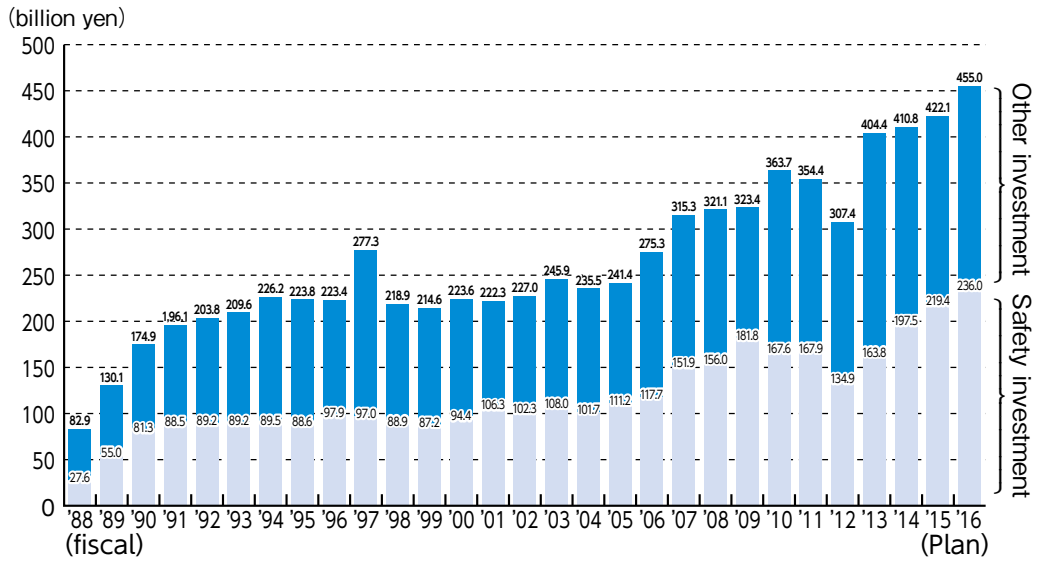
Efforts to further improve safety levels

Investment in safety equipment

Safety facilities investment

JR East has invested more than three trillion yen during the 28 years following the company's establishment. In our Group Safety Plan 2018, JR East's Five-year Safety Plan, which was announced in Feb. 2014, JR East plans to invest approximately one trillion yen in safety measures during the five years from FY2015 to FY2019.

■ Trends in safety investment



Major safety investment in FY2016

In FY2016, JR East will steadily implement improvement of ATS, measures against large-scale earthquakes, local gusts and gales, improvement of platform doors for the Yamanote Line, and safety measures for level crossings.
JR East plans to invest 455 billion yen in total in its facilities and 236 billion yen of that total will be invested in safety.

■ Major safety investment

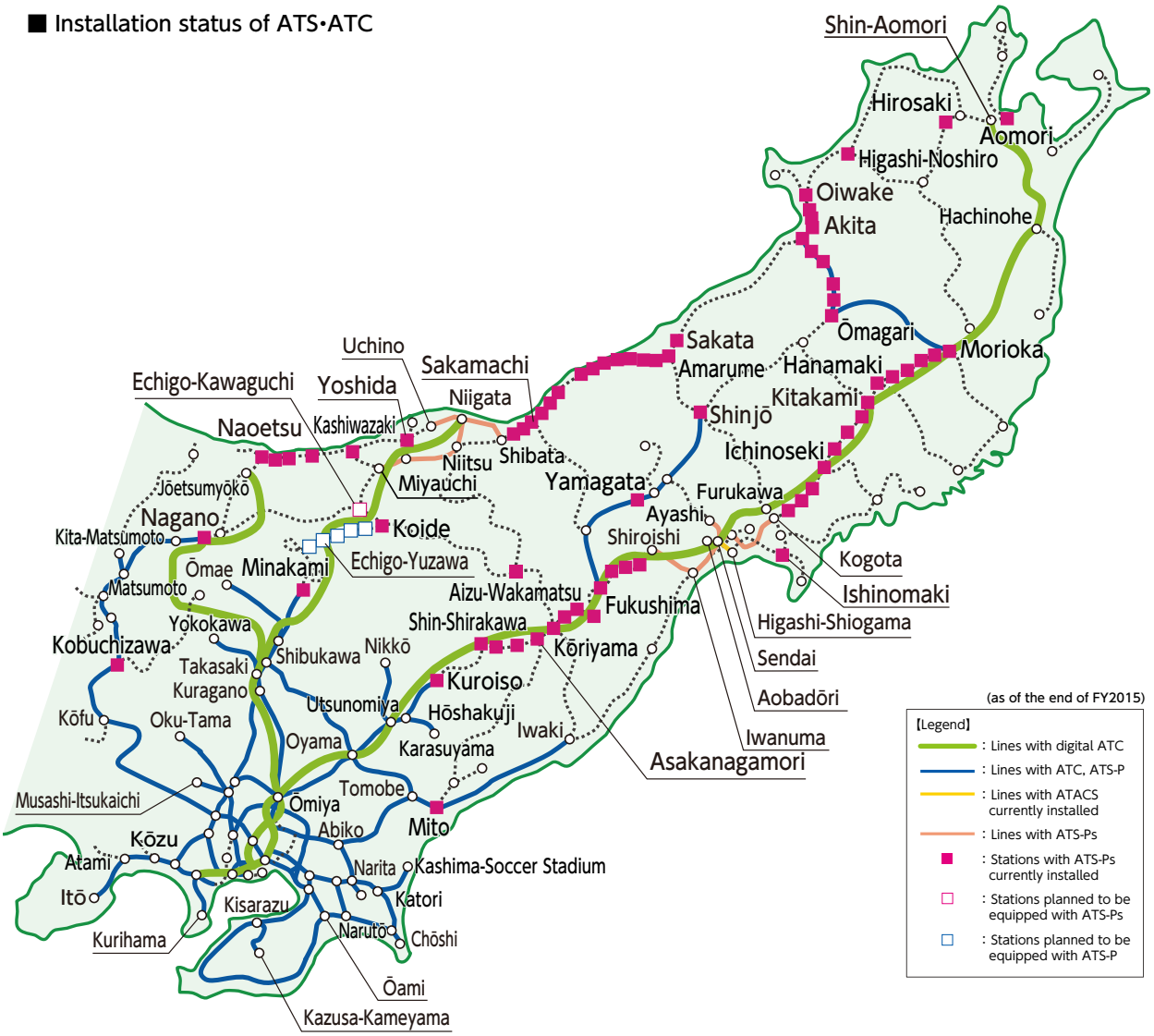
- Improvement of ATS, etc.
- Measures against large-scale earthquakes (seismic reinforcement of elevated bridges, embankments, buildings)
- Safety measures for level crossings (level crossing warning systems, obstacle detectors, etc.)
- Improvement of automatic platform doors for Yamanote Line
- Improvement of dot-Braille blocks that indicate which direction is away from the edge of the platform
- Measures against natural disasters (rainfall, local gusts, and gales, etc.)

Installing 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.

