Annual Report 2010

Railway Technical Research Institute
Japan

Hisashi TARUMI
President,
Railway Technical Research Institute

Foreword

A great earthquake that occurred in the Pacific Ocean offshore in the northeastern section of Japan on March 11, 2011, chaotically damaged the Tohoku district of the country with its unprecedented large-magnitude quakes and fiercely-repeated tsunamis. I sympathize wholeheartedly with those who suffered from such a large-scale disaster. As the railways in the area were also seriously destroyed, we concentrated our efforts to quickly restore the transport network in the northeastern part of the country. We will continue to promote research and development further to overcome the disasters caused by hostile natural phenomena.

Since I took office as President of Railway Technical Research Institute (RTRI) in April 2009, I have had the implementation of "RESEARCH 2005," a master plan in the previous term, completed and drawn up a new version "RESEARCH 2010" as a basis of research activities for the next five years. I have also strengthened the organization to become a public-interest corporation and improved the research environment, while deliberately promoting safety control at workplaces. Furthermore, I positively disseminated the information on railway technologies in Japan to overseas countries and promoted the preparatory work to reinforce the organization for international standardization. Increased emphasis on international issues will contribute to increasing business opportunities in overseas countries for domestic railway-related industries.

In FY 2010, we started a five-year plan "RESEARCH 2010 – aiming at the sustainable development of railways," which has significantly contributed so far to the attainment of the targets proclaimed in various fields. For research and development, I have promoted activities on basic and practical themes and those oriented into the future. Regarding the contract-based research and development, we were able to secure more than 500 contracts from customers despite the severe economic conditions. To secure human resources, I hired new graduates and mid-career researchers, while positively promoting personnel exchanges with railway business promoters to help ensure the continued retention of knowledge over time. We also improved our test facilities in 2010 by completing the renewal of the high-speed wheel-rail contact fatigue test machine and introducing a large-scale vibration test machine to simulate earthquake motion. By utilizing these machines, we obtained valuable research results in the fields of structures and rolling stock. We applied for 230 patents, including utility models, in 2010 and now have more than 2,200 patents registered. In April 2010, we started the Railway International Standards Center staffed with members including those from railway promoters and manufacturers. Regarding international activities, we promoted joint research projects as before with the research organizations in France, China and Korea, while holding an international workshop on railway noise at Nagahama, Japan in October 2010.

As the railway business income of JR companies has substantially dropped, it is thought that we can no longer expect much from their contribution to our operational expenditure, which accounts for a lion's share of the budget. Nevertheless, we will integrate the wisdom and power of our resolute researchers to cope with this hardship and continue to contribute to sustainable development of railways as well as to the social and economic development of the nation. Your continued cooperation and support to RTRI will highly be appreciated.

Contents

Organization

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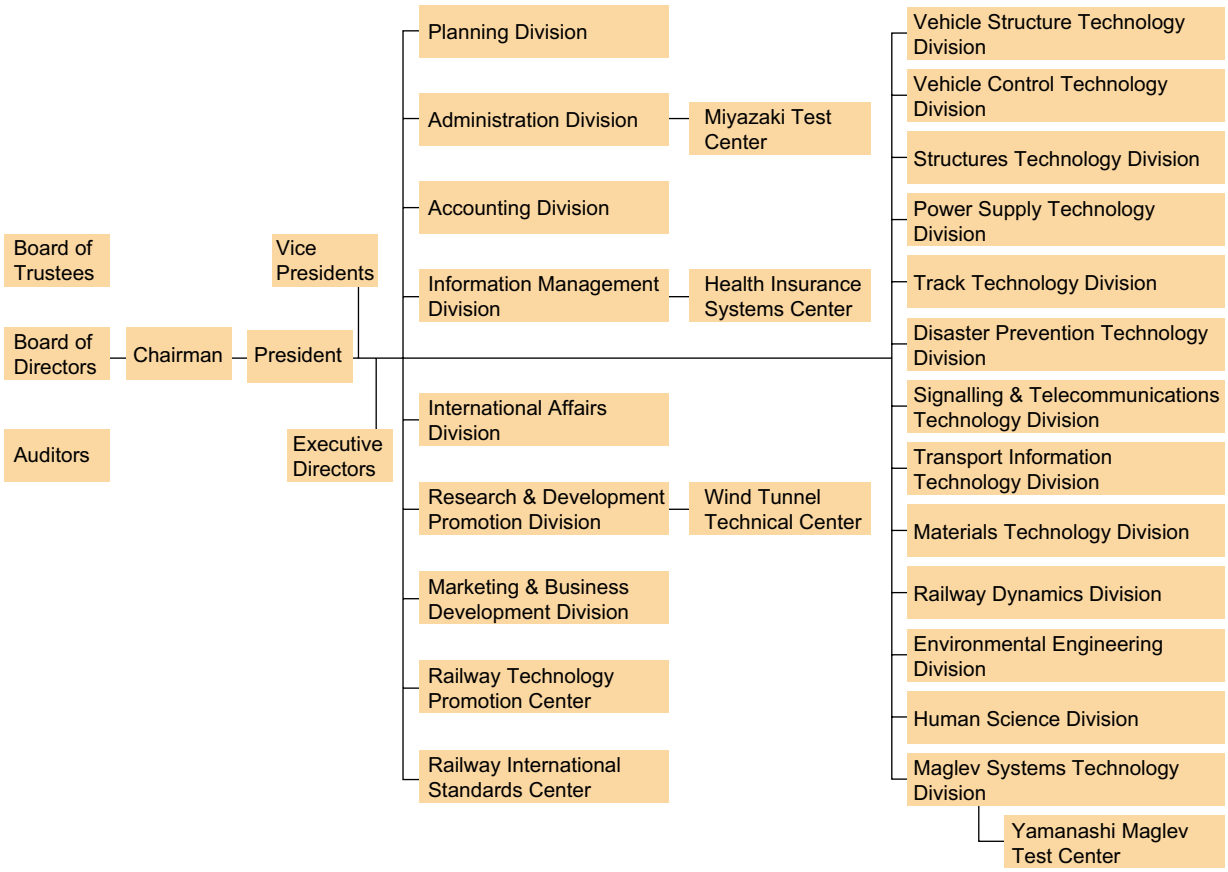


Board Members

Position	Name
Chairman	MASADA Eisuke
President	TARUMI Hisashi
Vice President	INAMI Mitsutoshi
Vice President	UCHIDA Masao
Executive Director	KUMAGAI Norimichi
Executive Director	ICHIKAWA Atsushi
Executive Director	KAWAI Atsushi
Executive Director	KAKINUMA Hirohiko
Executive Director	HAYASHI Yasuo
Executive Director	MORIMURA Tsutomu
Executive Director	YOSHIE Norihiko
Executive Director	NISHIMAKI Tsuguhiro
Executive Director	AOYAGI Toshihiko
Executive Director	MIYAZAWA Yukinari
Executive Director	SUDA Yoshihiro
Executive Director	AOKI Mami
Executive Director	KUCHINO Shigeru
Auditor	NAKAMURA Yasuhiro
Auditor	FUJII Hidenori

