Efforts to further improve safety levels

Fostering safety-oriented personnel

■Safety education and training

To heighten safety awareness among employees by placing priority on safety education and training JR East is offering educational and training opportunities to its employees at the JR East General Education Center (Shirakawa City, Fukushima Prefecture) and General Training Centers (branch offices), and on-the-job training in each workplace. The JR East General Education Center offers group training for personnel development and improvement of knowledge and skills, fostering the development of new train crews and also providing the necessary training for job transfers. The General Training Centers in each of our branch offices offer education and training to improve the skills of train crews by utilizing accident prevention simulators on a regular basis. In OJT (on-the-job training), we offer education and training to suit the situations of each workplace.

JR East General Education Center

Practical drills on training tracks

■Promoting the use of educational and training facilities

We are conducting safety-related education and training based on the following principles:

①In basic education in classrooms and in on-the-job training at each workplace, importance is placed not only on work procedures, but also on the purposes, objectives, reasons, background, structures and working principles that underlie them so that trainees can think about and learn the sense of values that underpin the reasons for each action.

②During training to improve responsiveness, trainees can touch and feel actual devices and equipment so that they can encounter situations that are as similar as possible to actual situations. By experiencing failures in training, they can learn by practice and acquire the level of responsiveness required in daily operations.

③By experiencing the most serious accidents, trainees can be ready for the worst-case scenario and take the necessary countermeasures. Engraving the importance of lives on the minds of employees will drive them to further improve their countermeasures.

To improve the levels of education and training, we are introducing simulators for crew training at all transport-related workplaces. We newly enhanced educational and training facilities at General Training Centers and Skills Training Centers at all of our branch offices. We introduced cut models of actual devices and equipment, and simulators for train crew training and construction worker training by using virtual reality. By promoting the use of these upgraded educational and training facilities, we will further increase the level of safe and stable transport.

Track facility at Skills Training Center

Cut model of rolling stock equipment

Simulator for train crew training

Simulator for construction worker training

Through utilization of yard simulators

JR Technoservice Sendai Co., Ltd. has nearly 100 yard drivers for shunting in yards. In June 2018, we introduced yard simulators. With these simulators, we can conduct practical training on expected problems and further improve the capabilities of yard drivers to respond to emergencies. To further utilize the yard simulators, we introduced eye-tracking functions. This allows the visualization of the allocation of attention and the movement of sight lines of experienced drivers, which had previously been difficult to share in a visual way. By comparing the differences between these drivers and less-experienced drivers, we can facilitate an improvement in driving skills.
By fully utilizing educational and training facilities, we will contribute to improving the safe and stable transport of the JR East Group.

JR Technoservice Sendai Co., Ltd.

■Education and training to understand the "essence of work"

For higher quality operations, it is necessary to truly understand the "essence of work". For these reasons, in our education and training, trainees learn not only procedures including manuals, but also undertake practical training so that they can understand the "essence of work" including the reasons, structures, and working principles behind them.

■Development of personnel responsible for safety

In this time of rapid change in generations, since it is of the utmost importance to enable our employees to play major roles in securing safety in our operations, we are taking various measures as indicated below.

Key Safety Leaders

We are fostering three capabilities in Key Safety Leaders in field organizations: "familiarization" "instruction" "development of successors" in each workplace. Key Safety Leaders have a thorough understanding of the safety rules, details of past accidents and safety weaknesses in their own workplace, offer guidance to other employees on a regular basis in the workplace, and contribute to the betterment of safety levels in field organizations.

Key Safety Leaders' meeting

Safety Professionals

We have selected Safety Professionals from each branch office and construction work office to train them as Safety Professionals. They are expected to be professionals capable of guiding other employees through their long experience in railways and abundance of knowledge of safety rules and details of past accidents as well as their countermeasures.

Safety Professional certification ceremony

Chroniclers of Safety (Narrators of Oral History)

JR East is currently experiencing a rapid change in the generations of its employees, including frontline staff and therefore needs to steadily instill successors with safety-related knowledge, leadership, and technical capabilities. We assigned ex-employees of JR who possess an abundance of knowledge and applied skills in railway safety to act as our "Chroniclers of Safety" (Narrators of Oral History).

Assignment of ex-employees of JR East who possess an abundance of knowledge and applied skills in railway safety to act as our "Chroniclers of Safety" (Narrators of Oral History)

Further evolution of our safety culture

At JR East, each and every one of our employees acts on his/her own initiative as a main player when discussing what to do with other members of staff to improve our levels of safety.

The Challenge Safety Activity

We have continued the Challenge Safety Activity (i.e. Proactive Safety Activity)with the aim of encouraging our employees to actively take on the challenge of further improving safety levels, rather than just passively maintaining safety, with each one of our employees thinking about safety and autonomously taking actions. With initiatives of field staffs, in a consorted campaign with all employees JR East is working to create a corporate climate in which its employees actively engage in pursuing higher safety levels in our operations. In the campaign, each one of our employees finds their own safety issues and takes actions to solve these safety issues with support from branch offices and the Head Office.

Development of safety-related discussions in each workplace

Examples of CS Activity

Challenge Safety Aoshingo

Since April 1989, we have been publishing a monthly safety information magazine, Challenge Safety Aoshingo, to comprehensively distribute safety information to our employees. The magazine offers useful information for CS Activities in each workplace such as specific efforts of the Activities in each workplace and details of past accidents.

Challenge Safety Aoshingo
(August 2019 issue)

The Railway Safety Symposium

With objectives to improve the safety awareness of each one of our employees and to further vitalize various safety improvement activities including Challenge Safety Activities, JR East started Railway Safety Symposiums in 1990. Symposiums are attended by approximately 700 people including employees of group companies. We invite key figures from outside of the company to host panel discussions and introduce detailed safety examples of other companies. Participants bring back what they learn at symposiums to their workplaces and share safety awareness with other employees.

The Railway Safety Symposium

Round table discussions between front-line employees and executive officers

We are increasing the frequency of opportunities for the exchange of opinions between front-line employees and executive officers to further deepen mutual understanding. Through direct discussions between front-line employees and Head Office executive officers, we have mutually confirmed efforts to solve safety-related issues in order to take specific measures to further improve the safety levels of our operations.


Round table discussions with front-line employees

Group-wide efforts to further improve safety

JES-Net (JR East Safety Network)

As the division of work increasingly progresses among Group and partner companies, to further improve safety levels it is inevitable that there is a sharing of common safety values and cooperation. When we started the Safety Plan, the JR East Safety Network (JES-Net) was established in FY2005 as a safety promotion network consisting of 25 JR East Group and partner companies that are engaged in work directly affecting train operations. As of March 2019, the number of companies in this network had expanded to 37. JR East Group continues to promote measures for improvement and share issues to enhance safety levels across the whole group through JES-Net Presidents' Meetings with presidents of each group and partner company and JR East's top management; through safety collaboration camps with safety-related managers of branch offices and JES-Net member companies to discuss safety issues; and through safety reviews where frontline staffs exchange various opinions on site. Additionally, through active exchanges of human resources among JES-Net members, we are working to improve safety levels and sharing safety awareness across the whole group.


