

Module 1

TYPES AND STYLES OF ELEVATORS AND ESCALATORS

Outline

- 1-1 History of Transit Vertical Transportation Systems
- 1-2 Elevator Facts
- 1-3 Transit Elevators and Escalators Today
- 1-4 Introduction to Transit Escalator Systems
- 1-5 Introduction to Transit Elevator Systems
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Purpose and Objectives

The purpose of this module is to introduce the types and styles of vertical transportation commonly found in U.S. transit systems.

Following the completion of this module, the participant should be able to complete the objectives with an accuracy of 75% or greater:

- Identify common types of escalator and elevator systems used in U.S. transit system.
- Compare how internal and external drive system escalators operate.
- Describe how a traction and hydraulic elevator system works.
- Identify the type and number of elevator and escalators used within the participant's agency.

Key Terms

- | | | | |
|---|--|--|----------------------------|
| • Alternating current (AC) | • Direct current (DC) | • Holeless hydraulic elevator | • Pit (lower landing) |
| • American Public Transportation Association (APTA) | • Direct plunger system | • Hydraulic elevator | • Pump |
| • American Society of Mechanical Engineers (ASME) | • Elevator | • Internal drive | • Riser |
| • Americans with Disabilities Act (ADA) | • <i>Elevator Industry Field Employees' Safety Handbook (EIFESH)</i> | • Landing platform | • Roped hydraulic elevator |
| • Balustrade | • Escalator | • Machine room-less (MRL) | • Sheaves |
| • Brakes | • External drive | • Modular escalator | • Skirt/skirt panel |
| • Car | • Feet per minute (fpm) | • Newel | • Steps |
| • Combplate | • Floor plate | • Occupational Health and Safety Administration (OSHA) | • Tank |
| • Counterweight | • Handrail | | • Traction |
| • Cylinder | • Hoist ropes | | • Traction elevator |
| | • Hoistway | | • Tread |
| | | | • Truss system |

1-1 HISTORY OF TRANSIT VERTICAL TRANSPORTATION SYSTEMS

History of Transit Escalator Systems

Escalators are moving inclined stairways that operate like a conveyor belt to move people up and down. Like a conveyor belt, escalators rely on a rotating chain loop to pull steps in a constant cycle at a consistent speed usually 90-100 feet per minute (fpm). The idea for using escalators dates back to the late 1800s.

In March 1892, an inventor named Jesse Reno (Figure 1) filed a patent at the U.S. patent office. His “Endless Conveyor or Elevator” was not destined to end up as a set of drawings gathering dust, although it was not constructed immediately.

Reno’s design was basically an inclined conveyor belt with metal cleats that inclined people’s toes rather than their heels. *Figure 1 Jesse Reno*

His first machine was built in 1896, and curiously was actually advertised as an amusement ride at Coney Island rather than a form of transportation. It was a great success, attracting 75,000 riders.

Reno wasn’t the only person interested in the idea, however. In August 1892, George Wheeler appeared at the patent office with his design for an “*elevator*.” It was in fact a moving stairway, and the design is the basis for modern escalators (Figure 2).

Wheeler never did see his design constructed, and eventually sold his idea to a gentleman named Charles Seeburger.

While Jesse Reno can be credited with the construction of the first viable moving stairway, Seeburger is responsible for developing the product that is in use all over the world today. He is also responsible for the word *escalator*, which is a combination of the word *elevator*, and the Latin word for step, which is *scala*. Seeburger was working for the Otis Company, which was trying to develop a prototype of the escalator and took a lot of Wheeler’s ideas and incorporated them into the eventual design for Otis.

The main difference between Reno’s

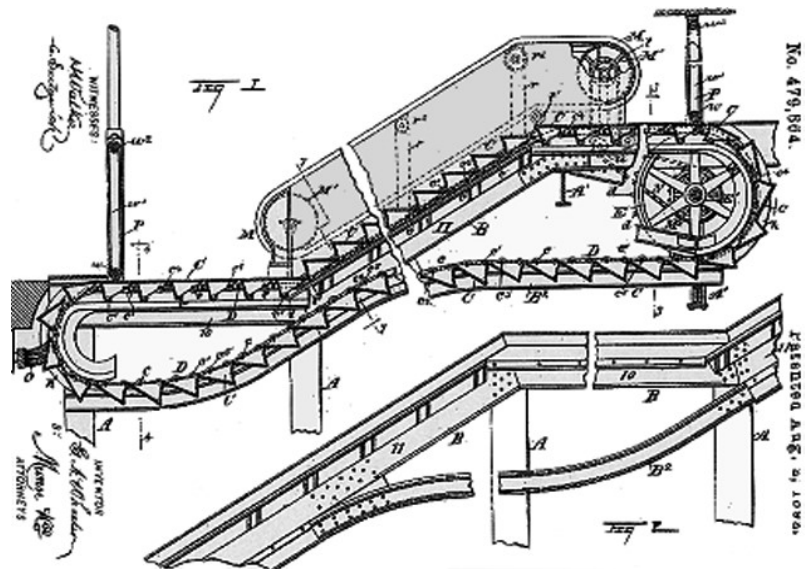


Figure 2 Moving Stairway

and Seeburger's design was that the Seeburger model was really a moving stairway as opposed to Reno's inclined conveyor belt. However, the surface of the steps was flat, and, unlike today, there was no comb-like device at the end of the escalator to prevent clothing getting caught. In addition, to guide passengers off of the escalator, there was a curved barricade that would gently steer people from the machine (Figure 3). Seeburger's design was the first commercial escalator brought into service, and in 1900 it won first prize at an exhibition in Paris, beating competition from Reno, among others.