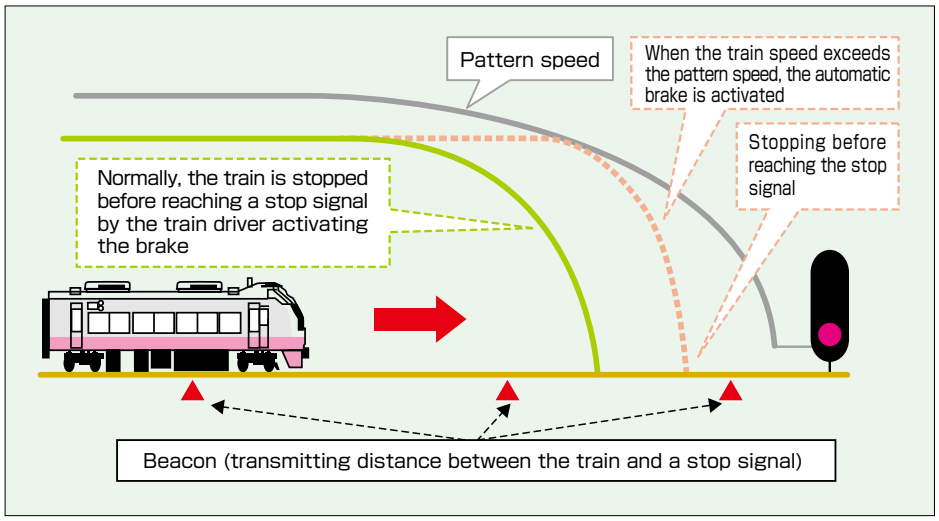
■ Installation status of ATS•ATC



ATS (Automatic Train Stop)

ATS stands for Automatic Train Stop. It is a system to automatically activate brakes so that a train can stop before reaching its stop signal. Currently, JR East is installing ATS-P and ATS-Ps systems with improved safety capabilities on its railway lines.
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



■ Installation plan for ATS-P and ATS-Ps systems

	Areas for planned installation	Installation status as of the end of FY2015
ATS-P system	Mainly for railway sections with frequent train operations in Tokyo metropolitan area	Completed installation in railway sections for 2,405.8 km (service km)
ATS-Ps system	Provincial city areas and major railway sections excluding Tokyo metropolitan area	Completed installation in 71 major stations and railway sections for 210.5km

We plan to complete installation of ATS at curves, turnouts, track ends, and descending gradients by the end of FY2016. This will comply with the 10-year time limit for installation that is required by the July 2006 revisions to the Ministry Ordinance for technological standards for railways.

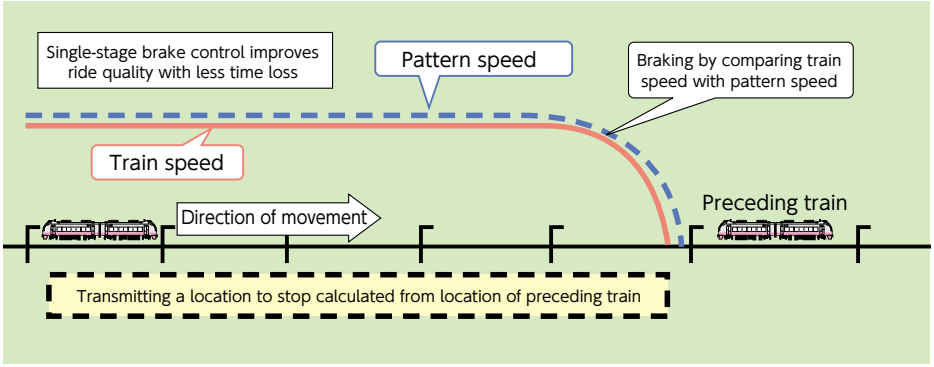
■ Installation status of ATS for mandatory locations by the July 2006 revisions

Category	Target locations	Installations as of the end of FY2015	Progress	Completion or planned completion
Curves	934 locations	934 locations	100%	FY2010
Turnouts	466 stations	460 stations	99%	FY2016
Track ends	38 stations	37 stations	97%	FY2016
Descending gradients	707 locations	707 locations	100%	FY2012

ATC (Automatic Train Control)

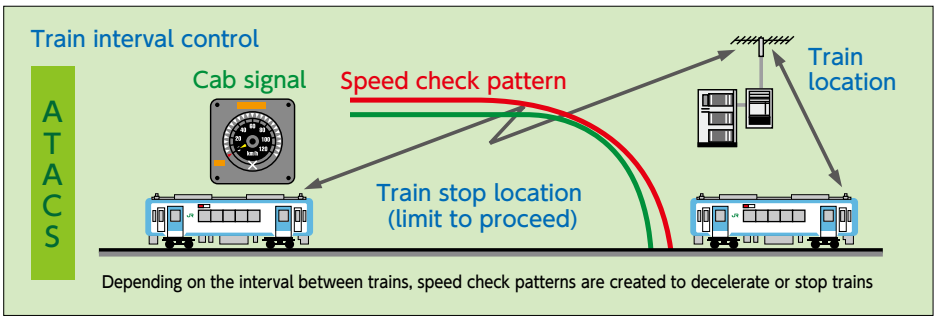
ATC stands for Automatic Train Control. In this system, ground equipment continuously transmits signals to trains via the rails. The transmitted signals are indicated on the driver's cab and the system automatically activates the emergency brake if the train exceeds its permitted speed. JR East has introduced the system on the Tohoku, Joetsu and Hokuriku Shinkansen Lines and on several conventional lines: the Yamanote, Keihin Tohoku, Negishi, Saikyo (between Ikebukuro and Omiya), and Joban Lines (local trains).
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. With the introduction of the digital ATC, we can further improve the safety levels of our railway operations, as well as enhance the ride quality, shorten headways, and simplify facilities.

■ Digital ATC



ATACS (Advanced Train Administration and Communications System)

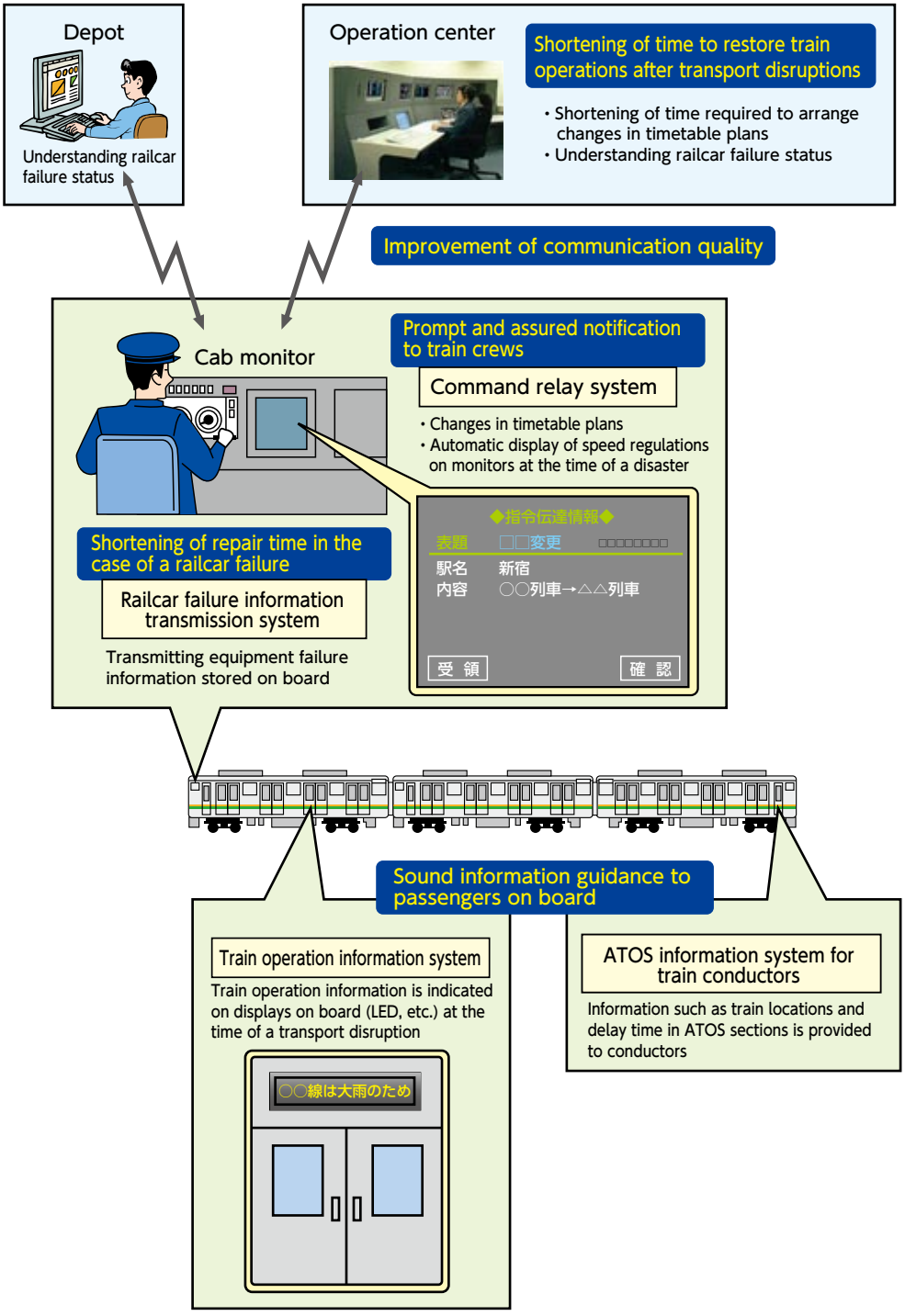
ATACS is a train control system that utilizes radio transmissions. It is a totally new system for trains to detect ATACS is a train control system that utilizes radio transmissions. It is a totally new system for trains to detect their own locations instead of using traditional methods of train location 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 in October 2011 on the Senseki Line between Aoba-dori and Higashi-Shiogama.