Safety review

Safety efforts by JR East Group companies

【JR Bus Kanto Co., Ltd.】

In FY2019, we introduced drive recorders with two-way communications and IP radio to all of our expressway buses. Before the introduction of these recorders, we could only confirm the recorded images after the driver had returned to depot. This introduction enables us to confirm images on a real-time basis. So we can support drivers by checking recorded images as soon as a problem arises. Additionally, we can remotely conduct coaching sessions for drivers from our office. We are utilizing these approaches to prevent accidents.

【Mito Railway Servicing Co., Ltd.】

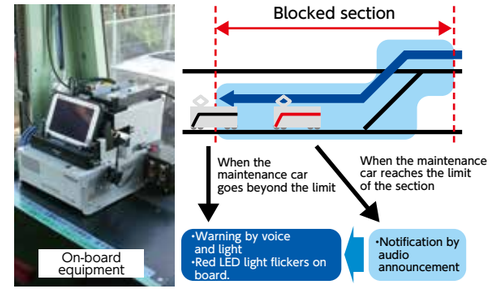
To improve the safety and skills of staff driving in yards, we installed a yard driving simulator at our general training center to train our staff about driving in our yard premises. The training is provided on a one-to-one basis. This enables us to address the weak points of each member of staff. The result of the training is summarized in a report that is shared among staff at Head Office and other relevant offices so that it can inform the further education and training provided to our staff.

Safety-related research and development

JR East Group conducts various safety-related research and development activities with the Research & Development Center of JR East Group as its core.
Research themes at these organizations include those related to major accidents such as derailments, the development of the maintenance car location detection system, evaluations of JR East Group's safety conditions by utilizing human factors such as safety management and safety cultures, and safety evaluations of natural disasters such as strong winds, earthquakes, and heavy rain.

Development of the maintenance car location detection system

As a countermeasure in light of the derailment accident at Kawasaki Station in Feb. 2014, we developed the maintenance car location detection system. The system activates an alarm when it detects an unauthorized maintenance car (including a road railcar) in an unblocked section, where train operations are not yet blocked for maintenance work. We developed a rotary encoder method to detect a train location by the number of axle revolutions. As a method to support the prevention of train collisions with maintenance cars, we introduced the system to the Saikyo Line between Ikebukuro and Omiya in Nov. 2017. We will also introduce the system to other lines.



Maintenance car location detection system (rotary encoder system)

Maintenance car location detection system (rotary encoder system)

Development of a system to detect abnormality in the wheel load balance
We developed a warning system to detect wheel load unbalance by using a strain gage attached on the side of a rail. A wheel load unbalance could lead to a derailment accident. We started test operations in Mar. 2018 and are currently conducting verification tests on the system.


Wheel load unbalance detection system
Strain gage

Research on human factors

To promote safety management by looking ahead in order to take preemptive measures, we developed a system to constantly monitor the status of the functions of a system that is used to maintain and improve the safety levels of JR East Group. The assessment is conducted from 36 perspectives, including the elements that make up our safety cultures.

Elements to support safety at field sites [25 items]
Knowledge and skills of field site employees, continuous improvements at workplaces, etc.

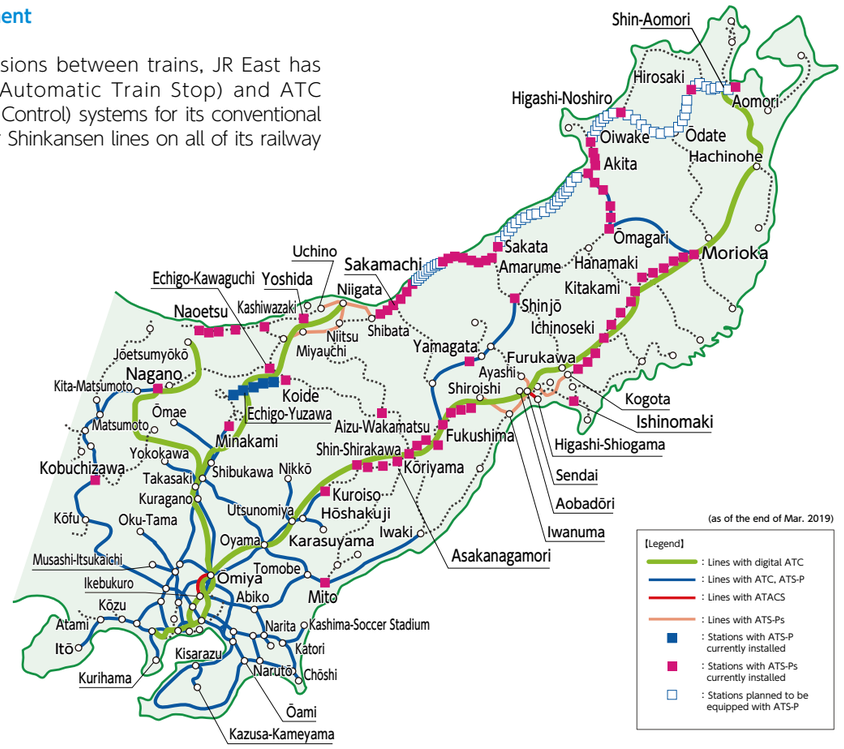
Management elements from managerial perspectives [11 items]
Management of safety investment, proper management of business resources, etc.

Measures to prevent train collisions

■Safety equipment

○ATS and ATC

To prevent collisions between trains, JR East has installed ATS (Automatic Train Stop) and ATC (Automatic Train Control) systems for its conventional lines and ATC for Shinkansen lines on all of its railway lines.



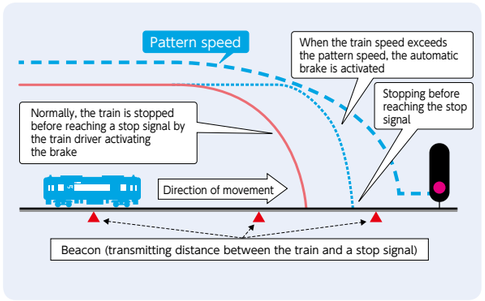
[Installation plan for ATS-P and ATS-Ps systems]

	Areas for planned installation	Installation status as of the end of FY2019
ATS-P system	Mainly for railway sections with frequent train operations in the Tokyo metropolitan area	Completed installation in 5 major stations and railway sections for 2,405.8km (service km)
ATS-Ps system	Provincial city areas and major railway sections excluding the Tokyo metropolitan area	Completed installation in 72 major stations and railway sections for 210.8km

○ATS (Automatic Train Stop)

With ATS-P and ATS-Ps, based on information from ground equipment, on-board equipment calculates the allowed train speed to stop at a stop signal. When the train exceeds the speed pattern, the system automatically activates its automatic brake to stop the train. The system also responds to speed limits for curves and turnouts.