(As of March 31, 2011)

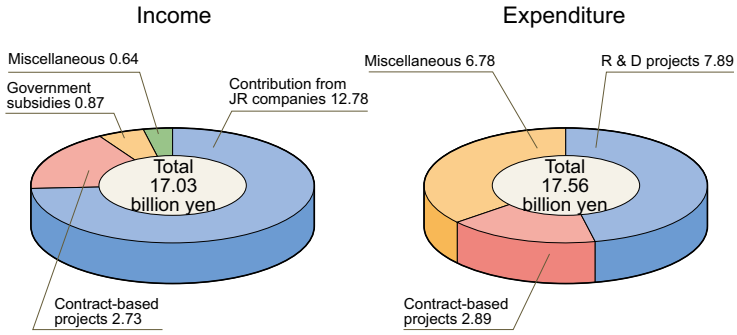
Trustees

Name
NAKAJIMA Naotoshi
SEINO Satoshi
OGATA Masaki
YAMADA Yoshiomi
NODA Toyonori
SASAKI Takayuki
NISHIKAWA Naoki
MATSUDA Kiyohiro
KARAIKE Kouji
KOBAYASHI Masaaki
IWATA Sadao
SAWADA Jun
UMEZAKI Hisashi
YOSHINO Gentaro
MUKAIDONO Masao
ISHIKAWA Hiroki
KOBAYASHI Toshio
KAKUMU Masahiro
KAMIJO Kiyofumi
KENJU Toshikazu

(As of March 31, 2011)

Overview

Income and Expenditure in FY 2010



Human Resources

Number of employees	499
Number of Ph.D. Degree holders	157

(As of April 1, 2010)

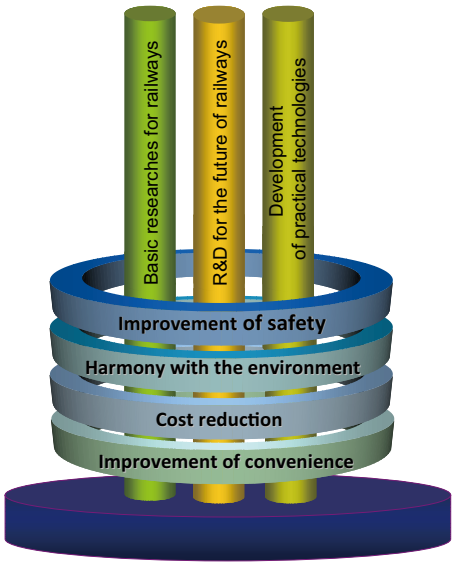
Number of Projects

Numbers of Projects in FY 2010

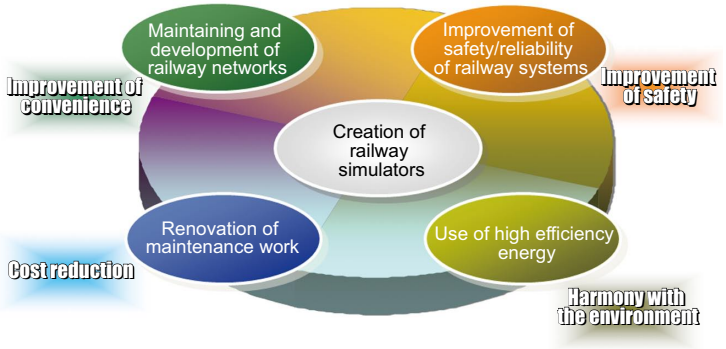
Development of the levitated railway		
Narrow-gauge railways	Projects	
	Inquiries about contracts	
	Basic research projects	
	R & D for the future railways	34
	R & D for practical technologies	133
	Basic research for railways	125
	Standards and surveys	14
	Total	306

Relationship with Organizations in the Research Fields

Objectives and Mainstays of R&D Activities



R&D for the Future of Railways



Medium and Long Term Master Plan – RESEARCH 2010 –

The master plan, RESEARCH 2010 was produced to describe research and development required for five years beginning in FY 2010 to effectively promote activities to fulfill our commitment within various circles as a research institute capable of integrating many railway technologies. The plan is directed towards the sustainable development of railways, while considering progress in research and development in the past and changes in the circumstances surrounding the railway industry that have occurred in recent years.

1 Basic Policies and Objectives

In preparing this plan, we adopted basic policies on its content in view of the circumstances surrounding RTRI and railways in Japan as a whole. Regarding the management environment of JR companies, changes in their financial contribution and other movements outside the organization, we set the term of the plan at five years from FY 2010 to 2014, to account for the fact that it will take a certain length of time to promote the "research and development for the future of railways" as referred to later, though it is difficult to correctly predict the trend in long-term future needs.

For RTRI having responsibility to society as a public-interest corporation, it is important to effectively perform its commitment to JR companies and other stakeholders through publicly disseminating research results to support railway business in the future. To this end, we shall make efforts to freshen up the targets of research and development set in the past, such as the improvement of safety and reliability, development of solutions to environmental problems on a global scale, achievement of harmony with the wayside environment, decrease system costs and the pursuit of comfort and convenience of passengers. As a new research challenge, we shall also aim at improving our simulation technology and try to expand our core competencies. We shall also review the organization for research and development needs and capabilities at all times to respond to the changes in the internal and external circumstances and make efforts to enhance the efficiency of our activities based on financial situations.

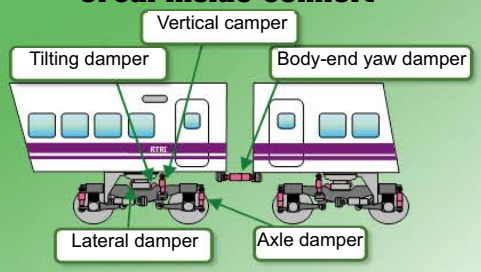
As development needs in the future are quite uncertain in different countries, we will review this plan regularly to take into account changes in social and economic conditions in the world.

As a guideline to promote research and development aimed at achieving safe and assured, highly reliable railways, with low environmental impacts and featuring low-costs and high-level convenience for customers, we set forth the following as the basic objectives of RTRI activities.

