

# Business Development for Platform Screen Door System with Integrated Engineering, Comprehensive Management Including Civil and Architectural Activities



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*Improving the safety of station platforms is an important issue for all passengers, and there is an urgent need to expand the installation of platform doors in order to reduce the number of accidents on platforms in which passengers fall onto the track or are hit by a train, and the resulting train delays. In the first Basic Plan on Transport Policy approved by the Cabinet in 2015, the government set a target of improving 800 stations by fiscal 2020, and has promoted the installation of platform doors through a policy of prioritizing stations with an average of 100,000 or more passengers per day by utilizing subsidies and other programs related to the installation of platform doors. In addition, the government has set a new barrier-free transportation target for fiscal 2025, and continues to call for further introduction of platform doors and further improvement in the safety of station platforms.*

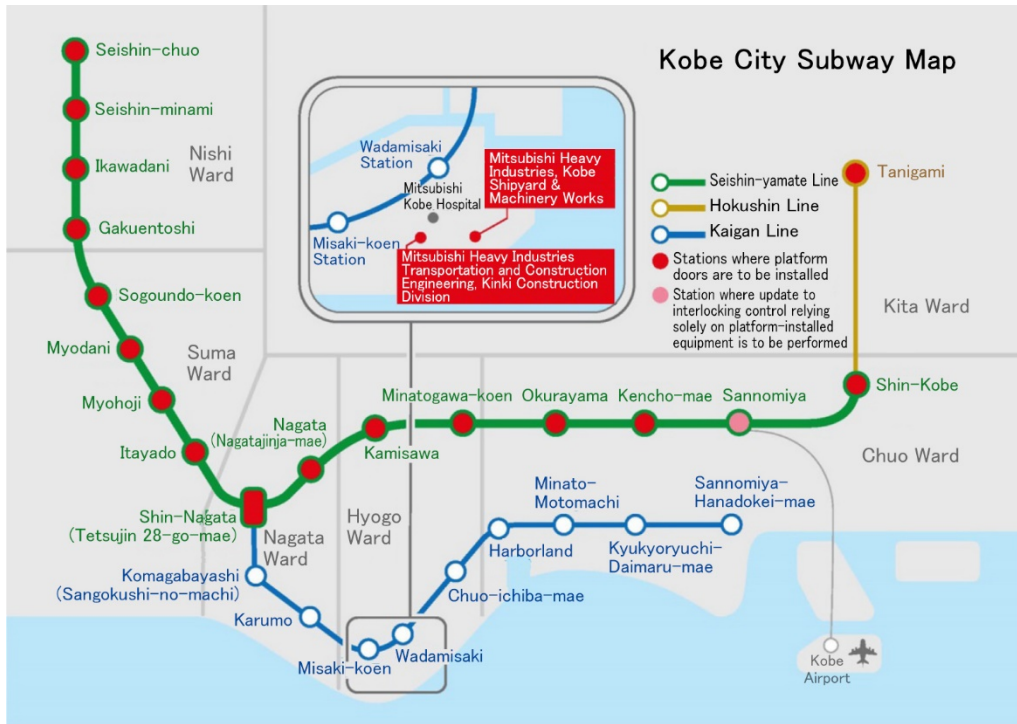
*On the other hand, in order to install platform doors, it is necessary to investigate the structural analysis of the existing platforms and to reinforce them according to the information gathered, which is one of the challenges in expanding the installation of platform doors.*

*In July 2020, the Kobe City Transportation Bureau announced a comprehensive-evaluation general competitive bidding for the "Project to install platform doors at 16 stations on the Seishin-yamate and Hokushin lines of the Kobe City Subway" including a diagnostic inspection of platform integrity and platform reinforcement work. In November of the same year, we, Mitsubishi Heavy Industries Transportation and Construction Engineering, Ltd., which was formed in April 2020 through the merger of a civil engineering, construction, and plant engineering company and a transportation equipment design, manufacturing, and service company, were awarded a contract for the project as a contractor capable of providing design, manufacturing, installation, and servicing of the platform door system collectively including civil engineering work.*

*The project is currently progressing steadily with the platform door system already in service at some stations in advance, and scheduled to be fully completed in July 2023. The following chapters describe an overview of the project.*

## **1. Overview of project to install platform doors**

The Kobe City Subway, operated by the Kobe City Transportation Bureau, spans six wards of Kobe City: Nishi, Suma, Nagata, Hyogo, Chuo, and Kita. Its total length is 38.1 km, consisting of the 22.7 km Seishin-yamate Line, the 7.5 km Hokushin Line, and the 7.9 km Kaigan Line. The subway service lines where the platform door system is installed this time are the Seishin-yamate Line between Seishin-chuo and Shin-Kobe stations, and the Hokushin Line between Shin-Kobe and Tanigami stations, 30.2 km in total, which will be installed at 16 stations (Total: Thirty-seven platforms, thus 666 openings) excluding Sannomiya Station (**Figure 1**).