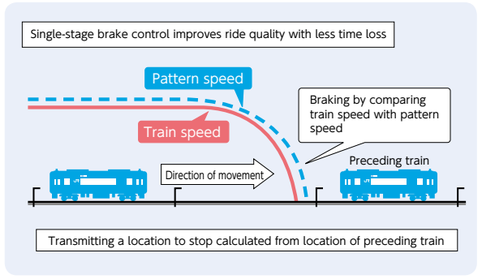
[Overview of ATS-P system]



ATC (Automatic Train Control)

In this system, ground equipment continuously transmits signals to trains via the rails. The transmitted signals are indicated in the driver's cab and the system automatically activates the emergency brake if the train exceeds its permitted speed. On the Shinkansen and the Yamanote, Keihin Tohoku and Negishi Lines, we have replaced the systems with digital ATC. This system transmits the location information of the preceding trains to the following train so that on-board equipment can control the train speed based on a speed pattern calculated from the information.

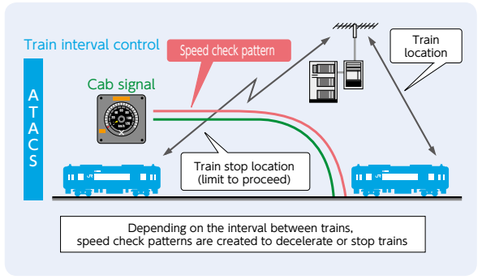
[Digital ATC]



ATACS (Advanced Train Administration and Communications System)

This is a totally new system for trains to detect their own locations instead of using traditional methods of train location detection with track circuits. By using radio communications for the transmission of train location information between ground and on-board facilities, we can control train operations. JR East began using ATACS on the Senseki Line between Aobadōri and Higashi Shiogama in October 2011 and on the Saikyo Line between Ikebukuro and Omiya in Nov. 2017.

[ATACS]

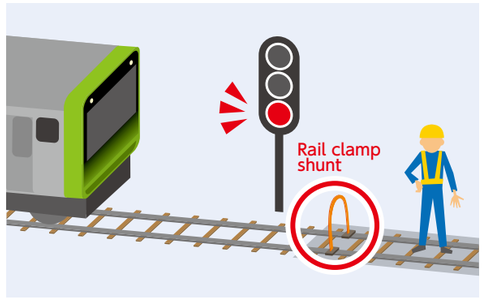


■Others

Dual safety measures

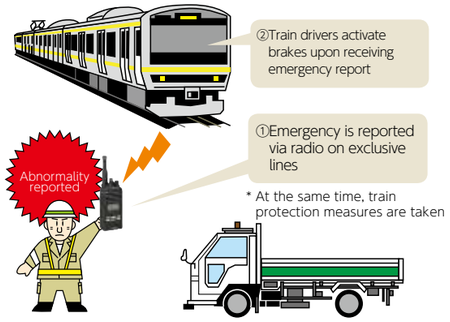
When conducting track construction, maintenance, or inspection, we close tracks so that other trains cannot enter these particular railway sections. However, in the case of a failure of a track closure as a result of human error, it could result in a train mistakenly entering a closed section during construction, maintenance or inspection. To prevent this from happening, we undertake dual safety measures. In addition to the above-mentioned track closure procedure, by installing rail clamp shunts on the closed section, signals will change to a stop signal to prevent trains from proceeding to that closed section.

[Dual safety measures]



Collision prevention support radio system

Learning lessons from the derailment accident in the Kawasaki Station premises of the Keihin Tohoku Line in Feb. 2014, JR East introduced a collision prevention support radio system to help maintenance workers stop trains in case of an emergency during maintenance work. The collision prevention support radio system alerts neighboring trains of an emergency by operating exclusive radio terminals in the case of an abnormality to immediately stop trains. The system is installed on all conventional line trains and when the emergency signal is transmitted, drivers receiving the signal promptly stop their trains. However, depending on radio and line availability, the signal might not reach all neighboring trains. For this reason, the collision prevention support radio system is used as a supplementary method for train protection.

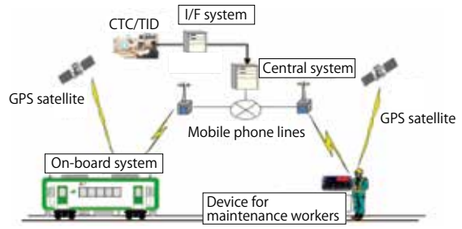


Train approach alarm system

JR East utilizes alarm systems to warn maintenance workers on tracks of approaching trains. For railway sections with track circuits* installed, we use a TC-type wireless train approach alarm system to warn workers of approaching trains by track circuit. For railway sections without track circuits, we developed a GPS train approach alarm system to inform workers of train locations by locating the positions of trains and workers on GPS. We implemented these systems in 25 railway sections including the Iiyama Line and the Hachikō Line from April 2016.

* Track circuit: A section of rail is used as a part of the electric circuit. By short-circuiting the rail using the wheels of the train, the position of the train can be detected.

[GPS train approach alarm system]



Preparedness against natural disaster

■Our measures against earthquakes

Learning from earthquakes in the past, JR East has employed the following three anti-earthquake measures:

①Preventing structural damage (seismic reinforcement measures)
②Stopping trains immediately (emergency train stop measures)
③Minimizing secondary accidents following derailment (preventive measures against derailed trains leaving the track area)

Seismic reinforcement measures

In order to be prepared for the expected earthquake whose epicenter is anticipated to be located directly beneath the Tokyo metropolitan area, since FY2013 we have been working on the seismic reinforcement of embankments, cuttings, brick arch viaducts, power poles, and the prevention of the collapse of ceilings and walls on platforms and in other parts of stations. Additionally, we have proceeded with the seismic reinforcement of bridge pillars and elevated bridge columns ahead of schedule. Moreover, due to the Great East Japan Earthquake in 2011, we are pressing forward with the seismic reinforcement of station buildings that have daily passenger traffic of 3,000 persons or more and also of Shinkansen power poles that were greatly damaged by the earthquake at the time. Based on changes in the expected intensity of the possible earthquake whose epicenter would be directly beneath the Tokyo metropolitan area and information on active faults, from FY2018, we started to work on the expansion of the reinforcement areas and also the implementation of new measures in order to manage the potential damage to each facility and the effects of the earthquake on our railway lines.