(1) Creation of new technologies aimed at sustainable development of railways
(2) Quick and correct response to meet customer needs
(3) Timely transmission and dissemination of research results
(4) Continued pursuit of railway technologies and accumulation of basic technological knowledge
(5) Effective use of this knowledge within the community of railway engineers

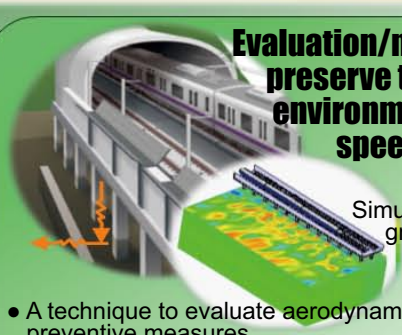
– RESEARCH2010 – Futu (FY 2010

Evaluation and measures of car inside-comfort



- A technique/measure to improve vibration ride comfort
- A technique/measure to reduce noise inside cars
- A technique to evaluate comfort inside cars

Evaluation/measures to preserve the wayside environment for high speed operation



- A technique to evaluate aerodynamic noise/ preventive measures
- Noise/ground vibration preventive materials

Smoothing the movement at traffic nodes

- Smoothing the movement at and around stations
- A diversified technique to evaluate train operation
- A technique to evaluate freight traffic

➡ Establishment/evaluation of an environment for seamless movement

Sustainability and Development of Railway Networks

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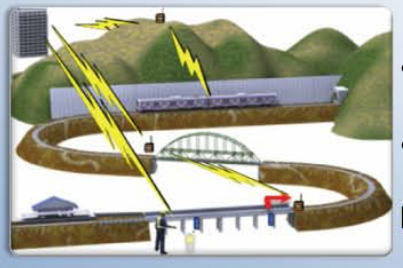
Innovation of Maintenance

A new technology to monitor and maintain equipment conditions



- A technology to monitor/maintain equipment conditions
- Basic technologies to monitor equipment conditions

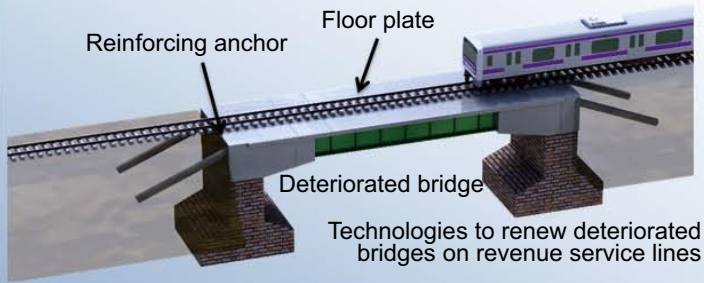
➡ A proposal of an equipment condition monitoring system

Design/dev of a railway simul

① Car, track and train
② Simulation of the ph structure and whee
③ A prototype virtual r
④ An integrated air flo noise simulator
⑤ A contact wire/pant

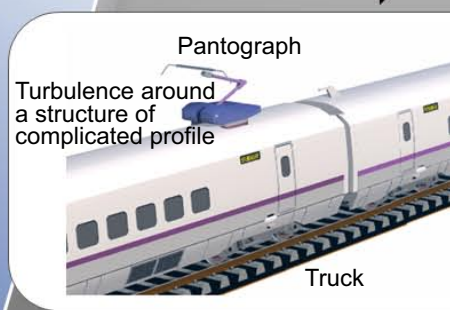
➡ A vi

Innovation of the structure renewal technologies



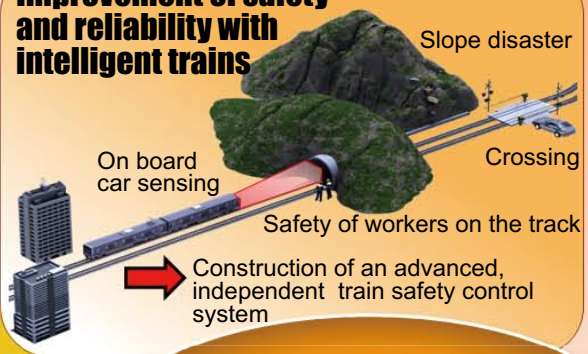
Technologies to renew deteriorated bridges on revenue service lines

➡ Renewal technologies for bridges, viaducts as well as underground and ground level stations



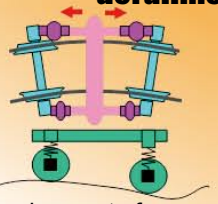
ure-Oriented Subjects
– 2014)

Improvement of safety and reliability with intelligent trains

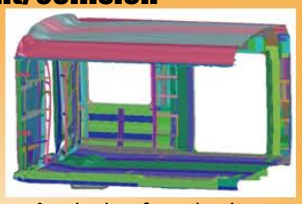


Construction of an advanced, independent train safety control system

Improvement of the safety against derailment/collision



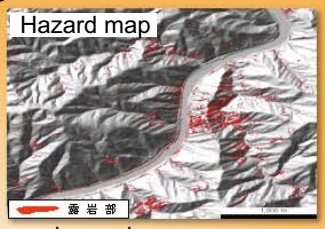
Development of a derailment-proof truck



Analysis of car body deformation behavior

Raising the safety against meteorological disasters

- Simulation of the local meteorological conditions
- A technique to evaluate hazards
- A technology of disaster/hazard mapping



Real-time hazard mapping

Improving the Safety and Reliability of the Railway System

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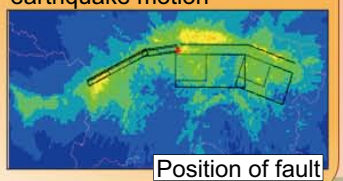
Raising the safety against earthquakes

- A system to predict large-scale earthquake motion
- Evaluation of the safety of rolling stock running during earthquakes
- Earthquake-proof technologies/measures

An image of the prediction of earthquake motion



High-efficiency Energy Utilization

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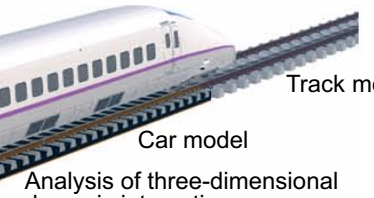
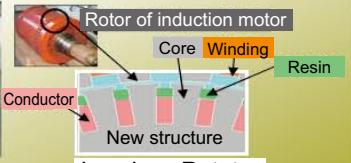


Analysis of three-dimensional dynamic interaction

Reduction of car energy consumption

Nano-technology metallic material

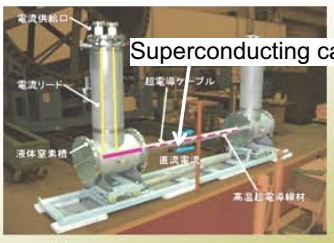


Low loss Rotator

Lightweight cars made of new materials
High-efficiency car components
Decreases in car aerodynamic resistance

A simulator to evaluate energy consumption

A new power supply system



- Application of superconducting technologies
- Use of semiconducting elements of low loss
- Utilization of natural energy

Simulator of power consumption in train operation
Evaluation of train operation diagrams reflecting the constraint in power supply

2 Project Activities

2.1 Research and Development

(1) Promotion of Research and Development

(a) Targets of research and development

Amid the increasingly severe surroundings, we set the following four items as the "targets of research and development," in consideration of the serious accidents/disasters and difficult economic circumstances in recent years, based principally on the targets of research and development in the past.

We further aim at achieving:

- Increased level of safety
- Harmony with the environment
- Low-cost railways
- Improved convenience for customers

(b) Poles of research and development

Recognizing that we have limited resources, to effectively promote research and development, we set the following three items as the "corner stones of research and development," with efforts concentrated in particular on the enhancement of the simulation technology for all the three:

- Research and development for the future of railways
- Development of practical technologies
- Basic research for railways

(2) Research and development for the future of railways

In the field of research and development for the future of railways, we promote basic research to better understand phenomena and to construct tools from which a "game-changing" breakthrough is expected for research and development. We also promote research oriented to technological development having a far-reaching effect after commercialization.

