

Buildings Systems

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Start of Service of World's Fastest Elevator

The world's fastest elevator^{*1} has begun service at its delivery site in Guangzhou CTF Finance Centre, a skyscraper complex in the city of Guangzhou, China. Guangzhou CTF Finance Centre is a skyscraper complex with a height of 530 m above ground level, making it one of the world's tallest buildings. It contains offices, serviced apartments, hotels, and commercial facilities.

The Rosewood Guangzhou Hotel opened for business on Levels 93 to 108 of the building on September 10, 2019. With a rated speed of 1,260 m/min (75.6 km/h)^{*2}, the elevator links the first above-ground level to the hotel lobby on Level 95. The elevator incorporates a number of drive and control technologies used to produce the world's top speed, such as a large-capacity traction machine with 347-kW motor and a 2,200-kVA parallel-drive control panel. It also has technologies designed for safety and comfort. Its operation was demonstration-tested in May 2016, when it achieved a speed of 1,200 m/min (a world record at the time).

The main technologies developed and applied to provide safety include brake equipment made of a

braking material offering outstanding heat resistance, and an electronic safety system driven by functional safety technology. The main technologies used to provide comfort include the application of a car capsule structure designed to reduce noise in the car. It was developed using computational fluid dynamics analysis technology gained from high-speed train development work. Another example that was developed and applied is an up/down active system that can inhibit multiple vibration modes to reduce vibrations in the car received from minute guide rail level differences and curves.

After further improvements were made to control equipment and safety equipment for technical objectives, the elevator was officially certified in April 2019 with a speed of 1,260 m/min by an accreditation body Guangdong Institute of Special Equipment Inspection and Research (SEI).

Hitachi will continue to draw on the technology and expertise gained from the bid to reach the world's top speed to provide safe, secure, and comfortable elevators.

^{*1} As of September 2019, as determined by Hitachi.

^{*2} The running speed may vary according to the usage conditions at Guangzhou CTF Finance Centre.



1 Guangzhou CTF Finance Centre (left) and world's fastest elevator (right)

2 Dashboard for Building Owners and Managers

Hitachi has started providing a dashboard for building owners and managers. The dashboard provides information such as the operation statuses and maintenance conditions of elevators and other building equipment on a PC or smartphone.

By remotely gathering and monitoring operation data from over 180,000 elevators and other items of building equipment in real time in the Japanese market, Hitachi has used the data analysis results to start providing an advanced remote monitoring/maintenance service. But the challenge has been meeting the needs of building owners and managers who want to directly track information such as the operation statuses of building equipment and recovery progress during times of widespread disasters.

Hitachi has responded by using the Internet of Things (IoT)-driven dashboard to build user trust by enabling users to check building equipment operation statuses on a PC or smartphone. The dashboard was conceived to meet the needs of building owners and managers by letting them view, connect with, and operate equipment. The wide range of menu options it provides lets users perform operations such as setting elevator operation controls and changing the information displayed in elevator cars. The dashboard provides a service that helps increase work efficiency in a paperless environment. The service is designed to enable closer connections with users and provide benefits such as a competitive edge and improved work efficiency.

Hitachi is planning to augment the dashboard functions for the Japanese market in FY2020 and progressively release the product in Asia and elsewhere worldwide.

(Hitachi Building Systems Co., Ltd.)