Seismic reinforcement of embankment

[Seismic reinforcement measures taken after the Great East Japan Earthquake and progress made (as of the end of March 2019)]

Major measures		Total completed / Planned total	Completed ratio
Elevated bridge columns	Shinkansen	Approx. 8,640 units / Approx. 8,640 units	Completed
	Conventional Lines	Approx. 6,470 units / Approx. 6,600 units	98%
Bridge columns	Shinkansen	Approx. 640 units / Approx. 680 units	94%
	Conventional Lines	Approx. 1,720 units / Approx. 1,910 units	90%
Embankments	Near Ochanomizu (embankment on the river side)	Approx. 1.2 km / Approx. 1.2 km	Completed
	Height of 8m and over	Approx. 8 km / Approx. 8 km	Completed
	Height of 6m and over, and below 8m	Approx. 10.0 km / Approx. 11 km	96%
Cutting (Including near Ochanomizu)		Approx. 18 km / Approx. 23 km	77%
Embankments and anti-derailing guards before and after bridges		Approx. 74km / Approx. 74km	Completed
Station buildings		64 buildings / Approx. 85 buildings	75%
Ceiling of station buildings and platforms		Approx. 450 stations / Approx. 560 stations	80%
Walls of station buildings and platforms		56 stations / 56 stations	Completed

○% Completion ratio of 80% and over　Completed Completed

Seismic reinforcement

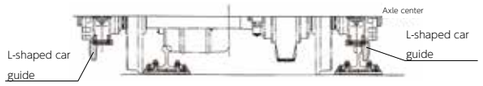
Emergency train stopping measures

For Shinkansen lines, JR East utilizes the Shinkansen Early Earthquake Detection System to stop trains as quickly as possible before the principal shock (S-waves) hits the Shinkansen lines. The system estimates the location of the epicenter and the scale of the earthquake from information from seismometers, which can detect primary tremors (P-waves) along the lines and along the shores in the Tokyo metropolitan area and inland areas, and from information produced by the Earthquake Early Warning system of the Japan Meteorological Agency.

Furthermore, by improving the functions of seismometers for Shinkansen lines, we are continuing our efforts to shorten the time required from the detection of an earthquake to the emergency stopping of trains on both for Shinkansen and conventional lines. Additionally, we utilize information from ocean-bottom seismographs of S-net* of the National Research Institute for Earth Science and Disaster Resilience (NIED) so that we can further shorten the time required for the detection of an earthquake. “S-net” stands for Seafloor Observation Network for Earthquakes and Tsunamis along the Japan Trench.

Prevention of secondary accidents after derailmen

During the Niigata Chuetsu Earthquake in Oct. 2004, one of our Joetsu Shinkansen trains derailed. Fortunately, passengers and crew were uninjured. However, by learning lessons from the earthquake, JR East has taken preventive measures for Shinkansen trains and tracks. For Shinkansen trains, we have installed L-shaped car guides on bogies. By guiding the derailed trains along the rail, the L-shaped car guides prevent Shinkansen trains from completely leaving the track in a derailment. We have also improved glued insulated joints to reduce the impact of wheels and bogie parts in the event of a derailment. Additionally, we completed the installation of rail rollover prevention devices to guide the wheels along the rails following a derailment, thereby preventing a rail rollover and the rails from completely deviating from the track even after a train derails and the rail fasteners are broken.



L-shaped car guide

Before improving glued insulated joints

After improving glued insulated joints

Rail rollover prevention devices

Topics

Strengthening traffic control functions for times of disaster

In FY2019, to strengthen our preparedness for times of disaster, we renewed the conference room we have been using as the disaster countermeasures headquarters at Head Office.
For this renewal, we reviewed the layout of the room, installed a 12-screen multiple display and a large sub-display. This will enable us to comprehensively display a variety of information by switching the screens. Additionally, we introduced an electronic whiteboard. The information written on the whiteboard at headquarters can be shared via video-conferencing on a real-time basis. Furthermore, we introduced the latest ICT devices such as desktop displays.

Renewed conference room for headquarters and a real-life image of the previous headquarters in action

General emergency drills

JR East conducts general emergency drills to prepare for an earthquake during disaster preparedness week around Sep. 1st, every year. The drills include the following: Drills to operate an on-site disaster countermeasure headquarters at Head Office and each branch office, and drills for rescuing, life-saving, guiding passengers during an evacuation, and for initial firefighting in each district. Additionally, we participate in disaster drills run by local municipalities.

Drill to rescue passengers with firefighters

Preparing rescue kits and first aid kits

In the case of an earthquake with an epicenter directly beneath the Tokyo metropolitan area, many passengers might be injured and we might need to save the lives of passengers with the help of a limited number of our employees before the arrival of rescuers. For a major earthquake, placing top priority on saving the lives of the injured, JR East has prepared the following first aid kits and is also conducting drills to give personnel necessary first aid skills.

●Rescue kits to save injured persons

We installed rescue kits (crowbars, jacks etc.) at each station of the five branch offices in the Tokyo metropolitan area.

Rescue kits

●First aid kits to provide first aid to injured persons

We installed first aid kits (triangular bandages, etc.) at each station within 30 km of Tokyo.

First aid kits

●Drill for styptic treatment (external injuries) and transporting the injured

We continue to work on training all our employees. We also formulated the JR East rescue and lifesaving training text book.

Training text book

■Measures against tsunamis

Before the Great East Japan Earthquake, we had set operational restriction methods and tsunami danger zones for each location, prepared manuals, and were holding study sessions and conducting drills on guiding passengers to deboard trains for evacuation. We believe that these efforts led to the prompt evacuation of passengers away from tsunami danger zones at the time of the earthquake.

Tsunami evacuation manual

Drill to guide passengers to alight from a train for evacuation

Formulating action guidelines for evacuation to avoid tsunamis

To prepare for a case when there is no time before the arrival of a tsunami, JR East formulated action guidelines for evacuation during tsunamis for each one of its employees to follow in January 2012.

■Action guidelines for evacuation to avoid tsunamis

1. At a time of a large earthquake, be prepared for tsunamis. Gather information by yourselves and if communication lines are disconnected, make your own decisions for evacuation. (Do not be afraid to make a mistake.)
2. Once decided to evacuate, by judging the conditions of customers, promptly guide customers to evacuate.
3. In alighting from trains, evacuating and gathering information, ask customers and local people to cooperate.
4. Even after evacuation, go to a higher place without being satisfied and thinking this would be high enough.
5. Stay evacuated with customers and do not return to field offices or trains while tsunami warnings are still issued.

Tsunami evacuation navigation system

We developed the Tsunami Evacuation Navigation System to assist train crews in evacuating passengers from unfamiliar places along railway lines through the use of their tablet devices.

Tsunami evacuation navigation system

Improvement of evacuation signs and routes and conducting drills for evacuation during tsunamis

For railway lines such as the Hachinohe Line, which resumed operations following damage caused by tsunamis, we have improved the signs and routes for evacuation from tsunamis. We will also improve evacuation signs and routes for other railway sections.