(3) Development of practical technologies

We promote the development of practical technologies in the following areas:

- Technological development specified by the seven JR companies (six under-taking passenger transport services and one devoted to freight transport)
- Contract-based research and development
- Development of practical technologies performed based on our own initiatives.

(4) Basic research for railways

We believe the basic research for railways will lead to practical technologies, which are essential to solve various railway-related problems, and/or will promote further work which we might define as "analytical research projects" and "those to explore further research."

(5) Others

(a) Transmission of information

We will positively collect, store and transmit information on railway technologies in Japan and abroad and present the results of these research/development activities in a timely manner.

(b) International activities

We will positively participate in various international conferences, make efforts to continue to exchange information on railway technologies with overseas researchers, and send staff abroad to survey the status of the railways and technologies in foreign countries. We will also promote joint research projects, exchange researchers, strengthen the cooperative relations with overseas universities and research institutes and enrich the information transmitted to other countries.

(c) Railway Technology Promotion Center

Having a bird's eye view over the railway industry as a whole, the Railway Technology Promotion Center will assess the technological needs common to all its member railway companies and solve their problems so that they can correctly respond to the expectation of society.

(d) Railway International Standards Center

The Railway International Standards Center will integrate the discussions on wide-ranging international standards on railways, thereby contributing to railway companies as a whole, while positioning the discussions on the strategy of international standardization, reviews of international standards and collection/transmission of the information received.

Statement of Activity Results 2010

1 Test and Research Projects and Major Results of Research and Development

In FY 2010, we promoted research and development on 306 themes and successfully completed research on 94 themes. Major Results of the Research and Development are shown here below.

Safety/Reliability

(1) Slide control using a new index for slide detection

- A proposal for a slide control technique to judge the status of sliding with a new parameter called "the skid expected time" obtained from speed information as an index with no additional sensors or other devices
- High skid prevention performance using the index even when all wheels are sliding

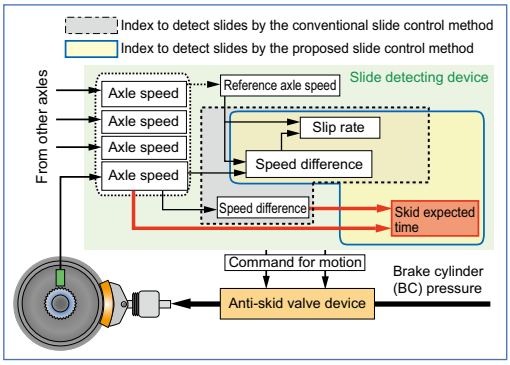


Fig. 1 Composition of the slide control using a new index

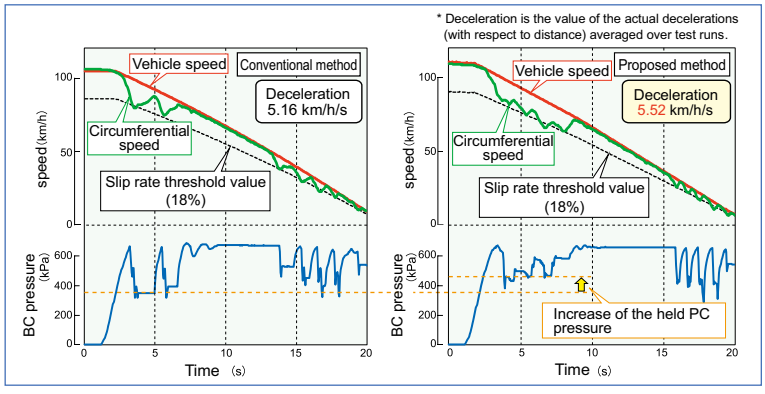


Fig. 2 Results of a field test by the conventional/proposed slide control methods
(an increase of about 7% in deceleration when the proposed method is applied to three cars in a seven-car train set.)

(2) A method to physically learn the effect of finger-pointing call

- Verification of the effect of finger pointing call to prevent human errors in five categories
- Development of the software to physically learn the effect of finger-pointing call to prevent human errors and an application method thereof

Table 1 Action elements of finger-pointing call, the effect to prevent human errors and tasks for physical sensation

Element	Physically sensible effect	Tasks for physical sensation
Finger-pointing	Eyes readily turn to the object.	Point counting
	Action becomes deliberate.	Delayed actions in the "paper-scissors-stone" game
Calling	Memory improves.	Memory of colors
	The test subject readily notices errors.	Instantaneous judgment
Finger-pointing call	Vigilance holds.	Vigilant observation of a watch

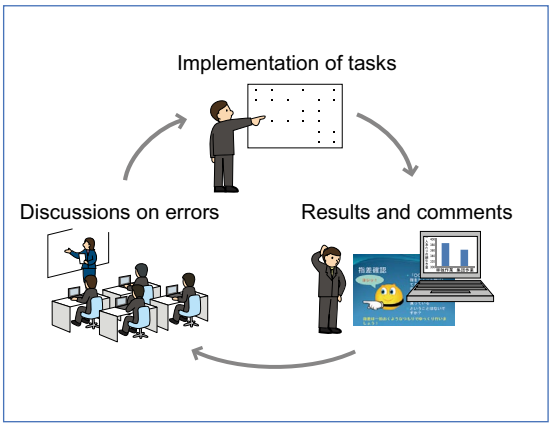


Fig. 1 Method of learning physical sensation

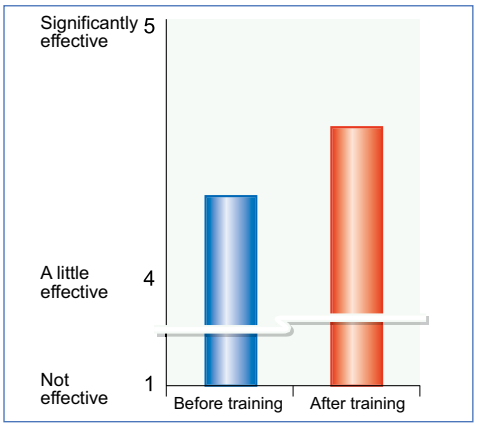


Fig. 2 Recognition of the effect of training by the method of learning by physical sensation

(3) A simple technique to predict earthquake damage

- Development of a technique to create simple models of the structures distributed along tracks in wide areas to predict earthquake damage
- A capability to simply calculate the damage probability for structures and determine the areas where the stability of running cars decreases