3 FI-700 Human Flow Predicting Elevator Operation Management System

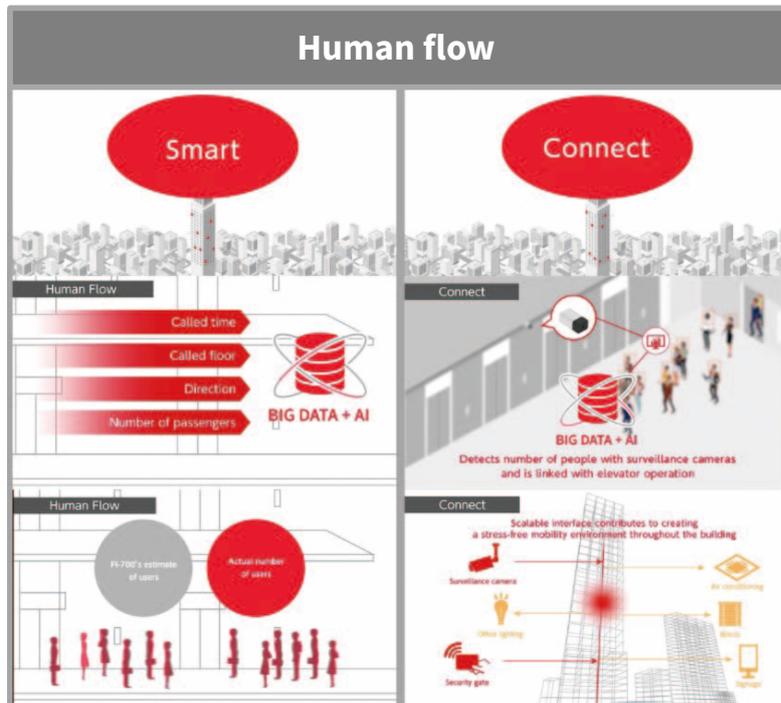
FI-700 is an elevator operation management system that Hitachi has developed to realize the efficient operation of multiple elevators by predicting human flow.

FI-700 is the next-generation elevator operation management system that was developed aiming to provide a comfortable mobility environment tailored to the unconscious behaviors of each user. It uses artificial intelligence (AI) to analyze massive amounts of past operation data such as the timing of elevator calls on each floor at each time and numbers of users getting on and off elevators. It enables efficient operation by predicting the number of elevator users on each floor and sending concentrations of elevators to floors expected to have high user counts.

The system also has a wide range of operation modes that provide a comfortable mobility environment to building users. For example, the automatic elevator call operation mode automatically registers call button presses from the entrance floor during times of high user counts such as morning commuting times. The bypass-when-full operation mode uses the sensor inside each elevator to determine when an elevator is



2 A dashboard screen for smartphones (for illustration)



3 Overview of human-flow-predicting elevator operation management system

nearly full and to operate it without stopping at intermediate floors even if a call button press is registered.

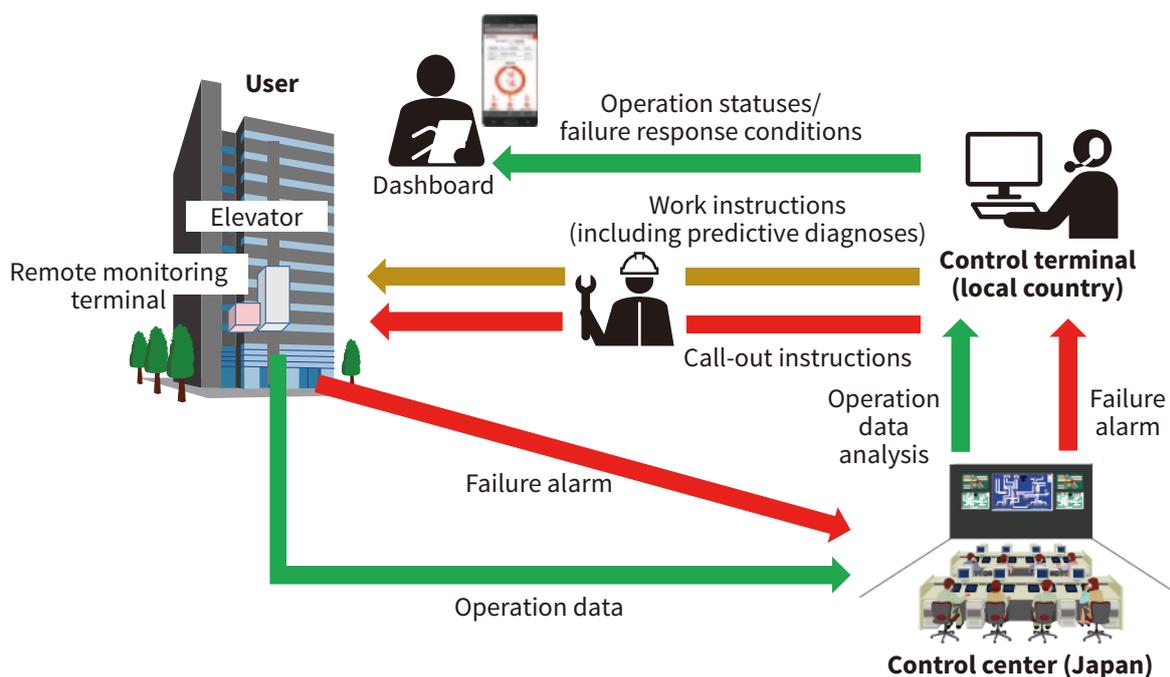
Furthermore, FI-700 has a function for linking data to building equipment. For example, the function can use user count data from surveillance cameras to achieve more comfortable mobility within the building.

