compared to more traditional elevators. Not only is the ride quiet within the elevator cab, but the gearless motor delivers a smooth stop/start at each floor compared to a worm gear AC or DC motor.
Because of the variety of design options within the standard offerings, the cab styling can easily support or even enhance the building’s beauty.

The building owner also realizes the benefits of MRL elevators, right from the start. Using high efficiency permanent magnet gearless motors can realize — up to 40% energy savings compared to more traditional elevators — year after year.

Many MRL elevator manufacturers offer remote monitoring of the vertical transportation equipment using a phone line and modem from the control space cabinet. Diagnostic information from the controller transmits errors, warnings and status updates to a central facility for processing. For example, this might include monitoring door operation, leveling, critical circuit board failures and entrapments/ shutdowns. This approach allows a predictive analysis — trends and potential problems can be determined in advance and a trained service technician dispatched to the building in advance of a more-costly call or downtime.

For a building owner, it is critical that accurate and real-time information is readily available to help ensure the long-term operation of equipment, including elevators. In response, one elevator manufacturer has developed an on-line, computer-based service. By simply entering a unique identifier, the building owner can access the elevator’s performance data, service history and can choose when to be proactively notified of certain events by e-mail.

**Putting it all together**

Ten years ago, MRL elevators were considered leading edge technology and were perhaps viewed with some hesitation and skepticism. However, MRL elevators have become more commonplace and are now readily accepted by many code officials and the design community. The next decade will see MRL elevators become the dominant technology; especially as additional market penetration will support cost savings in the controllers and motors.

Specifying and installing MRL elevators can offer tangible advantages for everyone in the building community. Consider an MRL elevator today.

**About the author**

Bill Glas, Schindler’s Product Line Manager for traction elevators, is responsible for the New Installation Custom Modular Product Line and Traction Application Engineering. He holds a Bachelor of Science degree in Engineering Science and Mechanics as well as a Masters of Engineering, Industrial Engineering, from Pennsylvania State University. He can be contacted at Bill.Glas@us.schindler.com or 973.397.6517.