Improvement of other safety facilities

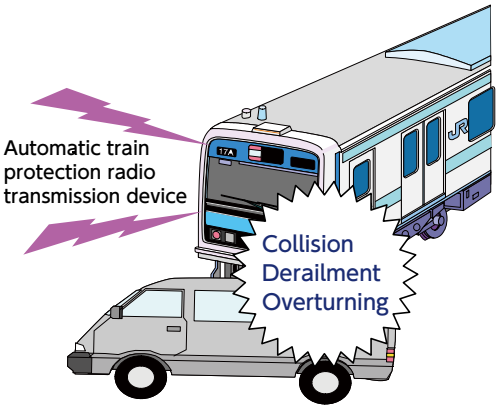
Digital train radio system for conventional lines

We completed the introduction of a digital train radio system for conventional lines for railway sections in the Tokyo metropolitan area in July 2010. Currently, to extend the introduction of the system to other areas outside Tokyo metropolitan area, we are working on design and construction for its introduction along 1,040km of 11 railway sections in a first phase and along 1,240km of 20 railway sections in a second phase. We plan to start to use it on the railway sections of the first phase by FY2017 and on those of the second phase by FY2019.
In comparison to traditional analog systems, digitalized systems improve audio communication quality and make the communication between train dispatchers clearer. Additionally, the digital train radio systems for conventional lines introduced for railway sections of the Tokyo metropolitan area have made various data communications possible so that we can offer information to customers when an issue occurs, and prompt and accurate notifications to train crews are possible.



Automatic train protection radio transmission device

When an emergency occurs such as a derailment accident, train crews use a train protection radio in the driver's cab to stop neighboring trains. Other trains receive a train protection radio signal to activate emergency braking, and secondary accidents such as train collisions can be avoided.
JR East has developed a system to automatically transmit a train protection radio signal to prevent secondary accidents even when train crews cannot promptly transmit a train protection radio signal at the time of a major accident. In FY2009, we started to use the system with E233 Series trains on the Keihin Tohoku and Negishi Lines. Currently, we are introducing the system to conventional lines in the Tokyo metropolitan area to further heighten the safety of train operations.

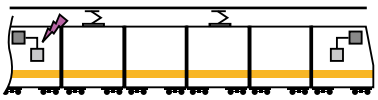


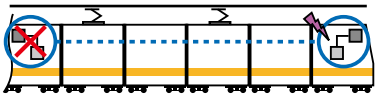
In this automatic radio transmission system, acceleration sensors monitor the vibration and tilting of trains. When the system detects collisions, derailments or overturning of trains based on the vibration and tilting of the trains, the train protection radio automatically transmits emergency stop signals.
Additionally, by installing the systems in the driver's cab in both the front and end railcars of a trainset, even when the train protection radio or the acceleration sensor of the front railcar is damaged due to a collision, the other train protection radio in the rear railcar can automatically transmit emergency stop signals to other trains to prevent secondary accidents.

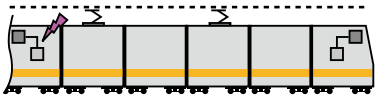

Automatic train protection radio transmission device

Cab monitor

■ Major functions

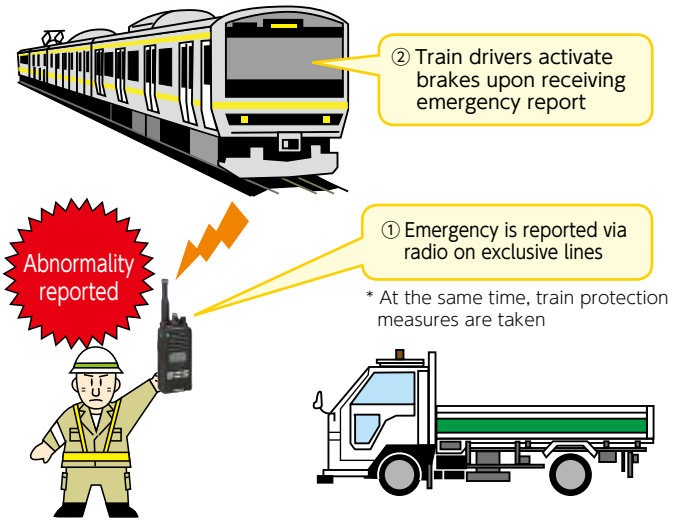

Prompt automatic transmission of train protection signals after a collision


Even when the lead car fails, the rear car can automatically transmit train protection signals.


Even when the power supply is cut off, automatic transmission will continue.

Collision prevention support radio system

Learning lessons from the derailment accident at the Kawasaki Station premises of the Keihin Tohoku Line, JR East introduced a collision prevention support radio system to help maintenance workers stop trains in case of an emergency during maintenance work.
The system utilizes an exclusive radio to notify train crew of an abnormality to help stop trains when an emergency arises that requires to stop trains immediately.



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.

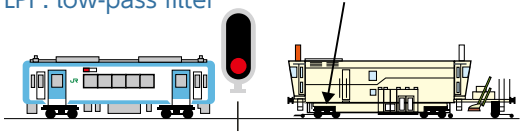
Track circuit shorting by maintenance vehicles

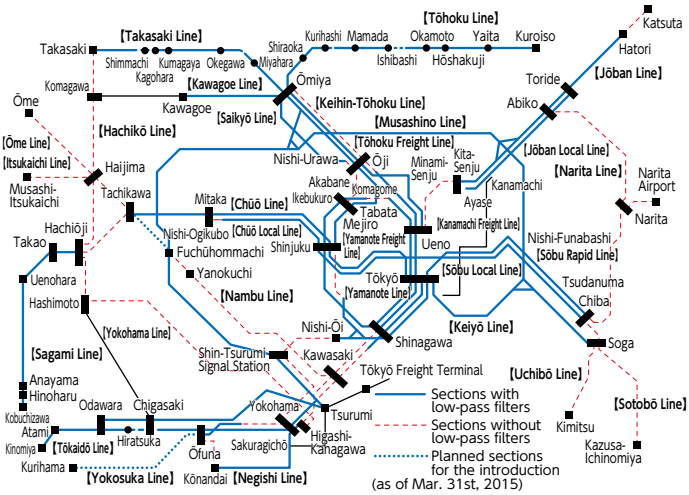
This is an improvement to prevent a collision between a train and a maintenance vehicle. Railway signals turn red to indicate a stop signal when a train short-circuits the rails and electric current flows between the rails, as a standard method of preventing train collisions. This short-circuit current also activates warning and barrier devices at level crossings.However, since track maintenance vehicles may occupy a track ffor a long time during maintenance work, their axles are insulated so that they do not cause lebel crossings to be blocked by short-circuiting the rails, and therefore are not protected by the railway signal system.
JR East has developed low-pass filters (LPFs) to allow electric current to flow for signal control while at the same time stopping current flow for level crossing control, so that maintenance vehicles can be protected from train collisions without blocking road traffic at level crossings. Currently, we are steadily installing LPFs in our maintenance vehicles.