Hitachi is working on developing the system's detailed specifications and plans to release it for sale in Japan and overseas in April 2020.

(Hitachi Building Systems Co., Ltd.)

4 Asian Release of Remote Elevator Monitoring Service

Drawing on over 30 years' worth of technology and expertise accumulated in Japan, Hitachi has now begun the full-scale global release of the remote elevator monitoring/maintenance service it has provided to about 180,000 elevators in the domestic market. The service will begin to be offered in the Republic of Singapore in October 2019, after which it will be progressively released in Asia and elsewhere around the world.



4 Process flow for remote monitoring service and related services (starting in FY2020)

This service is driven by a control center in Japan and a control terminal installed in the local country that monitor equipment operation statuses by gathering operation data from remote monitoring terminals installed in the elevators. The gathered operation data is analyzed, and the results are used to provide an advanced remote monitoring/maintenance service that identifies failure precursors to prevent equipment failures.

If an equipment failure occurs, instructions are sent from the control terminal to local maintenance engineers who immediately respond by visiting the site.

In FY2020, Hitachi will add a system for assisting the failure repair work done by local maintenance engineers with AI-driven operation data analysis. Service subscribers receive Hitachi's dashboard, letting them check elevator operation statuses, maintenance conditions, and similar information from a PC or smartphone. The service is designed to help users improve the efficiency of their elevator operation and building management work, while creating a safe, secure, and pleasant movement environment.

(Hitachi Building Systems Co., Ltd.)

Hitachi Building Systems and officially began operation in April 2019.

Hitachi Building Systems and its overseas affiliates own multiple educational facilities for engineers. The facilities have had problems handling growing admission numbers and with the inefficiency of students having to come together at these facilities from many different locations to take part in education. Students also wanted educational options that would give them first-hand experience of the horror of workplace accidents through simulation-based safety education.

The educational content Hitachi Building Systems has recently started providing is designed to teach correct work procedures even without the actual equipment. It includes simulated experiences of workplace accidents such as falling into an elevator shaft, instruction on how to climb on and off the top of an elevator car (a basic operation in elevator maintenance work), and instruction on brake overhaul work (one of the most important operations).

The recently developed VR educational system has been put into operation at a training center in Japan. Hitachi Building Systems plans to augment the content, provide VR tools to bases in Japan and overseas, and release multilingual versions at bases in Asia. The company will work on creating more advanced and efficient educational programs for engineers throughout the world, while expanding educational opportunities. (Hitachi Building Systems Co., Ltd.)

5 Engineer Educational System Using VR Technology

The virtual reality (VR) educational system is a simulation-based educational system for elevator maintenance engineers that uses VR technology. It was developed by



5 Training with the VR educational system

Renovation product lineup	Description	Construction duration
Select 4 Full-removal renovation	All the parts are removed and updated to the latest machine room-less traction elevator parts	At least 31 days
Select 3 Partial removal renovation	Parts mounted on building frames (such as jambs and sills) are reused, other components are removed including hydraulic equipment, and updated to the latest machine room-less traction elevator parts	At least 24 days
Select 2 Partial-removal renovation (rapid) New option	In addition to parts mounted on building frames, landing doors on each floor are reused, other components are removed, and updated to the latest machine room-less traction elevator parts	At least 19 days
Select 1 Control renovation New option	Control panels and other major equipment units are updated while keeping hydraulic elevators unchanged	At least 6 days

6 Overview of standard hydraulic elevator renovation products

6 Development of Renovation Products Tailored to Customer Needs

To meet growing demand for renovation of elevators installed 20 or more years ago, Hitachi has been continually augmenting its lineup of renovation products that improve elevator safety, comfort, and maintenance quality. In September 2018, the company released a renovation product for standard hydraulic elevators.

