Urban Rapid Transit Systems – An Overview

Urban rapid transit systems (RTSs) have been in use since the middle of the 19th Century. The world’s oldest system is in London, which went into service in 1863. Although originally steam powered, the London underground system was electrified in 1896. Shortly thereafter, RTSs were opened in Budapest (1896), Boston (1898), Paris (1900), Berlin (1902) and New York City (1904). In the 1920s and 1930s, systems were put into service in Madrid, Tokyo and Moscow. In the 1950s and 1960s, Toronto and Montreal opened RTSs. By the year 2000, there were 95 rapid transit systems operating in 59 countries, with 11 in the U.S.

Railways used in these systems may have portions of the track below, on or above ground on elevated structures. However, the terms “subway” and “metro” are used to describe those systems that have most of their tracks running underground and through the hearts of the cities they serve. While the largest subway system is in NYC, which carries 1.2 billion passengers a year and has more than 245 miles of track with 6,723 cars and 463 stations, there are many smaller systems that provide equally important means for people to quickly and efficiently travel in and around densely populated urban centers. RTSs are essential to effective traffic flow in most of the world’s major cities. Equipment manufactured and installed by the elevator industry throughout these systems is necessary to RTS operation as well.

With track systems located well below ground or high above city streets, elevators and escalators are essential elements of metro systems. Most stations are approximately 10 feet below ground, while some cities, such as Moscow, have stations as deep as 15-20 feet below the street level. Chicago and NYC have RTS lines elevated two or more stories above grade. In NYC, there are locations where elevated lines cross over each other, putting the topmost line 50-60 feet in the air.
Vertical transportation units in some systems number in the hundreds. These units must operate reliably in severe weather conditions, harsh environments and, often, in remote locations. The challenge for equipment designers, maintainers and RTS operators is to develop specifications and operating procedures that will ensure continuous safe and reliable operation of various types of vertical-transportation (VT) equipment throughout their systems. In many cases these units are required to operate 24 hours a day, seven days a week; therefore, heavy-duty, weather-tolerant equipment is utilized and provided with remote monitoring capability. While numerous systems operate in this manner throughout the world, earlier this year ELEVATOR WORLD had the opportunity to firsthand observe the Baltimore Metro, also known as the MTA.

The Baltimore Metro

While the Baltimore Metro may not be one of the largest of these systems, it does contain all of the elements of a major system. Its operators face significant challenges to keep the elevators and escalators scattered throughout the extensive system running during the extreme weather conditions that are common in the mid-Atlantic region of the U.S. This system is important to both the citizens of Baltimore as well as the numerous tourists who visit this historic U.S. seaport city. Our recent visit afforded us the opportunity to ride through a large portion of this system and observe many of the remotely located elevators and escalators.

The world-renowned engineering firm of Gannet Fleming is working on a large number of engineering projects for the MTA. The Gannet Fleming Vertical Transportation group, known as VTX, provides consulting services geared specifically toward the needs of metro system operators. VTX is currently the MTA's elevator and escalator consultant on numerous equipment refurbishment and maintenance management projects. VTX has developed and is also currently implementing a remote monitoring program to enhance the reliability and safety of the Baltimore Metro's vertical transportation equipment.

VTX President Patrick Welch took us on a tour of the Baltimore Metro to provide an overview of what his organization has accomplished for the MTA. The trip began with a visit to the MTA central command station. Wayne Jones, PE, chief mechanical/electrical facilities engineer, explained how the remote monitoring system works and how the MTA utilizes it to keep track of the operational status of the equipment located throughout the 15.5-mile, 14-station system.
The elevator and escalator modernization project calls for the complete refurbishment of 33 elevators and 81 escalators located throughout the Metro system. The elevator modernization includes new controllers, machines and drives, in addition to ADA upgrades. The escalator modernization includes new controllers and updated code-required safety devices.

VTX’s on-call services include the following tasks:
- Preparation of cost estimates
- Construction management by full-time QEI inspectors
- Elevator and Escalator modernization contract management
- Inspection and acceptance testing of equipment for quality control, performance and code compliance
- Development of wireless remote monitoring systems

Continued ▶
▲ New escalator controllers

▲ New hydraulic elevator controller

▲ New governor

▲ Upper handrail drive
VTX developed the wireless, remote monitoring Oculus Network™, which is used throughout the Baltimore Metro to monitor elevator and escalator equipment operation. Oculus identifies and logs equipment problems and shutdowns (see screen captures), and is used to schedule corrective and preventative maintenance on all of the MTA's elevators and escalators. The equipment refurbishment, repair and maintenance work is contracted out to various elevator companies with all of the vertical transportation equipment fitted to interface with the Oculus Network.
The Metro operates from Owings Mills Corporate and Shopping Plaza located in the Baltimore suburbs, into and through the heart of Downtown Baltimore and to the world-renowned Johns Hopkins Medical Facility. VTX provides on-call consulting services for modernization and maintenance management on 33 elevators and 81 escalators located throughout the metro system. Welch and VTX Vice President Kenneth Hamby, along with a team of engineers and project managers, have developed a full-scale elevator and escalator equipment modernization and project management program.

Jones continued the tour by showing us the escalator remote monitoring display panels that are located in his office. He demonstrated the system’s indicating and troubleshooting capabilities, and explained MTA’s operational and management procedures that the monitoring system is used to enhance. The Baltimore Metro system is one of numerous systems on which VTX is consulting. It is representative of how the company approaches its projects and implements the service provided to its clients. Additional metro systems that VTX provides consulting services for are located in the cities of Chicago, Dallas, Massachusetts, Buffalo, Philadelphia and Washington D.C.

Urban RTTs are the backbones of the cities they serve. Reliable and safe operation of these systems is crucial to the overall operations of the metropolitan areas in which they are located. While the Baltimore Metro’s VT system may not be the largest in the world, its operational program is representative of a good way to ensure a high degree of up time on its vertical transportation equipment. It is a model for other RTT operators to consider implementing in other metro systems as well.
At VTX, our group of industry professionals specializes in elevators, escalators, moving walks, and technology consulting. We recognize that each project requires a detailed, integrated process that is customized to meet the owner’s needs. Our designers, industry experts, and analysts have one focus: to help our clients achieve their goals through practical design and program management.

800-830-4668
info@vtexcellence.com
www.vtexcellence.com