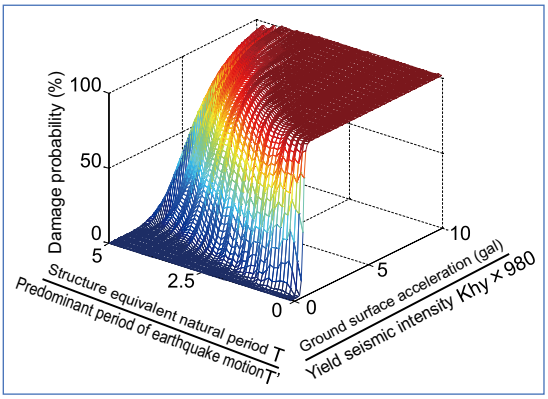


Fig. 1 An example of the curves of structure damage ratio

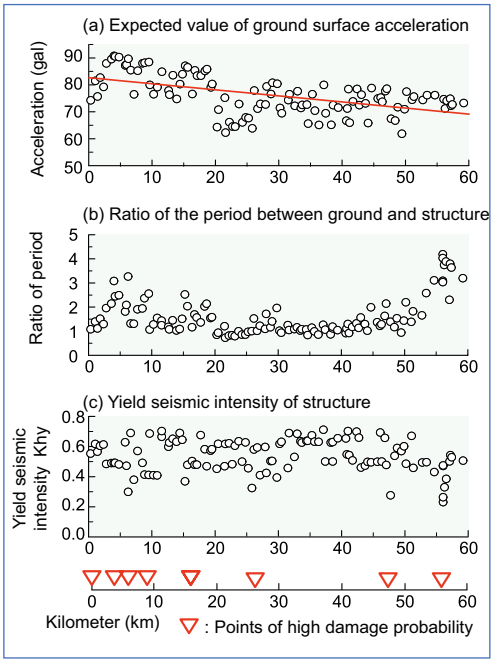


Fig. 2 An example of the extraction of relatively weak points based on the calculated damage probability

(4) Analysis of the three-dimensional motion of the contact wire system and measures to improve its earthquake resisting performance

- Simulation of the three-dimensional motion of trolley wires, contact wire metals, poles and other components to assess the weak points and behavior of system components at earthquake
- Manufacture of the reinforced contact wire metals and confirmation of their improved earthquake resisting performance

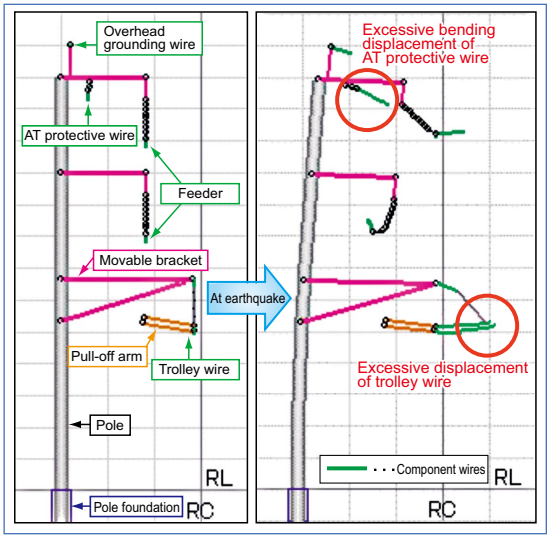


Fig. 1 An example of the simulation of contact wire three-dimensional motion

Table 1 Targets for different scales of earthquake

Category	Target earthquake resistance of the contact wire system	Conditions of earth structure
Medium-scale earthquake (equivalent to the earthquake motion L1)	* Prompt resumption of train operation • No breaks of contact wire • No breaks of contact wire metals • No incidents of pantograph dewirement	• The function remains intact without repair while yielding no excessive displacements.
Large-scale earthquake (equivalent to the earthquake motion L2)	* Evasion of the collision between trains and supports • No collapse of supports • Inevitable damage on the contact wire system	• The function is quickly recoverable with repair. • The whole structure system does not collapse.

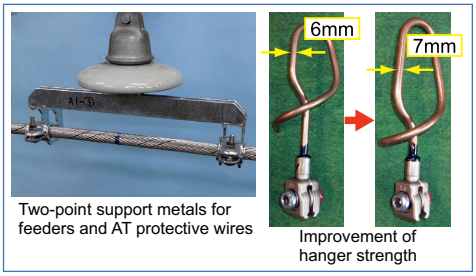


Fig. 2 Proposed measures to improve the earthquake resisting performance

(5) A technique to diagnose the soundness of earth-retaining walls using a small vibration generator

- Establishment of a technique to vibrate earth-retaining walls with a small vibration generator for soundness diagnosis based on the Fourier amplitude spectral analysis of acceleration waveforms
- Development of a small vibration generator fixed at the crown of earth-retaining walls for excitation

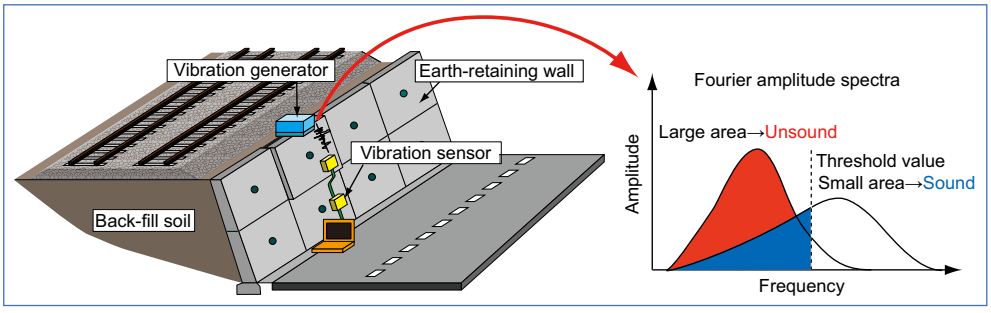


Fig. 1 A technique to diagnose the soundness of earth-retaining walls using a vibration generator and vibration sensors

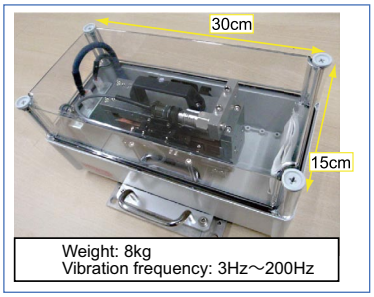


Fig. 2 A small vibration generator

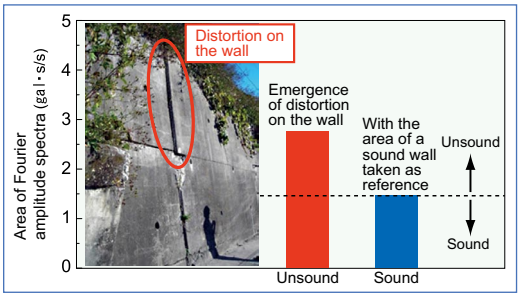


Fig. 3 Soundness diagnosis based on the magnitude of area

(6) A simple method to estimate the natural frequency of viaducts based on earth noises

- Estimation of the elastic natural frequency of viaducts based on the data of earth noises and a proposed technique to convert it into the equivalent natural frequency
- Estimation of the equivalent natural frequency of structures in different sections with high precision and utilization of the technique for the diagnosis of the earthquake resistance treating each section as a unit