Track short-circuits by maintenance vehicles set railway signals to stop, to prevent collisions of trains and maintenance vehicles.

Train
Red signal
⇒ A train stops before the signal.
LPF: low-pass filter

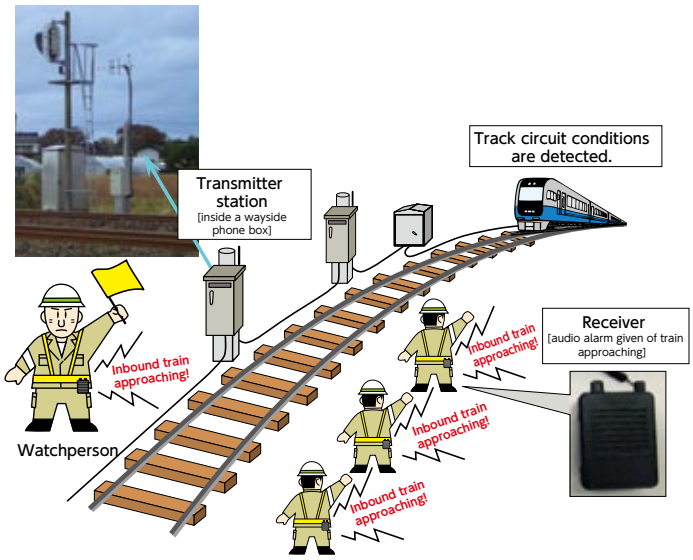

LPF: low-pass filter





TC-type wireless train approach alarm device

Since inspections of railway facilities are mainly conducted wayside, inspection work involves risk for maintenance workers as they could come into contact with trains. For this reason, JR East takes accident prevention measures such as assigning watchpersons to look out for approaching trains. Additionally, we are introducing a TC-type wireless train approach alarm device to inform watchpersons and maintenance workers of approaching trains to further improve safety levels, so as not to solely depend on the attentiveness of watchpersons.



The TC-type wireless train approach alarm device detects approaching trains via track circuits, transmits the information via wayside phone lines, and the transmitter station inside the wayside phone box transmits alarm radio waves. Maintenance workers receive the transmitted alarms via their mobile receivers and the alarm notifies them of approaching trains by audio notifications such as inbound train approaching, outbound train approaching, or both inbound and outbound trains approaching.
When a train is not approaching, the receiver emits confirmation beeps at a certain interval so that failure of a receiver can be noticed.

Efforts against natural disaster

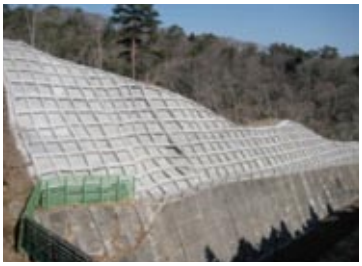
Measures for rainfall

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.
To date, for the Yamanote, Keihin Tōhoku, Akabane, Jōban, Tōkaidō Main, Yokosuka, and Chūō Main Lines and Narita Express routes (between Higashi-Chiba and Narita International Airport), we have completed our countermeasures projects and revised our operational restriction values for rainfall.
Additionally, from Oct. 2013, we have been working on disaster prevention measures against rainfall for the Yamagata Shinkansen (between Akayu and Kaminoyam-Onsen).

■ Countermeasures for rainfall

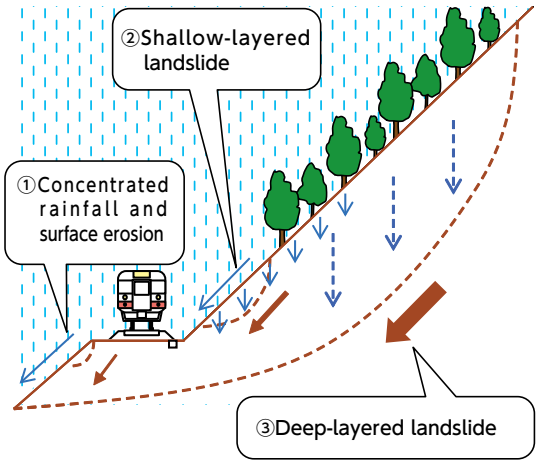

Cutting slope protection
(spray frame work)

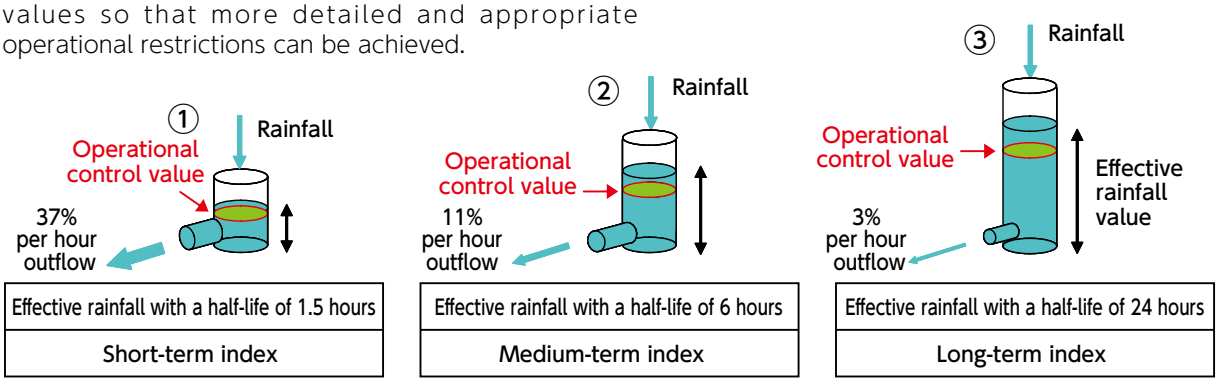

Embankment slope protection
(spray frame work)


Natural slope protection
(spray frame work)

Introduction of “effective rainfall” as an operational restriction indicator for rainfall

For operational restrictions for heavy rainfall, we have been using hourly rainfall and continuous precipitation as our indices. Since June 2008, we have been using three indices, including “effective rainfall” as a new indicator that is effective in the prevention of 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 operational restriction index for railways. With this indicator, we can more precisely predict the occurrence of landslide disasters, thereby improving the safety and reliability of our train operations.
Taking into consideration the tracks, neighboring topography and geography, and the past history of disasters, we utilize three levels of effective rainfall values so that more detailed and appropriate operational restrictions can be achieved.





Half-life: Time it takes for the tank water to be reduced by half

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. We pray for the souls of those who lost their lives, and offer our deepest apologies to the victims of the accident and their families.
To prevent accidents such as this from happening again, JR East is committed to taking all possible preventative measures and continuing our efforts to further improve the safety levels of our railways.
We would like to report on the measures we have taken since this accident.