We have identified tsunami warning sections which could be submerged by tsunamis. We are working to increase the number of signs to indicate where these tsunami warning sections start and finish, as well as the number of tsunami evacuation signs.
Furthermore, in FY2019, we conducted drills on guiding passengers to alight from trains and escape from a tsunami at tsunami-prone locations, assuming that there was no time before the arrival of the tsunami. We will continue these drills every year at the same time of year.

Tsunami evacuation sign

Flags to indicate the start of a tsunami warning section

Drill to guide passengers to alight from a train during a tsunami

■Measures for rainfall

Measures for rainfall

To protect tracks from landslides due to rainfall, JR East takes disaster prevention measures for wayside embankments in all railway sections in accordance with its plans. Especially in the Tokyo metropolitan area and for all Shinkansen routes, we take thorough measures to secure safe and stable transport.

[Countermeasures for rainfall]

Cutting slope protection (spray frame work)

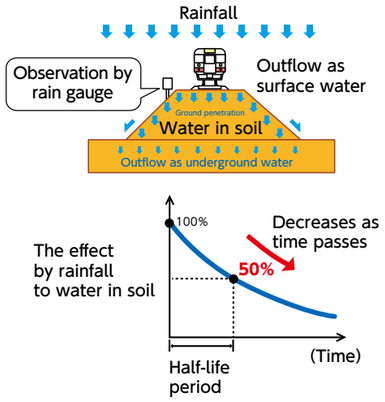
Embankment slope protection (spray frame work)

Natural slope protection (spray frame work)

Operation control for rainfall

For heavy rainfall, JR East ensures the safety of train operations by introducing operation control such as limiting train speeds and suspending operations. Since June 2008, we have been using effective rainfall values which are highly related to landslide disasters due to rainfall. Effective rainfall is the amount of underground water remaining after changes over time in ground penetration and outflow. Since many of the disasters due to rainfall result from rainwater seeping into the ground, the effective rainfall index is more appropriate as an operation control index for railways. With this indicator, we can more precisely predict the possible occurrence of landslide disasters, thereby improving the safety and reliability of our train operations.

[The concept of the effective rainfall]



■Efforts against wind

Uetsu Main Line train derailment accident

On December 25th, 2005, a derailment of the limited express train Inaho No.14 on the Uetsu Main Line between the Sagoshi and Kita-Amarume Stations caused the death of five passengers and injured 31 passengers.

State of derailment accident.

We would like to report on the measures we have taken since this accident.

Increased number of anemometers (wind meters)

JR East has increased the number of anemometers at the accident site between Sagoshi and Kita-Amarume Stations. In addition, for sections with operation control for strong winds, we have installed multiple anemometers as standard. We have also increased the number of anemometers at places with windbreak fences.

	As of Dec. 25th, 2005: A	As of Mar. 31, 2019: B	Increase (B-A)
Conventional lines	228 units	964 units	+736 units
Shinkansen lines	89 units	163 units	+74 units
Total	317 units	1,127 units	+810 units

Issuing early restrictions for all lines

For all railway sections of conventional lines with operation control for wind, after the resumption of operations of the Uetsu Main Line on January 19th, 2006 we reviewed the criteria for operation control as indicated below. For locations with windbreak fences, we use prior general restrictions.

Restriction type	Wind speed (meters/sec.)	
	General restrictions	Early restrictions
Speed restriction (max. 25 km/h)	25 - 30	20 - 25
Operation halted	30 -	25 -

Installation of windbreak fences

Since 1991, in order to reduce wind force on trains, we have installed windbreak fences at 29 locations as of the end of March 2019.

Uetsu Main Line, between Sagoshi and Kita-Amarume

Keiyō Line, between Shiomi and Shin-Kiba

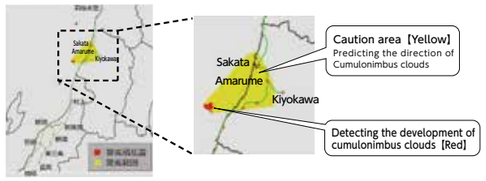
Expanded introduction of the gale warning system

JR East has been using gale warning systems on the Keiyō Line since Aug. 2005 and has installed the systems in all 292 locations on its conventional lines with a gale operation control, including the accident location between Sagoshi and Kita-Amarume of the Uetsu Main Line.
The gale warning system restricts or suspends operations not only when the actual wind speed measured by anemometers exceeds control thresholds, but also when the projected maximum wind speed exceeds these limits.

Utilizing meteorological information for operation control

Local gusts are meteorological phenomena, and are difficult to observe with conventional observation equipment such as anemometers. Through meteorological information such as the intensity of rainfall obtained from the Japan Meteorological Agency's radars and Nowcast that supports detection of tornados, and by detecting the development of cumulonimbus clouds, we introduced a method to forecast the occurrence of local gusts and to apply that information to our operation control. Every year between November and the following March, we use the system in six sections of railway lines along the Sea of Japan including the Uetsu Main Line between Niitsu and Ugo Honjo.

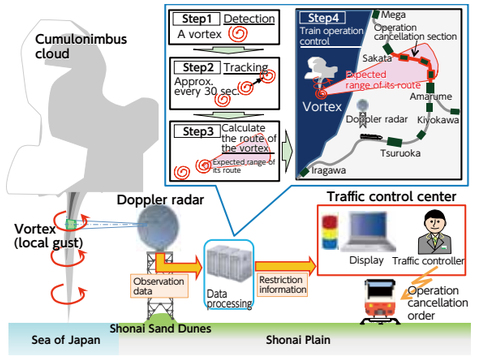
[Display of operation control area by utilizing meteorological information (image)]



Operation control method against wind gust using Doppler radar

Doppler radar is an observation system that can be used to ascertain wind conditions by detecting the movement of raindrops and rain clouds. Since 2007, jointly with the Meteorological Research Institute of the Japan Meteorological Agency, we have been developing a system that can detect a vortex of wind gust in the air from the movement of raindrops and emit an alarm when a vortex heads close to railway lines. In Dec. 2017, we installed a high-performance Doppler radar on a hill of the Shonai Plain which is suitable for observations in and around the Sea of Japan, where local wind gusts are generated. Since then, every year between November and the following March, we have used the system for part of the Uetsu Main Line and Riku-u West Line for train operation control.

Doppler radar installed at Kuromori, Sakata



Doppler radar observation method

Introduction of operational restriction methods by evaluating wind force on trains

The wind force on trains constantly changes. We have been researching the following methods to properly evaluate the wind force on our trains and to further improve our operation control to enhance the safety levels of our operations, while incorporating opinions from external experts.

1) Further improved wind observation methods by anemometers
2) Calculation methods for rolling stock windproof stress taking account of track conditions and railcar shapes

These two methods have been utilized on railway lines including the Uetsu Main since Dec. 2011.