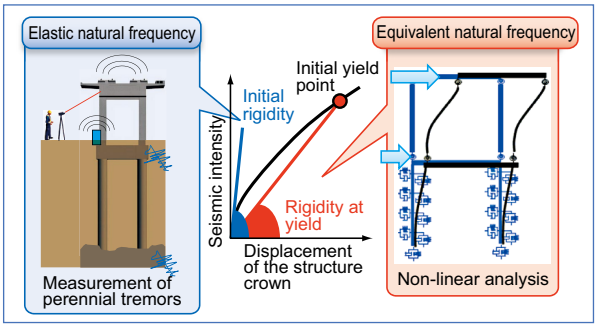


Fig. 1 Relation between the elastic and equivalent natural frequencies

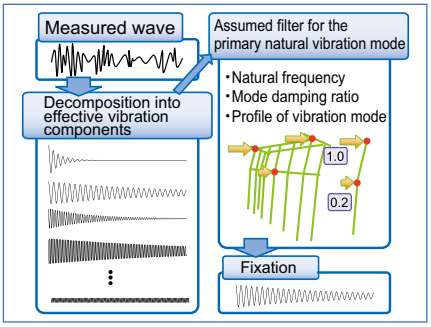


Fig. 2 A technique to estimate the elastic natural frequency

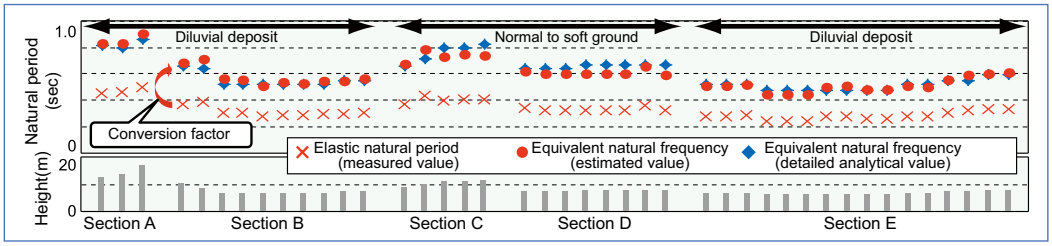


Fig. 3 An application of the technique to estimate the equivalent natural frequency

(7) A technique to design the reinforcement for upheaved track beds in mountain tunnels

- Quantitative understanding of the effect of reinforcing upheaved track beds in mountain tunnels with lock bolts through model tests and numerical analyses
- Compilation of a practical and easy-to-use manual on the design of reinforcement work for upheaved tracks

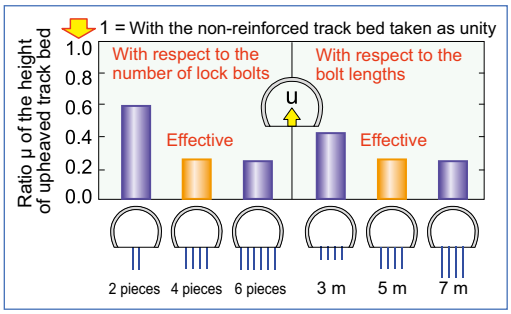


Fig. 1 An example of the verification of the effect of the reinforcement work (track bed lock bolts)

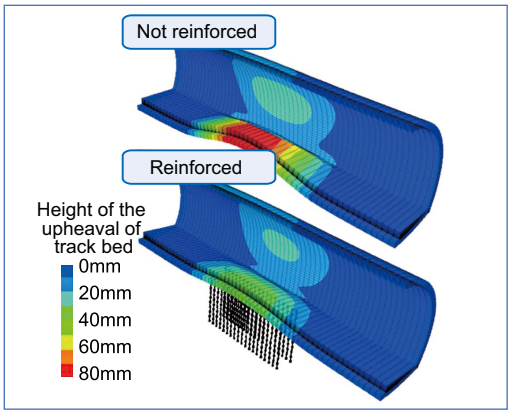


Fig. 2 Effect of the reinforcement work verified based on a numerical analysis technique

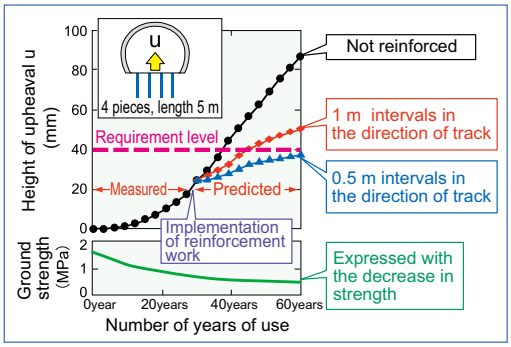


Fig. 3 Dimensions of reinforcement work determined based on a numerical analysis technique

(8) A reasonable method to support the decision-making for slope disaster prevention measures based on risk evaluation

- Establishment of a technique to evaluate slope disaster risks due to earth-flow and falling stones
- Reasonable decision of the priority and a method to apply disaster prevention measures based on the evaluation results

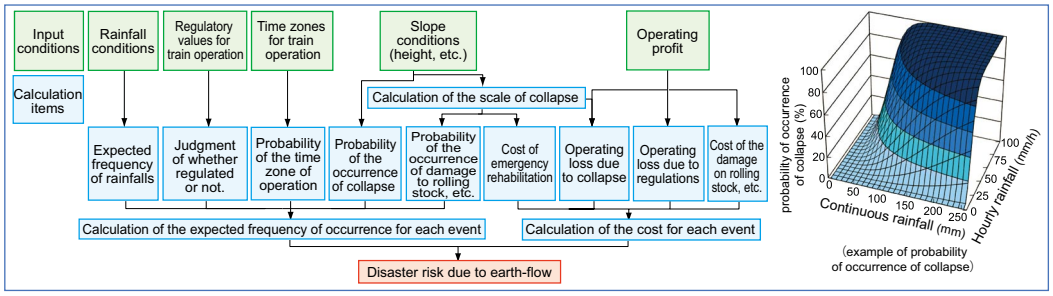
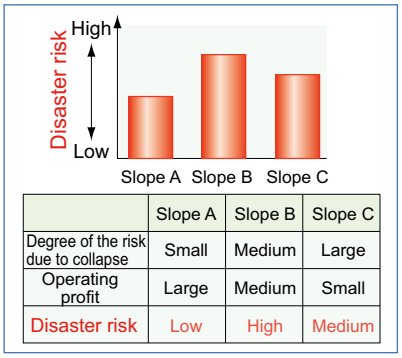
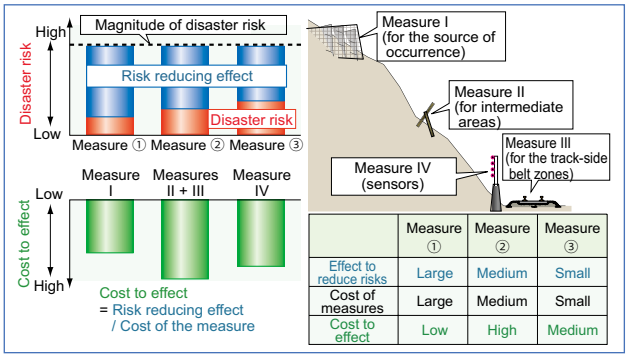


Fig. 1 A flow chart to calculate the earth-flow disaster



	Slope A	Slope B	Slope C
Degree of the risk due to collapse	Small	Medium	Large
Operating profit	Large	Medium	Small
Disaster risk	Low	High	Medium

Fig. 2 A comparison of present disaster risks



	Measure ①	Measure ②	Measure ③
Effect to reduce risks	Large	Medium	Small
Cost of measures	Large	Medium	Small
Cost to effect	Low	High	Medium