State of derailment accident

Issuing tentative early restrictions

For railway sections of conventional lines with operational restrictions due to wind, after the resumption of operations of the Uetsu Main Line on January 19th, 2006 we reviewed the criteria for operational restrictions as indicated below and are issuing temporary early restrictions for all railway sections.
However, for locations with windbreak fences, by taking the effects of windbreak fences into consideration, we use general restrictions instead of early 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 -

Increased number of anemometers (wind meters)

To date, JR East has increased the number of anemometers at the accident site between Sagoshi and Kita-Amarume Stations on the Uetsu Main Line. In addition, for sections with operational restrictions for strong winds, we have installed multiple anemometers as standard. By reconfirming the requirements for wind restrictions on sections of railway lines, using information from front-line employees, topography, and wind conditions in these areas, and adding new operational restriction sections, we are working to improve our safety observation network to counter the effects of these strong winds. With this reinforcement, since the accident JR East has installed a total of 651 anemometers on its conventional and Shinkansen lines, and we had a total of 968 anemometers installed.

	As of Dec. 25, 2005: A	As of Mar. 31, 2014: B	Increase (B-A)
Conventional lines	228 units	806 units	+578 units
Shinkansen lines	89 units	162 units	+73 units
Total	317 units	968 units	+651 units


Anemometer

Reviewing operational restriction sections

We have been deciding on the operational restriction sections for strong winds based on a past field study and the experiences of field staffs. We have newly utilized gale maps of the areas based on wind conditions and topography and reviewed operational restriction sections based on information from field staffs. As a result, we have newly installed 75 operational restriction sections.

Installation of windbreak fences

In order to reduce wind force on trains, we have installed wind break fences at the following locations:

(as of the end of FY2015)

	Line name	Section	Location of installation	Time completed
1	Tōkaidō Main Line	Bridge next to Nebukawa Station	Both sides of the line	Jul. 1991
2	Jōban Line	Between Yonomori and Ōno	West side only	Feb. 1996
3	Kawagoe Line	Between Sashiōgi and Minami-Furuya	North side	Apr. 1998, extended in Jun. 2009
4	Uetsu Main Line	Between Sagoshi and Kita-Amarume	West side only	Nov. 2006
5	Tōhoku Main Line	Between Fujita and Kaida	West side only	Nov. 2006
6	Tōhoku Main Line	Between Kurihashi and Koga	Both sides of the line	North side: Mar. 2007 South side: Jun. 2007
7	Jōban Line	Between Fujishiro and Sanuki	Both sides of the line	Mar. 2007
8	Keiyō Line	Between Kasairinkaikōen and Maihama	South side only	Mar. 2007
9	Keiyō Line	Between Ichikawashiohama and Futamatashinmachi	South side only	Mar. 2007
10	Keiyō Line	Between Kaihinmakuhari and Kemigawahama	South side only	Mar. 2007
11	Musashino Line	Between Misato and Minami-Nagareyama	Both sides of the line	South side: Mar. 2007 North side: Jun. 2009
12	Keiyō Line	Between Shiomi and Shin-Kiba	Both sides of the line	South side: Jun. 2007 North side: Oct. 2012 South side: extended in Oct. 2012
13	Keiyō Line	Between Shin-Kiba and Kasairinkaikōen	Both sides of the line	South side: Aug. 2007 North side: Oct. 2012 South side: extended in Oct. 2012
14	Keiyō Line	Between Futamatashinmachi and Minami-Funabashi	South side only	Aug. 2007, extended in Oct. 2012
15	Musashino Line	Between Minami-Koshigaya and Yoshikawa	Both sides on brige section North side	Both sides on bridge sections: Mar. 2009 North side: Feb. 2010
16	Musashino Line	Between Kita-Asaka and Nishi-Urawa	Both sides of the line	South side: Dec. 2009 North side: Aug. 2010
17	Uetsu Main Line	Between Atsumi-Onsen and Kobato	West side only	Dec. 2011
18	Uchibō Line	Between Sanukimachi and Kazusa-Minato	West side only	Mar. 2012
19	Keiyō Line	Between Shin-Narashino and Kaihinmakuhari	South side only	Dec. 2013
20	Sōbu Main Line	Between Koiwa and Ichikawa	South side only	Mar. 2014
21	Sōbu Main Line	Between Hirai and Shinkoiwa	South side only	May 2014
22	Shinetsu Main Line	Between Yoneyama and Kasashima	West side only	Oct. 2014
23	Jōban Line	Between Kanamachi and Matsudo	South side only	Mar. 2015
24	Jōban Line	Between Tennōdai and Toride	Both sides of the line	Mar. 2015
25	Jōban Line	Between Mito and Katsuta	North side only	Mar. 2015

Uetsu Main Line, between Sagoshi and Kita-Amarume

Keiyō Line, between Shin-Narashino and Kaihinmakuhari

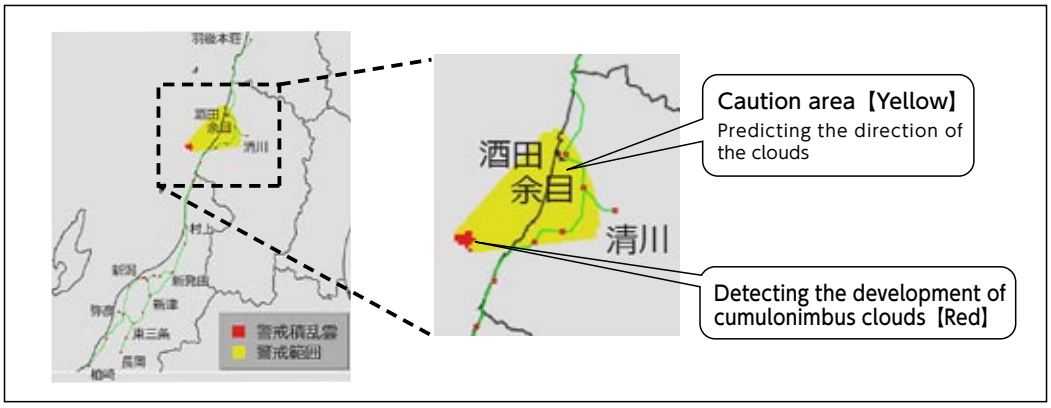
Gale warning system

JR East has been using gale warning systems on the Keiyō Line since Aug. 2005 and has installed the systems in all locations on its conventional lines with a gale operational restriction, including the accident location between Sagoshi and Kita-Amarume of the Uetsu Main Line. Since the gale warning system restricts operations not only when the actual wind speed measured by anemometers exceeds restriction thresholds, but also when the projected maximum wind speed exceeds these limits, we can further raise the level of safety of our operations.

Utilizing meteorological information to test methods for operational restrictions

Local gusts are meteorological phenomena, and are difficult to observe with conventional observation equipment such as anemometers. Through meteorological information obtained from the Japan Meteorological Agency's radars and Nowcast that supports detection of tornados, and by detecting the development of cumulonimbus clouds, we have been investigating how to forecast the occurrence of local gusts and to apply that information to our operational restrictions. Every year between November and the following March, we test 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 operational restriction area by utilizing meteorological information (image)

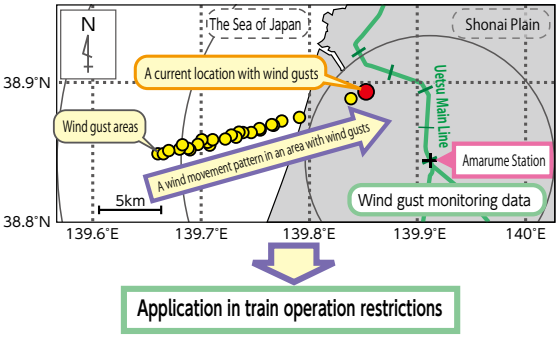


Research on a Doppler radar observation method

Since July 2007, in cooperation with specialized institutes, we have been developing systems to detect the development of cumulonimbus clouds and produce alerts for railway sections for trains' planned routes.