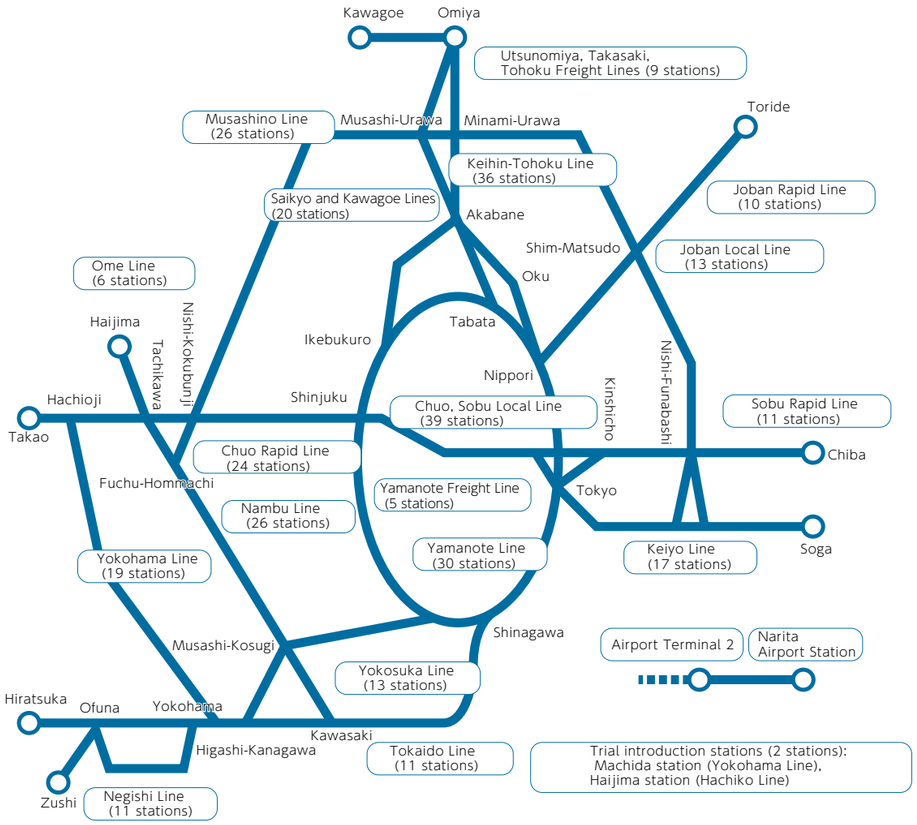
Safety measures at platforms

To prevent accidents involving customers falling from platforms or coming into contact with trains, we are installing platform doors. By the end of FY2019, we completed the installation of platform doors at 36 stations mainly on the Yamanote and Keihin Tohoku Lines (a total of 41 stations* by line).

We plan to accelerate the speed of installation, and by around the end of FY2033 we plan to have installed platform doors at all the stations on the major conventional lines in the Tokyo metropolitan area (330 stations by line, including the 243 stations where we have completed the installation to date).

* No. of stations is counted by line, e.g., Yurakucho Station is counted as 2 stations, one for the Yamanote Line and one for the Keihin Tohoku Line.

[Platform door installations to be completed by around the end of FY2033 (330 stations)]



Promoting the installation of platform doors

In March 2018, JR East announced that the company will complete the installation of platform doors at all stations on major conventional lines in the Tokyo metropolitan area by around the end of FY2033. This announcement of such a challenging target to those both inside and outside of the company truly reflects JR East's attitude toward safety. The installation of platform doors involves enormous cost, long construction periods, differences in the positions of train doors, to name a few. However, with a shared wish that our customers should be able to use our station platforms safely and with peace of mind, overcoming the boundaries of company divisions, we actively exchanged opinions and deeply considered the best way forward. I used to work in the Transport Safety Dept., formulating policies for the installation of platform doors, assessing new platform doors, and coordinating the related departments. Now that I am in the Transport & Rolling Stock Dept., I will continue my efforts to promote the installation of platform doors from the standpoint of operations.

Deputy Manager Transport & Rolling Stock Dept.

Furthermore, JR East is currently working to install an increased number of emergency stop buttons on platforms and dot-Braille blocks that indicate which direction is away from the edge of the platform. Moreover, to ask customers for their cooperation in preventing accidents, we are promoting platform zero accident campaigns.

Emergency stop buttons on platforms

By pushing an emergency stop button installed on platform pillars, people on platforms can notify drivers, conductors, and station staffs of danger.

Installation of high-resolution ITVs

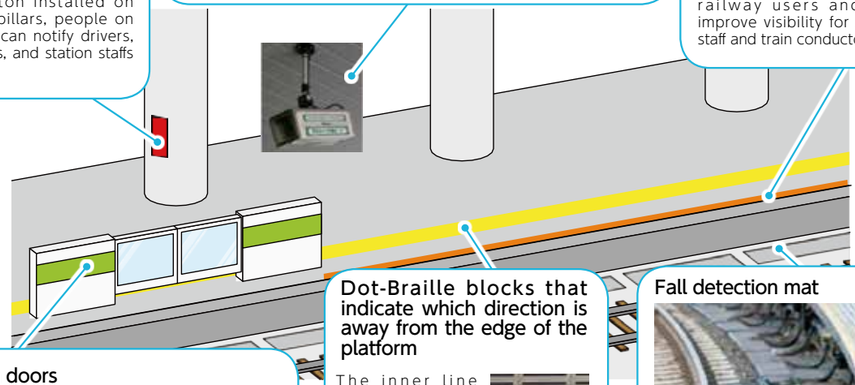
Conventional ITV

High-resolution ITV

To ensure the safety of station employees and conductors, we utilize ITVs on platforms and are increasing the number of high-resolution ITVs for more vivid and clear monitor images.

CP (color psychology) lines

By painting the ends of platforms red or orange, we promote awareness among railway users and also improve visibility for station staff and train conductors.



Platform doors

To improve visibility, glass is used for platform doors.

Dot-Braille blocks that indicate which direction is away from the edge of the platform

The inner line of the blocks is trimmed with lined bumps so that visually challenged customers can tell which side is away from the edge of the platform.

Fall detection mat

A mat placed on the tracks along the platform detects whether a person has fallen onto the tracks and notifies incoming trains to stop.

○ Introduction of new-type platform doors

To accelerate the speed of installation, we are actively introducing smart platform doors® at lower cost and in a shorter construction period.