Fig. 3 Effect of the measure to reduce disaster risks (measures against falling stone)

(9) Two failure point locating devices for AC feeding circuits

- Development of two failure point locating devices of different principles for AC feeding circuits
- Confirmation of the fact that the errors in the measurement obtained by the surge detection type failure point locating device are one-fifth or less than those obtained by conventional devices
- Confirmation of the fact that the errors in the measurement obtained by the differential voltage type failure point locating device are one-third or less than those obtained by conventional devices

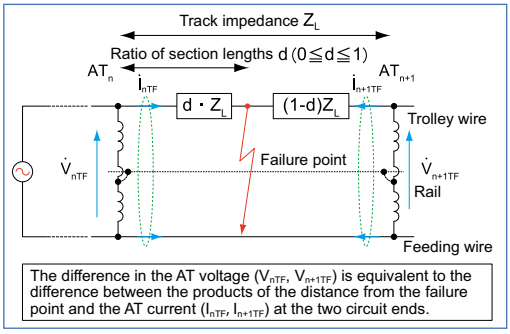


Fig. 2 Principle of the differential voltage type failure point locating method

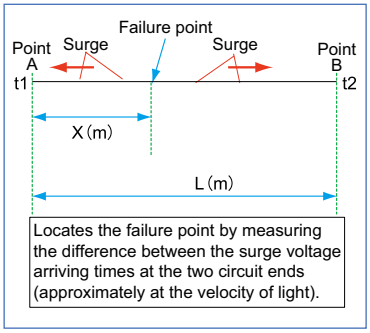


Fig. 1 Principle of the surge detection type failure point locating method

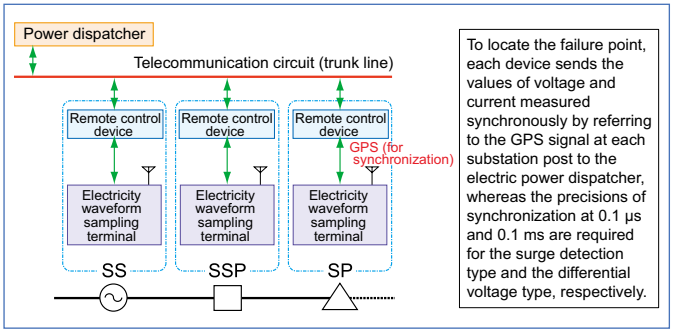


Fig. 3 Composition of a failure point locating device (common to the two types)

(10) A technique to analyze the mechanical performance of the switch and lock system

- Construction of a model to estimate the switching load without performing measurement tests and confirmation of the possibility to calculate it with reasonable precision
- Estimation of the switching load at the design stage to enable efficient development of switch and lock systems

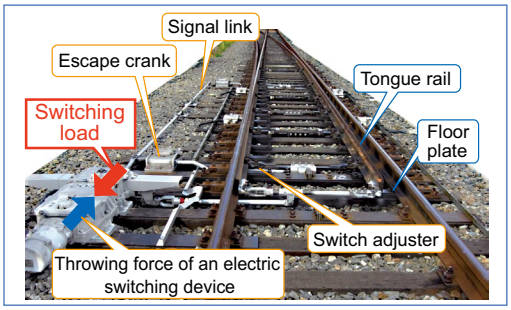


Fig. 1 A switch and lock system and the switching load

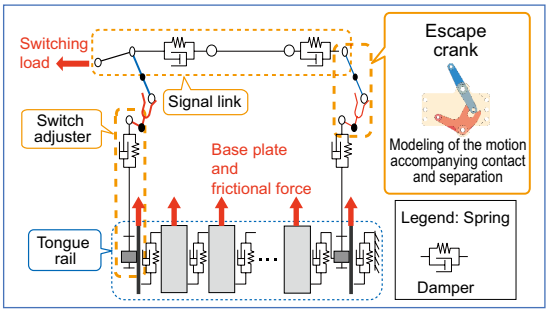


Fig. 2 A model to analyze the mechanical performance

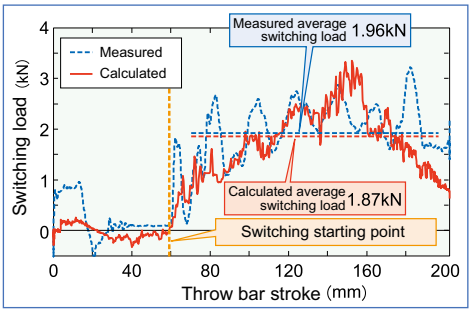


Fig. 3 A comparison of simulation results and measurements

Economy/Efficiency

(1) A technique to predict the pressure waves generated in small tunnel-shaped structures and their preventive measures

- Construction of a numerical model to predict the pressure waves generated in small tunnel-shaped structures
- Confirmation of the effect of the buffering work to reduce pressure waves

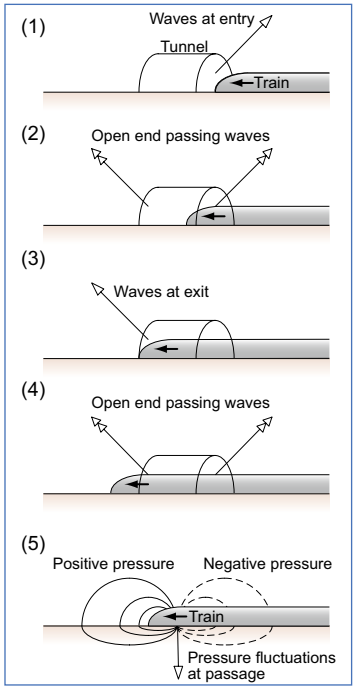


Fig. 1 Passing waves and pressure fields in a short structure

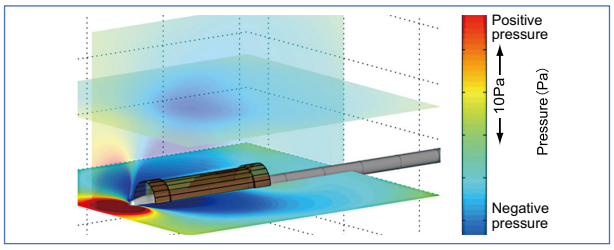


Fig. 2 Analysis of the pressure distribution of the waves passing in a short structure (with buffering work at both ends, red: positive pressure, blue negative pressure)

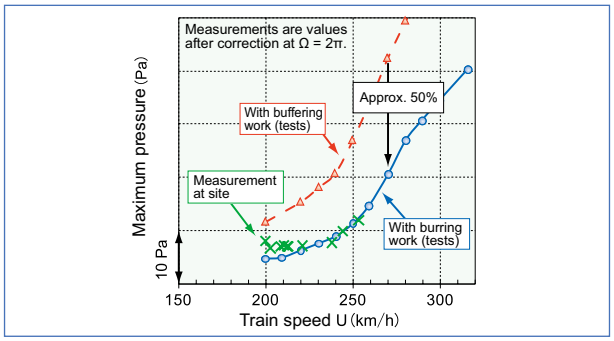


Fig. 3 The effect of the buffering work to reduce pressure waves (a comparison between the measured values and those obtained through model tests)