Hitachi provides an augmented lineup of two new products that have been developed and added alongside the two products of full-removal renovation or partial-removal renovation that it previously provided for standard hydraulic elevators. The two new products enable rapid, low-cost renovation work.

The company had previously released a renovation product for traction elevators in December 2012. Like the renovation product for standard hydraulic elevators, the renovation product for traction elevators is also a product for standard traction elevator renovation that provides selectable products tailored to client needs. Hitachi previously provided control renovation for order-type traction elevators that involved replacing major equipment units such as the control panel

and traction machine. But weight and size restrictions sometimes made it impossible to fit the new traction machine in the machine room, there were cases where renovations could not be done. Hitachi responded by developing a new lightweight, compact gearless machine, this expanded the range of order-type traction elevators subject to control renewal. And this product was added as a new option for the renovation product for traction elevators (expanding the range of order-type traction elevators applicable to the renovation product for standard traction elevators), and full-scale release began in June 2019.

(Hitachi Building Systems Co., Ltd.)

7 Rapid Escalator Installation Methods for JR Ochanomizu Station

Hitachi devised and used rapid installation methods to install four escalators at the Ochanomizu station of the East Japan Railway Company (JR East).

When installing a train station escalator using large, heavy machinery, the work is restricted by factors such as the station's topography and limited platform space.



(Photos courtesy of JR East.)

7 Receiving escalator components at the site (left and center), and completed escalators (right)



8 Interior of shuttle elevator car (left), and escalators installed in atrium (right)

It consists of procedures such as installing the truss, assembling the balustrades and handrails, and mounting the exterior panels that cover the truss. These procedures have previously required two to three months from truss installation to delivery.

But seeking to make the convenience of station users top priority, JR East wanted the work from truss installation to delivery done in just seven days (including time for adjustments).

To meet this demanding condition, Hitachi devised two methods of doing general assembly work beforehand on flat ground—one for completely eliminating assembly work after truss lifting and installation, and the other for enabling simultaneous lifting of two connected escalators. Several months' worth of work was also done with JR East to research and plan tasks such as designing and manufacturing special lifting tools, and simulating lifting pathways to allocate lifting routes from the concourse to the platform. As a result, Hitachi successfully installed two escalator trusses simultaneously in one night, and delivered the job in just seven days (including adjustments). (Hitachi Building Systems Co., Ltd.)

The car interiors of the shuttle elevators in the building's office section have been designed as lavish spaces intended to lift the spirits of their mainly office worker users. This interior look has been created by decorating the rear panels with works by renowned Japanese *washi* paper artist Eriko Horiki. The works are inserted between plates of glass and illuminated from behind. The completely mirrored ceilings reflect the *washi* paper artworks to provide a mesmerizing kaleidoscopic effect.

Escalators have been installed in the building's commercial section, where a three-level open atrium was conceived as a theatrical urban space with a style evoking the playhouses of medieval England. The exterior panels have been finished with decorative sheets. The two-tone color scheme has bronze side surfaces and champagne-silver bottom surfaces. Geometrically patterned plastic panels have been installed on the bottom surfaces and are illuminated with indirect lighting. The supports of the fencing used for protection from falling objects have been given an aged-bronze coating to provide the aged, antique look. They harmonize with the building and create an upbeat, lavish space filled with a mature charm.

8 Delivery of Vertical Transportation Units to Tokyo Midtown Hibiya

Hitachi has delivered a total of 77 vertical transportation units (52 elevators and 25 escalators) to Tokyo Midtown Hibiya, a large facility complex created by Mitsui Fudosan Co., Ltd.