Figure 3 Seeburger Escalator

Reno and Seeburger were to be competitors in the early escalator market, but Seeburger's design gradually began to dominate, although escalators were still nervously viewed by many people in the early 1900s. When a Seeburger-type escalator became the first such device to be installed in London's subway system at its Earls Court station, the transit authority went to unusual lengths to reassure passengers that it was safe to use. A one-legged man, who became known as "Bumper" Harris, was employed to ride on the escalator to demonstrate how safe it was. More cynical observers questioned how Harris had ended up with one leg in the first place and claimed he must have lost it the first time he rode the escalator. However, the cynics were in the minority, and the escalator soon won acceptance in London.

The Otis Company eventually purchased Reno's patent and began to incorporate the best elements of the two designs. Seeburger's flat steps were no longer flat, but now had slats just like the treads on a Reno-type escalator (Figure 4), and the distinctive barricade guiding people off became a thing of the past. Instead, the steps leveled out for a short way at either end, allowing people to walk on and off. This basic design has stood the test of time, and despite advances in technology that have improved the efficiency and safety of these machines, the escalators in use today bear a striking resemblance to those of the early 20th century.

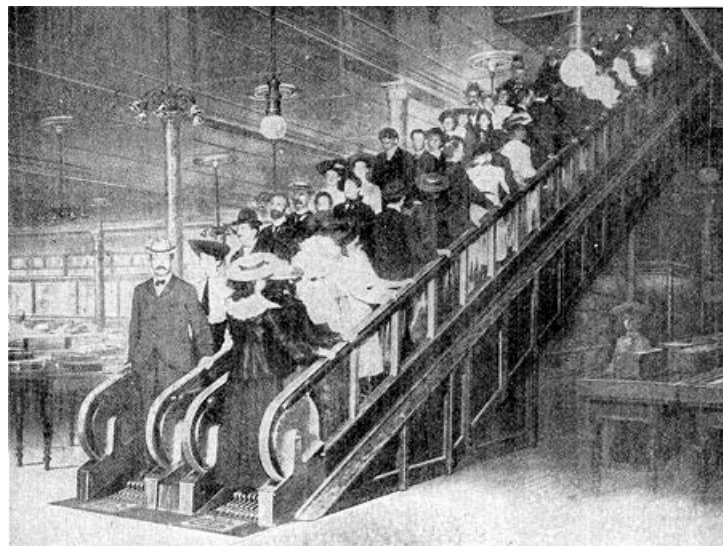


Figure 4 Reno-Type Escalator

Transit agencies were quickly adopted escalators as a means to move passengers safely to and from their facilities. London, Boston, and New York have been using elevator and escalator systems to move passengers since the early 1900s. In 1903, the *New York Times* published an article that described the efficiency of escalators in moving passengers during rush hour as compared to elevator systems. The cost to maintain or improve existing escalator/elevator systems has been an ongoing concern for major transit systems since their introduction.

MAGIC STAIRWAYS

by John H. Lienhard

Today, a magic stairway carries us into a new way of life. The University of Houston's College of Engineering presents this series about the machines that make our civilization run, and the people whose ingenuity created them.

Escalators were rare when I was young. In the 1930s it was heady adventure for a five-year-old to visit the one department store downtown that had one. Yet the idea wasn't new. An escalator that had most of the features of the modern ones was patented in 1859. It even had that comblike structure to let the steps emerge out of the floor and vanish back into it.

What we didn't have until the 1880s were electric motors to drive escalators. Steam-driven elevators were around in 1859, but who would install a whole steam engine just to drive a stair way! Besides, escalators make sense only when you want to move a lot of people. Mid-19th-century buildings weren't more than seven floors high. It's only when buildings are very high that you have to move a lot of people in the lower floors.

So escalators lay fallow until the 1890s. Then a spate of electric-powered moving stairways appeared. The first one was built in 1896 when Jesse Reno made a little 6-foot stairway that lifted people on to the Coney Island pier. Then, just four years later, the 1900 Paris Exhibition displayed four different kinds of escalators -- including Reno's. Escalators were catchy, but they were still a fairground ride, not a functional necessity.

The Coney Island success made Reno into America's leading escalator designer. From Coney Island his machines went into New York department stores and then into the Boston subways. The Otis Elevator Company bought Reno out; but the whole enterprise didn't reach much beyond novelty. By 1920 no escalator company operated more than 200 units.

Finally the Otis company sorted through the features of competing systems. They sifted out the best ones and made what's been the standard escalator ever since -- a machine that can carry 8000 people an hour up a 30x slope. Only then did escalators start to become commonplace. Only then did escalators show us their real role in our lives. They aren't so much labor savers as they are space savers. They keep people moving in crowded public places -- like subway stations and the lower floors of high-rise buildings.

Yet the old Reno escalator was a solid piece of equipment, and many are still in use. You can spot them in the Boston and London subway systems. They have a characteristic structure of wooden slats that make up their treads and risers.

When I was five, being swept up the stairs was high adventure. I didn't know I was seeing a convergence of techniques that was taking us into modern, high-density city life.

OVERVIEW OF VERTICAL TRANSPORTATION COURSE
MODULE 1: TYPES AND STYLES OF ELEVATORS AND ESCALATORS

I'm John Lienhard, at the University of Houston, where we're interested in the way inventive minds work.

Worthington, W. Jr., Early Risers. *American Heritage of Invention and Technology*, Winter, 1989, pp. 40-44.



ELECTRIC TRAVELING STAIRWAY IN A DEPARTMENT STORE
An escalator, operated by an electric motor, in a department store. Moving stairways, such as this, consist of endless belts, upon which one may stand or walk and be carried upward.

Figure 5 Electricity in Everyday Life, 1904, Provided by the Linda Hall Library

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