**Figure 1 Kobe City Subway Map**

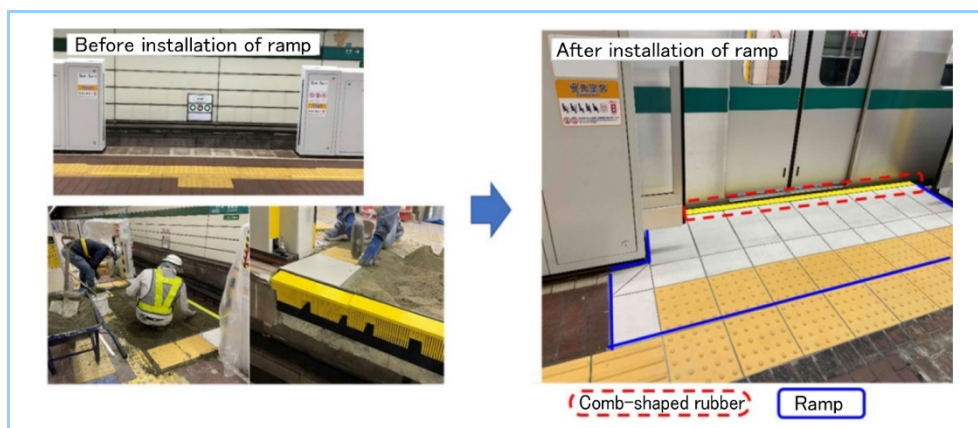
The installed platform door system is designed for 6 cars per a train-set on one platform, which a train-set consists of three-doors. The platform door opening width is 2,800 mm and there are 18 openings per one platform.

**Figure 2** shows the platform doors installed on No.1 platform of Shin-Nagata Station.



**Figure 2 Installation of platform doors on No.1 platform of Shin-Nagata Station**

This project includes the installation of ramps (with a slope of 1/20 or less) that eliminate the difference in height between the train car floor and platform, and comb-shaped rubber pieces at the edge of platforms that reduce the gap between the platform and the train car (**Figure 3**).



**Figure 3 Installation of ramp and comb-shaped rubber**

Note: Sannomiya Station already has platform doors installed by another company in March 2018, and the platform door opening/closing has been controlled by a QR-code system for this station since March 2020. However, this control opens the platform doors with a delay after the train doors open, resulting in longer passengers getting-on/off time. In this project, the control was updated to our "interlocking control relying solely on platform-installed equipment" that is superior in the opening and closing response of platform doors. **Figure 4** shows the detection sensors for the updated interlocking control relying solely on platform-installed equipment.



**Figure 4** Installation of sensors for interlocking control relying solely on platform-installed equipment at Sannomiya Station

## **2. Characteristics of this project**

### **2.1 Our "One-Team Project Management System" in response to demands from the railway companies**

Confirmation of the safety strength of platform floors, etc., required for installation of platform doors, structural calculations and other services in the case where reinforcement is required, and also field work management services for work sites are outsourced by the railway company to a consulting company or general contractor.

We achieved agile responses and cost reductions by establishing our self-contained "One-Team Project Management System" including the platform door manufacturing business and the civil engineering and construction business. One of the points that was highly evaluated in the customer's technical review was the shortening of the work period. This was a result of our integrated engineering capability achieved by our unique "One-Team Project Management System", which no other company has.

By assigning experienced civil engineering and construction designers to the project, we enhanced our credibility in civil engineering and construction. As a result, we received orders for platform reinforcement and improvement work at Myohoji Station and Shin-Nagata Station, as well as large-scale station building renovation work at Shin-Nagata Station in response to demands from the customer.

Generally, platform door installation is accompanied by civil engineering and construction work such as platform improvement. We will continue to respond to problems and demands railway companies have by fully utilizing our "One-Team Project Management System," which is one of our strengths.

### **2.2 Adoption of new-type platform door system**

We have been working to expand sales of platform door systems since the delivery of the conventional-type system to Nippori Station of Keisei Electric Railway Co., Ltd. in 2018. At the same time, we have also renewed the system with a new-type platform door system based on the concept of reducing initial and maintenance costs and simplifying future updates and have been working to ensure the quality through thorough verification by outdoor durability testing and other means (**Figure 5**).

This chapter describes the features of the new-type platform door system adopted for this project, which have been updated compared to the conventional type.



**Figure 5 Illustration of new-type platform door system**

- (1) Reduction of initial investment costs
  - While maintaining the safety concept of the conventional type in terms of the strength and door structure, the weight is reduced by about 35% by simplifying the structure of the platform door main body, which can simplify platform reinforcement work.
  - The wiring is reduced by approximately 40%, which can simplify electrical wiring work.
  - The foundation is reviewed, which can simplify civil engineering and construction work.
- (2) Reduction of maintenance costs
  - The simplified structure leads to improving the maintainability.
  - The configuration of the individual control panels is reviewed, which improves the maintainability.
  - The operating status of each platform door is monitored, which prevents problems.