Smart platform doors®

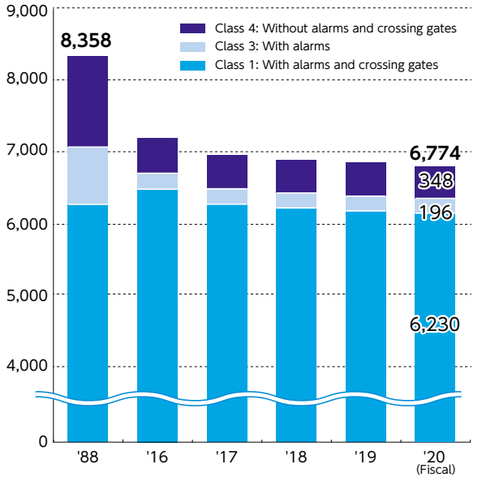
Improvement of functions to detect persons or objects stuck between railcar doors

For some of our railcars, we are increasing the detection functions by increasing the number of sensors. For the E235, a new-type railcar for the Yamanote Line, we have employed a system that enables a stuck object to be pulled out immediately after train departure. We plan to install this system in railcars to be newly introduced.

Measures to prevent level crossing accidents

The elimination of level crossings is our most fundamental measure for preventing accidents at level crossings. In cooperation with our customers in local communities, JR East is working on the elimination of level crossings by introducing grade-separated crossings, as well as by integrating or reducing the number of level crossings.
For those level crossings that cannot be eliminated, we will upgrade the crossings to Class 1 with alarms and gates. We are also further increasing the installation of obstacle detectors and level crossing alarm systems. Additionally, as a measure to improve visibility, we are installing crossing warning devices in a higher position for better visibility.
Furthermore, based on the Act on Promotion of Railway Crossings revised in April 2016, for level crossings requiring improvement, depending on the situation at each level crossing, we will take measures such as introducing overhead crossings instead of level crossings, and increasing the width of crossings. Where necessary, we will also apply colored paint to level crossings and overhead pedestrian bridges. Moreover, we are promoting level crossing zero accident campaigns to ask for the cooperation of pedestrians and automobile drivers in accident prevention at level crossings.

[Changes to the number of level crossings (as of April 1st every year)]



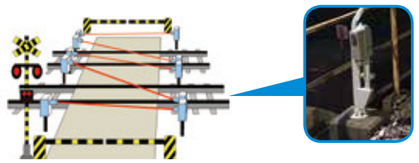
Our efforts to eliminate level crossings

[No. of eliminated level crossings by measures such as the introduction of overhead crossings (excluding those transferred to third sectors)]

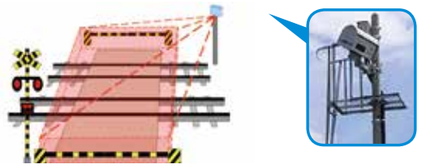
FY	2015	2016	2017	2018	2019
No. eliminated	37	18	42	20	17

Obstacle detectors

The detectors notify trains of danger by detecting an obstacle such as a stalled automobile on a level crossing. To monitor the whole area of a level crossing, we utilize laser-type detectors that cover multiple optical axes as well as three-dimensional laser radar obstacle detectors.
Currently, we are developing a highly functional three-dimensional laser radar obstacle detector to further improve functionality so that even a person who has fallen over on the level crossing can be detected.

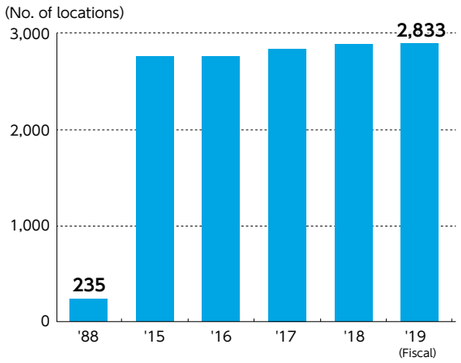


Laser-type obstacle detector



Three-dimensional laser radar obstacle detector

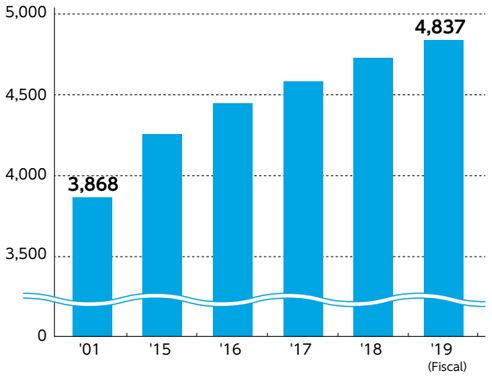
[No. of locations with obstacle detectors (as of the end of Mar. every year)]



Level crossing alarm system

Automobile drivers or pedestrians can notify trains of dangers by using the system when they are stuck on level crossings.

[No. of locations with level crossing alarm systems (as of the end of Mar. every year)]



Level crossing alarm system

Increasing visibility of level crossing alarm system and standardization of display

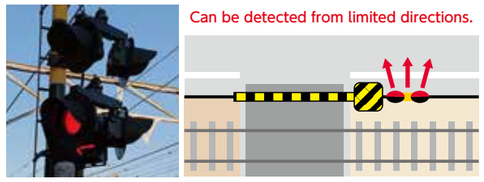
We are improving the visibility of all level crossing emergency buttons so that pedestrians and drivers can immediately push the emergency button in case of an emergency on a level crossing. By using high-luminance reflective panels, furigana for Chinese characters, an English-language sign, and a pictograph, we will make it easier for children and people from abroad to use the emergency buttons.

Before → After

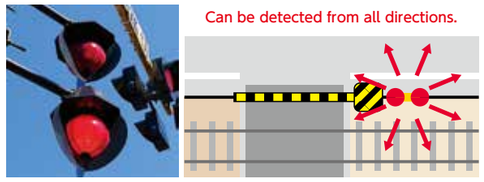
Measures to improve visibility at level crossings

Regarding level crossing warning lights to notify the approaching of a train, we are replacing conventional warning lights with omnidirectional warning lights so that they can be easily detected by the elderly with lower sight lines and automobile drivers who enter level crossings from roads.

[Conventional warning light]



[Omnidirectional warning light]



Separating level crossings for pedestrians and for automobiles

In cooperation with road administrators, we are increasing the width of level crossings and separating crossings for pedestrians from those for automobiles by changing the colors of the roads and walkways.

Efforts in snowfall areas

We utilize road heating for level crossings with heavy traffic in snowfall areas.

Measures to prevent accidents at Class 4 level crossings without crossing gates and alarms
For Class 4 level crossings that do not have crossing gates or alarms, in cooperation with neighboring communities, we are either closing them or upgrading them to Class 1 crossings by installing crossing gates and alarms. Additionally, to prevent accidents at level crossings, we are taking measures such as installing solar-powered illuminated signs or whistling signs to alert pedestrians to approaching trains.

