



SecuriSmoke ASD

EARLY WARNING FIRE DETECTION FOR ESCALATORS, TRAVELATORS & ELEVATORS

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Introduction

When in 1857 the world's earliest modern 'safety elevator', powered by a steam engine, went into service in New York City, USA, it climbed at a – then staggering – rate of 0.2 m/s (40 ft/min). Since then, technology advanced the development of the modern built environments from residential apartments, shopping malls to skyscrapers became practical for their occupants. The world's biggest elevator, at AngloGold Ashanti's Mponeng Gold Mine in South Africa, drops in three minutes an astonishing 2'283 m (7'490 ft) in its first single descent and then further to 3'597 m (11'800 ft) in a second elevator. Both run at speeds of almost 18 m/s (40 mph). The current world's tallest elevator at 660 m (2'165 ft) in the tallest commercial building, the Kingdom Tower in Saudi Arabia, which stands a full kilometre in height, runs at speeds up to 10 m/s (over 22 mph). The fastest commercial elevator can reach a speed of 20 m/s (44 mph) at the Guangzhou CTF Financial Centre, means it will take just 43 seconds to travel 95 floors up the 440 m (1'444 ft) shaft.

Evolution of escalators and elevators

The first escalator (then known as an incline elevator) was also installed in New York City in 1893. It elevated passengers on a conveyor belt at a 25-degree angle and travelled only a little over 2 m (7 ft). Contrary to faster travel speed for elevators in skyscrapers, escalator speeds are very slow and vary a great deal depending on the use. For instance, those in shopping centres in London tend to run at about 0.5 m/s (100 ft/min), whilst the London Underground standard is 0.75 m/s (150 ft/min). For city metro and transit networks in different countries, the escalator speed can vary from 0.6 m/s up to 0.8 m/s (120 ft/min up to 160 ft/min) at MTR in Hong Kong. But the basic design principle of average waiting time and handling capacity is similar. As such, to compensate for relatively slow-moving escalators in crowded public buildings like metro stations, the length of escalators and travelators is increased. Some of the longest escalators are commonly installed in metro or rapid transit networks. Examples include 138 m (453 ft) in length (69 m (226 ft) of elevation change) in St. Petersburg Metro, Russia, 120 m (400 ft) in length (60 m (200 ft) of elevation change) in Istanbul Metro, Turkey or 112 m (367 ft) in length (53 m (173 ft) of elevation change) in Chongqing Metro, China.

Mixed-occupancies and Separated-occupancies

Safety of escalators and elevators is paramount. One of the oldest Safety Codes for Elevators, first published in 1921, evolved to be known as ASME A17.1/CSA B44 [1] and A17.7/CSA B44.7 [2]. Similar codes and standards for escalators and elevators for instance EN 81-20/EN 115-1 [3], ISO 8100-32 [4] or AS1735.12 [5] ensure the conformity to health and safety regulations. These codes generally outline the requirements that are associated with the construction and the design of the elevators and also cover installation, testing, inspection, maintenance and the operation of the elevator.

Extensive construction and design standards

When escalators and elevators are designed within a specific building occupancy, for example large sport stadia or mix-use transportation hubs, building and life safety codes such as NFPA 101 [6], NFPA 5000 [7] and the International Building Code [8] often reference and mandate the use of the A17.1 expert consensus code on elevators. Others such as ABCB Handbook of Lifts Used During Evacuation [9] provide further details on the use of elevators in the event of an emergency evacuation. In the context of building and life safety, the design principle of average waiting time and handling capacity for escalators and elevators is no longer just a comfort factor of the occupants and efficiency for business operation. It is also affecting how early a fire or smoke incident can be detected and the quickest safe egress for orderly evacuation.

Using elevators and escalators as means of egress

When escalators, travelators or elevators are used as part of the egress route, a fire incident starting from these areas can present both technological and behavioural challenges when not detected early. Such challenges are for example, how escalators or elevators should be managed when a fire or smoke incident is detected, how to avoid potential stampede on crowded escalators or how to ensure

Technological and behavioural challenges