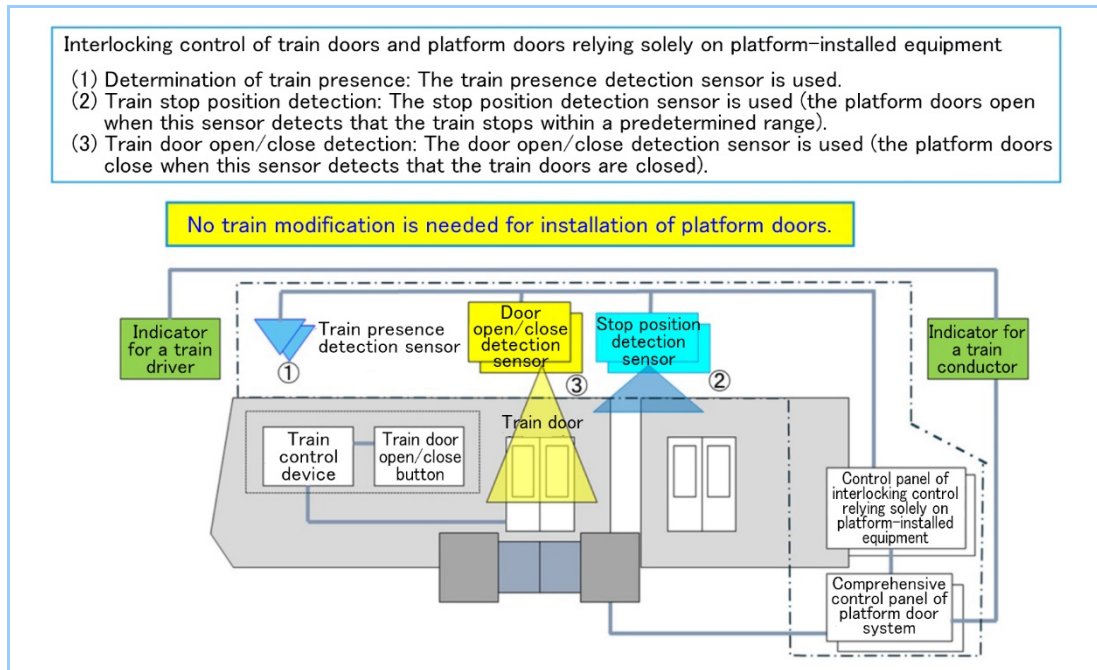
### **2.3 Adoption of interlocking control relying solely on platform-installed equipment**

In the past, the opening and closing of doors was manually operated by station staff with a visual check. There was a problem that in some cases the opening and closing of doors was delayed and the train stop time became longer than necessary. For the installation of platform door system, the train doors and platform doors require to be interlocked, and the modification of train cars as well as stations that do not have a train interlocking system is required.

Our interlocking control relying solely on platform-installed equipment can make the platform doors and train doors interlocked indirectly without modifying the train cars and can quickly open and close platform doors. This interlocking control relies solely on platform-installed equipment.

The train presence detection sensors installed on the platform determine whether a train is present, the stop position detection sensors installed on the platform determine whether the train stops within a predetermined range, and then the platform doors open. In addition, the train door open/close detection sensors detect the open/close status of train doors that open and close horizontally, and then the platform doors open and close accordingly in an interlocked manner.

We have delivered this interlocking control together with platform doors since the delivery to Kokusai-tenjijo Station of the Tokyo Waterfront Area Rapid Transit Inc. in 2018. The interlocking control is also adopted in this project. **Figure 6** shows a configuration diagram of the interlocking control relying solely on platform-installed equipment.



**Figure 6 Configuration diagram of interlocking control relying solely on platform-installed equipment**

## 4. Future development

We will develop our business of installing platform door systems at stations including civil engineering and construction work with our "One-Team Project Management System", which utilizes the manufacturing technology and civil engineering and construction engineering capabilities that we have cultivated so far and contribute to further improving the safety of station platforms.

We will develop platform door systems that meet the demands from railway companies by utilizing our strengths, such as the new-type platform door system with smaller weight and reduced wiring, the interlocking control relying solely on platform-installed equipment, our unique "Dokodemo Door (Anywhere Door)" technology that can flexibly deal with various trains with different numbers and positions of doors, the new multi-stage platform door system that can deal with express trains, and the new construction method incorporating civil engineering technology to install platform doors on a station platform constructed with an embankment.

Lastly, our platform door system business will realize, in the field of transportation, the MHI Group's mission "to solve social issues and make contributions with our technology and know-how and to provide a safe, secure, and comfortable environment and living infrastructure for societies in which people around the world live."

We will successfully complete the "Project to install platform doors at 16 stations on the Seishin-yamate and Hokushin lines of the Kobe City Subway" by ensuring safety and quality and strictly adhering to the project schedule, and realize more achievements in the future. Through doing so, we intend to develop our business in the field of "transportation and construction" with utilization of our comprehensive engineering capabilities to contribute to society.