Doppler radar installed on the roof of Amarume Station on the Uetsu Main Line

Doppler radar main body



Introduction of operational restriction methods by evaluating wind force on trains

The wind force on trains constantly changes. We have introduced methods to properly evaluate the wind force on our trains and have further improved our operational restrictions to enhance the safety levels of our operations. The following two measures were introduced to the Uetsu Main, Keiyo and Echigo Lines, and the second measure was introduced to the Ominato Line; a total of 12 sections on these four lines.

1) Further improved wind observation methods by anemometers

By installing three anemometers at approximately 5 to10m intervals within the length of a traincar(20m). we can acquire more accurate values for the wind velocity exerted on our trains.

2) Calculation methods for rolling stock windproof stress taking account of track conditions and railcar shapes

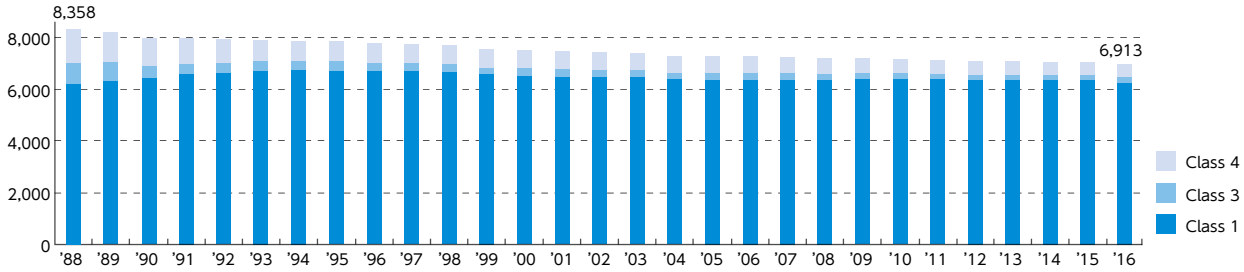
By using the new calculation method proposed by the Railway Technical Research Institute (RTRI detailed method) based on the traditional calculation method (Kunieda method), we can calculate a windproof stress for our trains that is closer to real conditions. The windproof stress of a train is the operable speed of the train against wind.

Other safety measures in progress

Measures to prevent accidents at level crossings

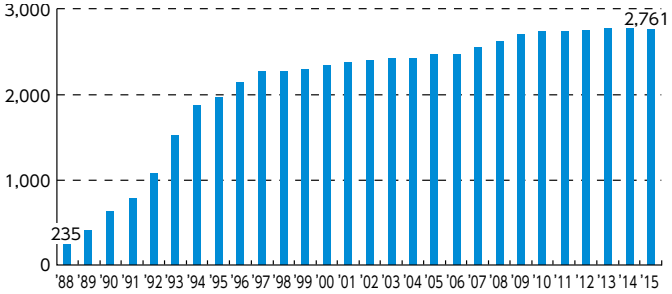
To improve our safety measures, we are further increasing the installation of obstacle detectors and level crossing alarm systems. Additionally, as a measure to improve visibility at level crossings, we are installing crossing warning devices in a higher position for better visibility.
Moreover, we are 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 every year)



Obstacle detectors

The detectors notify trains of danger by detecting a stalled automobile or an obstacle on a level crossing.



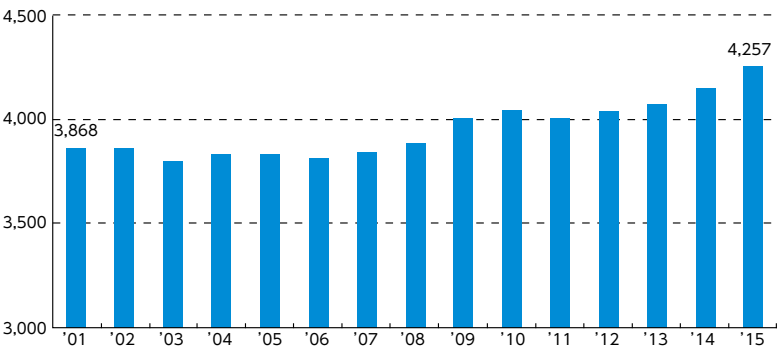
* We have installed these detectors at 2,761 level crossings as of the end of FY2015.

Three-dimensional laser radar obstacle detection method

Based on three-dimensional data measured by laser beams, the system detects obstacles in predetermined monitoring areas.

Level crossing alarm system

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



* We have installed the systems at 4,257 level crossings as of the end of FY2015.

Level crossing alarm system

Measures to improve visibility at level crossings

JR East implements various measures to improve visibility at level crossings for pedestrians and automobile drivers.

A crossing warning device located in a higher position for better visibility

By installing alarms at a higher position, level crossings become more visible to pedestrians and drivers.

A large crossing gate

Larger crossing gates have been installed; the barrier arms are thicker than usual.

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 and for automobiles.

Efforts in snowfall areas

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

Measures to prevent accidents at Class 4 rail crossings without crossing gates and alarms

To prevent accidents at Class 4 level crossings that do not have crossing gates or alarms, we take measures such as installing solar-powered illuminated signs to alert pedestrians and automobile drivers of the rail crossings. We are also continuing our efforts to install crossing gates and alarms for these Class 4 crossings to make them Class 1 crossings with crossing gates and alarms. Additionally, mainly for level crossings with prohibition of automobile crossings, we have installed fences to block automobile traffic.

Installation of fences to prohibit automobile traffic at level crossings where automobile crossings are banned

We have installed solar-powered illuminated alarm signs for all Class 4 level crossings without crossing bars and alarms to notify pedestrians and drivers of the crossings by blinking of lights for improved visibility.

Efforts to abolish level crossings

While improving various safety facilities for level crossings, in cooperation with neighboring communities we are also taking drastic measures such as the introduction of grade-separated crossings instead of level crossings and integrating and decreasing the number of level crossings.

■ No. of level crossings abolished due to measures such as the introduction of grade-separated crossings (excluding those transferred to semi-public sectors)

FY	2011	2012	2013	2014	2015
No. of abolished level crossings	22	11	24	12	37

Level crossing zero accident campaigns

Since trains cannot stop immediately, it is extremely dangerous for automobiles and pedestrians to enter level crossings while the alarms are sounding.
We have been conducting level crossing accident prevention campaigns every year since 1991. Through the campaigns, we ask our customers and neighboring communities to understand the risk involved in railway operations and cooperate in the safe use of level crossings.

During the campaigns, we post campaign posters and distribute pocketable tissue packs with campaign information at stations.

In cooperation with local police stations, we visit local elementary schools near Class 4 level crossings without crossing gates and alarms for educational activities.

Measures taken after the Daikonbara level crossing accident on the Iiyama Line

On Feb. 1st, 2011, at the Daikonbara level crossing between Morimiyanohara and Ashidaki on the Iiyama Line, the level crossing gates failed to operate correctly and the crossing gates had to be opened manually by staff on both sides of the crossing. This resulted in a collision between a train and an automobile, with the driver of the automobile being killed in the collision. We offer our deepest condolences and sincerest apologies to the driver and family. To ensure that accidents such as this do not happen again, JR East will take all possible preventative measures as we continue our efforts to further improve the safety levels of our railways.

■ Countermeasures

When alarms continue to sound due to causes such as failures of gates at level crossings and we need to allow pedestrians and automobiles to cross the failed level crossings, we stop the trains at stations and make sure that the trains do not pass through that crossing so that pedestrians and automobiles can cross the level crossings safely. Additionally, we prepare procedure manuals to ensure the safety of level crossings and to prevent human error.