Class 4 level crossing

Current safety record of JR East

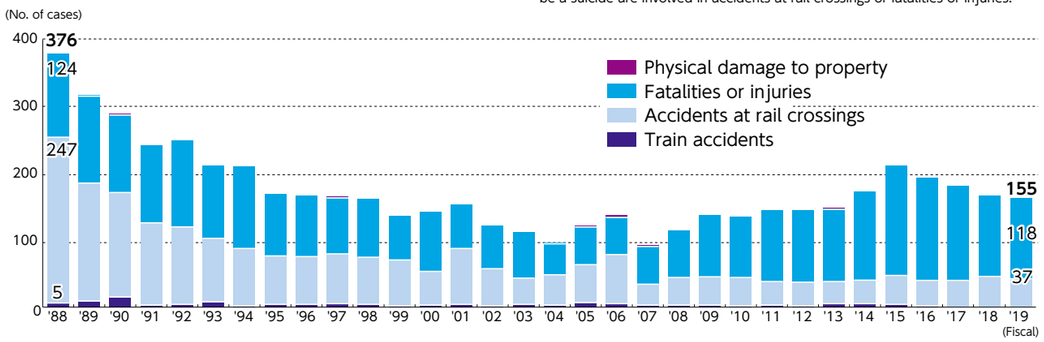
Railway accidents

In FY2019, JR East recorded 155 railway accidents, a reduction to nearly 40% of the level at the company's foundation. "Fatalities or injuries"account for approximately 70 percent of the total number of "Railway accidents" .

Train accidents	Train collisions, derailments, and train fire
Accidents at rail crossings	People or automobiles being hit by trains
Fatalities or injuries	People killed or injured by train operation excluding suicide
Physical damage to property	Accidents causing more than 5 million yen damage to property by train operation

[Occurrences of railway accidents]

* From the third quarter of FY2014, incidents which could not be determined to be a suicide are involved in accidents at rail crossings or fatalities or injuries.



■Train accidents
JR East recorded zero train accidents.

■Accidents at rail crossings
JR East recorded 37 accidents at road crossings. The accidents were caused by automobiles stalling on the tracks (11 cases), pedestrians/automobiles crossing the track immediately prior to the passing of trains (21 cases), side impact (3 cases), and others (2 cases).

■Fatalities or injuries
JR East recorded 118 railway accidents of "Fatalities or injuries". A total of 65 of these accidents related to customers on platforms or trespassers on tracks coming into contact with trains, and customers falling onto the tracks from platforms. Approximately 50% of these involved intoxicated customers.

■Physical damage to property
JR East recorded zero accidents.

Incidents

JR East recorded 1 incident (railcar failure).

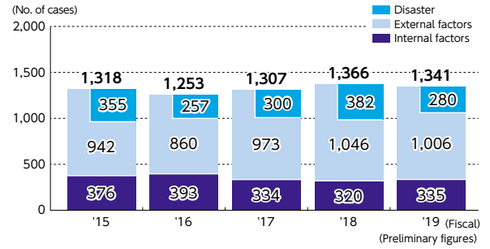
*Incidents	"Incidents" mean situations that could lead to a railway accident. The definitions of incidents are stipulated by the rules and regulations for railway accidents that require reporting.

Transport disorders

JR East recorded 1,341 cases of transport disorder.

Transport disorders	In addition to railway accidents, there are transport disorders, which encompass train service cancellations due to failures of trains or facilities, mishandling by employees, or disasters, or delays to passenger trains for over 30 min. or other trains for over 1 hour.
Disaster	Natural phenomena such as powerful storms, heavy rainfall, heavy snowfall, flooding, high tides, earthquakes, tsunamis, etc.
External factors	External factors such as trespassing or suicide
Internal factors	Internal factors such as those related to crews, trains, or facilities

[No. of transport disorders]



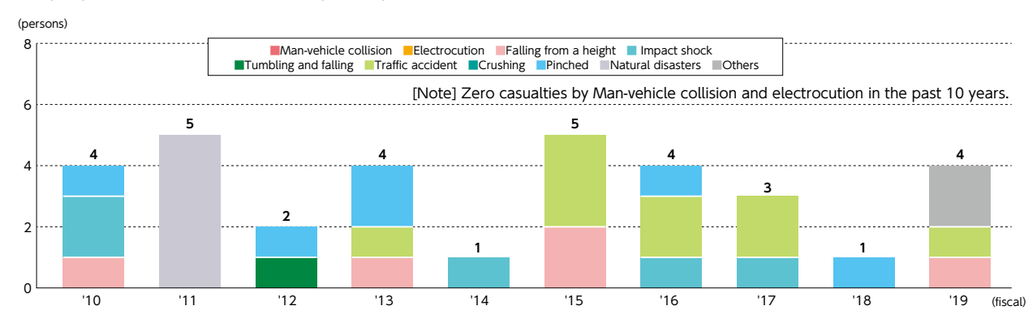
*No. reported to each District Transport Bureau

Current state of employee accidents

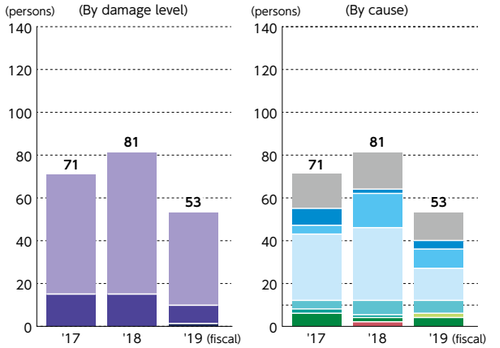
In FY2019, 4 lives were lost due to fatal accidents, and 150 accidents resulted in lost work time. Accordingly, as set out in Group Safety Plan 2023, we will continue our efforts to ensure that safety systems and rules are clearly defined and complied with across the entire JR East Group in our aim to achieve zero passenger accidents involving injury or fatality, and zero employee fatalities for both Group and Partner companies.

* Employees of Group companies, etc. include those of consolidated subsidiaries and partner companies with close relationships with JR East.

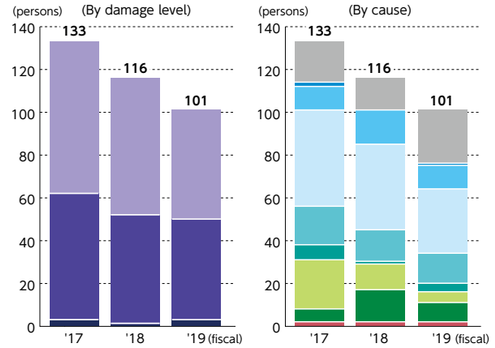
[Status of accident fatalities
(*Employees of JR East and Group companies, etc.)]

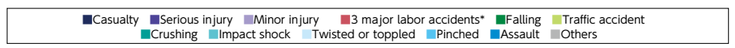


[Accidents with lost work time and fatality
(JR East employees)]



[Accidents with lost work time and fatality
(employees of Group companies, etc.)]





* 3 major labor accidents are man-vehicle collisions, electrocution, and falling.