Safety measures at platforms

To secure the safety of customers on platforms, we are installing emergency train stop warning systems and image-processing fall detection equipment.
Moreover, we are proceeding with the introduction of platform doors for the Yamanote Line. Excluding six stations with planned large-scale improvements (Shinagawa, Hamamatsucho, Tokyo, Shimbashi, Shinjuku, and Shibuya Stations), by the end of FY2016 we plan to start using platform doors at 23 stations. Additionally, we are considering the introduction of platform doors at Oimachi Station on the Keihin Tohoku Line and at Shin Koiwa Station on the Sobu Rapid Line.
For stations where the daily number of passengers exceeds 100,000, JR East is currently working to install an increased number of dot-Braille blocks that indicate which direction is away from the edge of the platform by the end of FY2016. Even for stations where the daily number of passengers is less than 100,000, we are considering the installation of dot-Braille blocks, mainly at stations used frequently by visually challenged customers.
Additionally, we are running station platform safety campaigns every year to ask for the cooperation of customers using our stations.

Platform doors

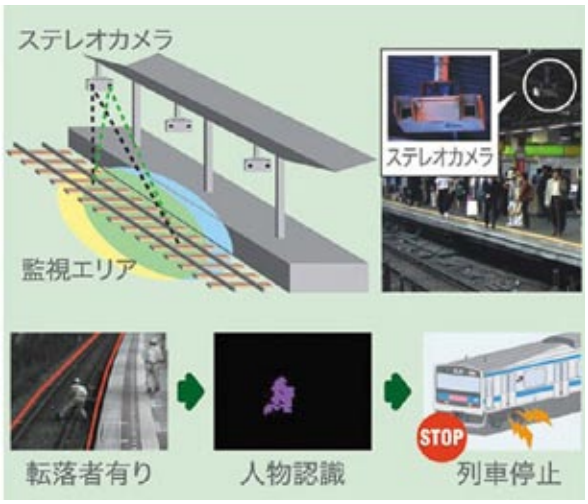
Dot-Braille blocks that indicate which direction is away from the edge of the platform

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.
*Dot-Braille blocks have been installed at 427 stations for conventional lines and 23 stations for Shinkansen lines as of the end of FY2015.

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.
* The system has been installed at 366 stations for conventional lines and 39 stations for Shinkansen lines as of the end of FY2015.

Image-processing fall detection equipment



By monitoring a three-dimensional image of the above-track space with stereo cameras, the equipment can detect that a person has fallen onto the track and notify incoming trains to stop.
* The equipment has been installed on four platforms at Shinjuku Station and two platforms at Shinagawa Station as of the end of FY2015.

Fall detection mat

A mat placed on the tracks along the platform detects whether a person has fallen onto the tracks and notify incoming trains to stop.
* The mat has been installed at 31 stations for conventional lines and three stations for Shinkansen lines as of the end of FY2015.

Platform steps

Steps help people climb back onto platforms even when they have fallen onto the tracks.
* The steps have been installed at 161 stations for conventional lines as of the end of FY2015.

Fall protection hood between railcars

Rubber hoods are installed between railcars to prevent customers from falling between railcars.
* The hoods have been installed on approx. 11,000 railcars as of the end of FY2015.

Functions to detect persons or objects stuck between railcar doors

209 Series and later railcars are equipped with a function to weaken the closing power of doors when the system detects that the bodies of customers or their belongings are stuck between train doors. For the rubber part of the door, from the floor to 30cm height, hard rubber is used so that the system can detect objects such as strollers.

ITV for station platforms and concourses

By installing monitoring cameras on station platforms and in concourses, we continue our efforts to improve safety on platforms and strengthen security in station premises.

Station platform safety campaign

We are running station platform safety campaigns to ask for the cooperation of customers by utilizing station posters and the Train Channel to promote safety on platforms. The Train Channel is an on-board information display installed on railway lines including the Yamanote and Chuo Rapid Lines. In FY2015, JR East conducted a station platform safety campaign together with 24 other railway operators.

Measures against train fire

JR East has taken the following measures by learning lessons from past train fire accidents.

■Sakuragicho train fire accident on April 24th, 1951

Measures:

① Changing gangway doors of trains from inward-opening to sliding doors. Introduction of flame-resistant materials for seats, hand straps, and floors of trains. Changing carbody roof material from wood to metal. Clarification of displays for instructions for operating door cocks.

■Hokuriku tunnel train fire accident on Nov. 6th, 1972

Measures:

① Introduction of flame-resistant materials for railcar materials and installation of fire extinguishers in railcars

② Installation of lighting facilities for long and large tunnels exceeding 5km. Installation of radio telecommunication facilities for communication to the outside from tunnels. Installation of fire extinguishers in tunnels. Improvement of signs to display distance to tunnel exits.

■Subway fire accident in Taegu, the Republic of Korea on Feb. 18th, 2003 (Korea Railroad Corporation)

【Measures for new railcars and those requiring major remodeling】

① Changing ceiling materials to those with fire resistance and melt and drip proof performance against radiant heat in addition to the current non-flammable performance

② Installation of gangway doors that can be closed normally between passenger cabins

③ Easy-to-see displays of fire extinguisher locations for passengers

【Formulating rules for underground stations and tunnels connected to these stations】

① Use of fire-proof materials for structures

② Improvement of disaster prevention control room

③ Improvement of fire alarm facilities, emergency report facilities, signs to guide evacuations, etc.

④ Improvement of fire-extinguisher facilities

■Sekisho Line train derailment and fire accident on May 27th, 2011 (JR Hokkaido)

【Tangible measures】

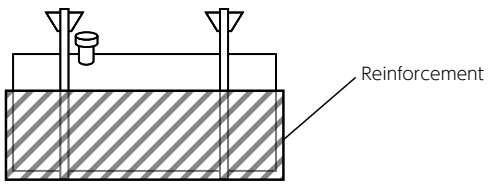
① Installation of lighting facilities and signs to locate light switches in tunnels exceeding 500m in length. Installation of signs indicating distance to tunnel exits every 100m.


Sign for a light switch

Sign to indicate distance to a tunnel exit

② Installation of metal fittings on diesel railcars that will prevent the pins that support reduction gears from unfastening. Improvement of durability of fuel tanks. Installation of flashlights.


Metal fittings to prevent unfastening of the pins that support reduction gears



Fuel tank reinforcement (image)

【Intangible measures】

① Conducting emergency drills to prepare for a train fire accident inside a tunnel on a regular basis

② Placing the priority on initial firefighting by allowing decision making at accident sites

③ Preparing educational materials and continuing education on a regular basis


Emergency drill to prepare for fire in a tunnel

■Two train fire accidents in FY2013

We are taking preventative measures such as measures to rectify faulty insulation for rolling stock and enhancing education of employees.

Fostering the skills of safety-related personnel

Safety education and training

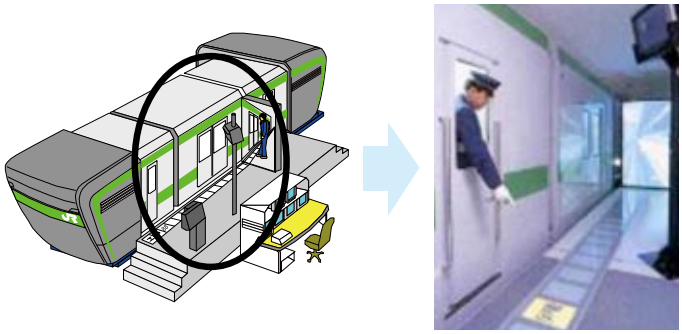
To heighten safety awareness among employees, by placing priority on safety education and training JR East is offering educational and training opportunities to its employees at the JR East General Education Center (Shirakawa City, Fukushima Prefecture) and General Training Centers (branch offices), 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

Cab simulator

Train protection drills on training tracks

Training train and training tracks at Tokyo/Omiya General Training Center



Accident prevention simulator installed at General Training Centers at branch offices

In FY2015, JR East offered safety-related training to approx. 27,970 employees at the JR East General Education Center and the General Training Centers of branch offices.

JR East General Education Center	Subtotal: Approx. 10,270 persons
Train crew and transport related Driver development training　Instructor training　Conductor training Dispatcher training, etc.	Approx. 4,700 persons
Facilities, electricity, and rolling stock related Training for maintenance vehicle managers　Accident prevention training Accident countermeasure expert training　Technical training for each field, etc	Approx. 5,500 persons
Safety culture and safety instructors, etc. Key safety leader training　Basic safety training, etc	Approx. 70 persons
General Training Centers at branch offices, etc.	Subtotal: Approx. 17,700 persons
Total	Approx. 27,970 persons

Accident History Exhibition Hall

Many of the safety-related rules and facilities have been created from our experiences of and reflection on past accidents. With the objective to further improve our safety levels by learning lessons from accidents, which is our basic policy for safety, we will never forget past accidents and are committed to pass on these valuable experiences learned from those lost lives. To this end, JR East established the Accident History Exhibition Hall at JR East General Education Center and the hall is used for various trainings to learn the importance of safety in railway operations. Additionally, by expanding the Accident History Exhibition Hall, in Mar. 2014 we opened accident train preservation center for the preservation of actual trains damaged in accidents or disasters.



Accident History Exhibition Hall

The Challenge Safety Campaign

In Sep. 1988, we started the Challenge Safety Campaign 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 Head Office.
In Group Safety Plan 2018, by placing importance on the CS Campaign's three characteristics, "think, discuss, and share with the whole workplace," we are working on solving safety issues with open minds to vitalize the discussions.

Development of safety-related discussions in each workplace

Examples of CS Campaigns (realizing and sharing)

Safety portal

JR East established an intranet portal site, the Safety Portal, to offer tools for accident prevention. Employees can search for necessary educational materials for CS Campaigns and their study sessions. We are increasing the amount of safety-related information so that employees can learn whenever they want. From Nov. 2014, we started the operation of the safety portal bulletin board, as an interactive communication tool for employees to introduce their CS Campaign activities and also share their questions and answers on safety-related issues.

Safety portal

Challenge Safety *Aoshingo* (Challenge Safety Green Light)

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 Campaigns in each workplace such as specific efforts of the campaigns in each workplace and details of past accidents.

Challenge Safety
Aoshingo (Nov. 2014 issue)

Fostering integral safety leaders and professionals

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 assign Key Safety Leaders in field organizations and Safety Professionals at branch offices to further improve our safety levels.
Additionally, we have assigned nine 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)," and they pass their accumulated experiences and skills down to future generations through seminars.

Key Safety Leaders

We are fostering three capabilities in Key Safety Leaders in field organizations: comprehensively understand situations, training and fostering 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

Since FY2010, we have selected 17 persons 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 staffs and therefore needs to steadily instill successors with safety-related knowledge, leadership, and technical capabilities.
On Oct. 14th, 2009, on the Railway Day, we assigned eight 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). They have played an active role in accident prevention in each of their specialty fields from the time of Japanese National Railways.
In Dec. 2014, we also assigned one ex-employee as one of our Chroniclers of Safety. We will continue to enable them to pass on their expertise to future generations through their experiences and knowledge of past accidents.


Toshiyuki Iijima
(rolling stock)


Takao Okuma
(transport)


Masahiro Osanai
(track maintenance)


Katsumi Kato
(construction work)


Haruyoshi Shibamata
(civil engineering and disaster prevention)


Naokazu Naiki
(signaling)


Katsutoshi Nakaya
(safety regulations)


Isao Matsumoto
(stations and traffic control)


Teruo Yabe
(safety systems)

Chroniclers of Safety seminars

Currently, Chronicler of Safety seminars are being conducted by the Chroniclers at Head Office and branch offices. In FY2015, they held 48 seminars with the participation of approx. 2,200 employees.
By reflecting requests from past participants, we are holding seminars at each branch office and construction office. By gathering opinions prior to seminars, we make it possible to deepen discussions at the seminars. On other occasions, we arrange for field visits to have discussions in small groups to share their findings. Sometimes, seminars are in lecture style with a large audience. In each seminar, we pay attention to incorporating the experiences and opinions of both the Chroniclers of Safety (narrators of oral history) and participating employees.



Scenes from seminars

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 Campaigns, 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 theme for the 23rd symposium in FY2015 was, "What we need to improve in the capabilities of each one of us."
Apart from annual Railway Safety Symposiums, we hold safety forums at branch offices and construction offices.


The 23rd Railway Safety Symposium in FY2015


Opening speech by Tetsuro Tomita, President and CEO, JR East

Lectures and discussions based on the theme


A scene of the symposium

Round table discussions between front-line employees and executive officers

By drastically increasing the frequency of visits by executive officers from Head Office involved in our traditional Head Office Safety Campaign, we are increasing the frequency of opportunities for the exchange of opinions between front-line employees and executive officers to further deepen mutual understanding.
In FY2015, we experienced a derailment accident in Kawasaki station premise and incidents requiring further attention. 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

JES-Net (JR East Safety Network)

JR East and its group and partner companies are required to share common safety values and offer railway services trusted by our customers.
To this end, 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 April 1st, 2015, the number of companies in this network had expanded to 36.
In coalition with JR East Group companies, we will further improve safety levels in our operations.


JES-Net presidents' meeting


Safety review

Safety-related research and development

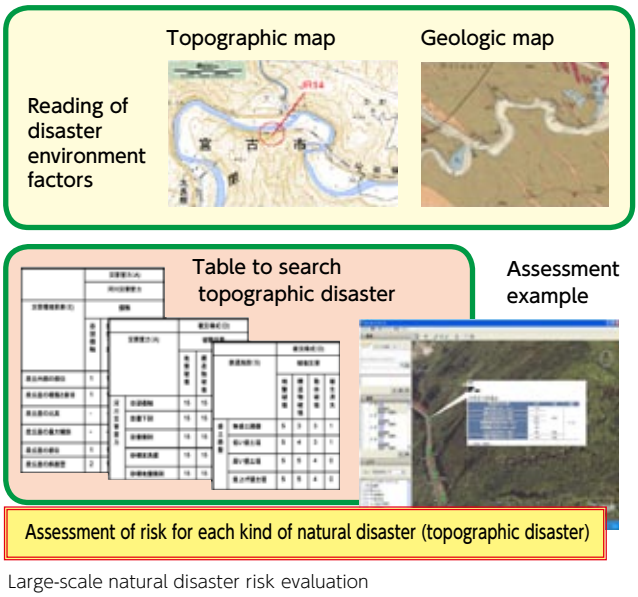
JR East Group conducts various safety-related research and development activities with the Research & Development Center of JR East Group as its core.
At the center, depending on roles and missions, six research organizations promote their research and development in each specific field to pursue extreme safety levels, while at the same time working in unison. These six research organizations are the Frontier Service Development Laboratory, Advanced Railway System Development Center, Safety Research Laboratory, Environment Engineering Research Laboratory, Technical Center and Disaster Prevention Research Laboratory.
Research themes at these organizations include those related to human factors to prevent accidents by accurately understanding accidents and the sources of accidents and analyzing their causes; development of systems to prevent accidents due to failures in maintenance work procedures; research on safety evaluation of natural disasters such as wind, earthquake, heavy rain and snow; research on the safety of railcars to prevent flange climb derailment at low speed; and research to ensure the safety of customers at stations.

A stone from another mountain: a tool to learn lessons from failures of others and a scene of a study session with the tool

* Visualization of maintenance work procedures

Maintenance work procedures (image)

Utilization of areal precipitation information from weather radars in decision making for train operations



Large-scale natural disaster risk evaluation