(2) Methods to reinforce and repair balustrades using high-ductility cement boards

- Development of the methods to reinforce and repair deteriorated Reinforced Concrete (RC) and block balustrades
- Confirmation of the effect of the methods of repair and reinforcement through life-size specimen tests and creation of a guideline for the design and implementation of the reinforcement

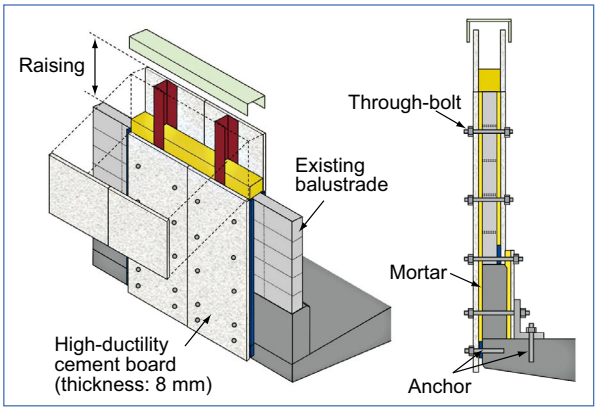


Fig. 1 An outline of the reinforcement

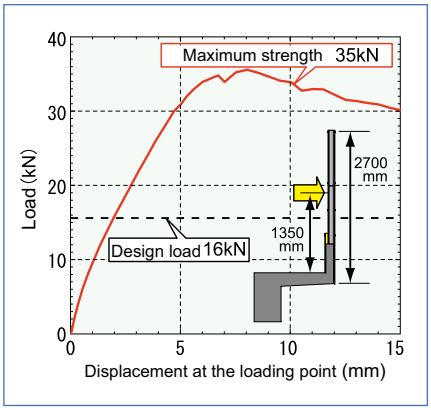


Fig. 2 Verification of the effect of reinforcement

(3) A rail-profiling grindstone to depress the generation of marks caused by grinding and improve the refilling efficiency

- Development of a new rail profiling stone having a new binder and two types of larger abrasive grains of appropriate proportions
- Confirmation of the fact that the developed stone depress the generation of marks caused by grinding and exhibits high profiling efficiency

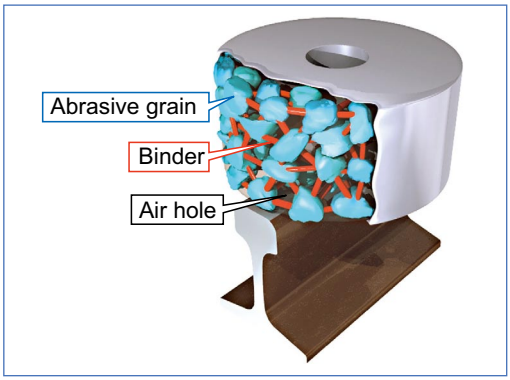


Fig. 1 A sketch of the grindstone

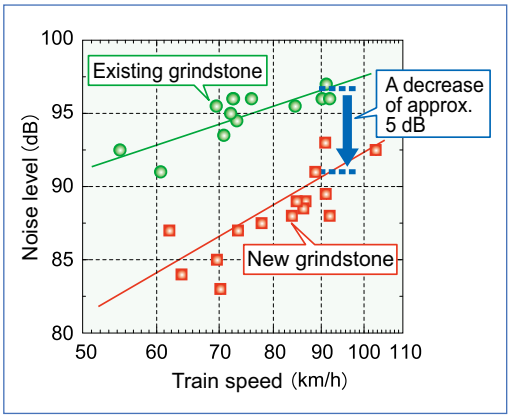


Fig. 2 Level of rolling noise after profiling

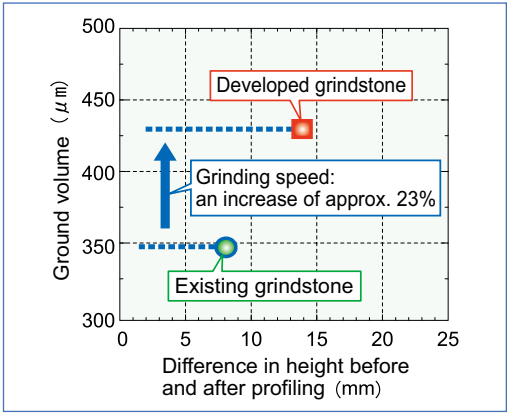


Fig. 3 Capabilities of the new and existing grindstones

(4) Optimization of the technique to control power storage devices

- A proposal of a technique to control power storage devices to cope with both the powering and regenerative operation of electric cars
- Confirmation of the capability of charging and discharging in succession through simulation
- Confirmation of the performance to control power storage devices having electric double layer capacitors

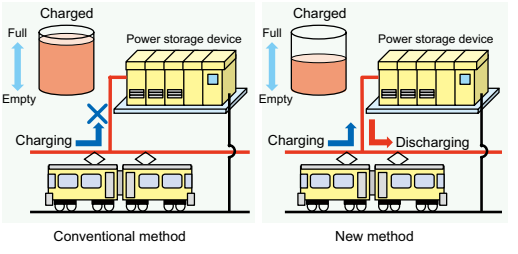


Fig. 1 An image of the method to control power storage devices

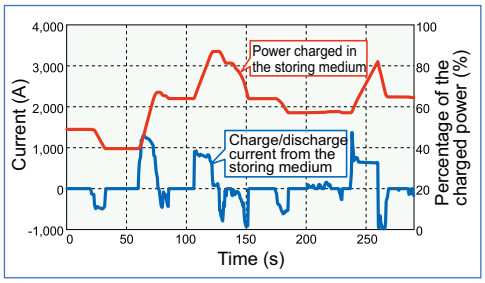


Fig. 2 Results of simulation

Table 1 Specifications of a power storage device

Electric double layer capacitor	Rated capacity	500 kW (10 sec.)
	Capacitance	7.875 F in total, 4.5 F (160 V) per piece, 8 pieces in series, 14 lines in parallel (112 pieces)
	Internal resistance	0.331 Ω
	Range of voltage	500～1,280 V
Bidirectional chopper	Rated capacity	500 kW
	Rated voltage	DC 1,500 V

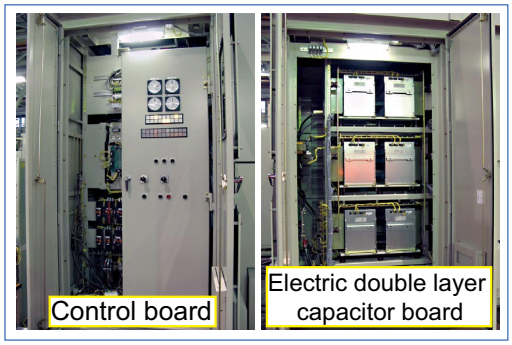


Fig. 3 A photograph of a power storage device

Comfort/Convenience

(1) Understanding the causes of heat cracking on wheel treads and a technique to determine its occurrence

- Reproduction of heat cracking on actual wheel treads mounted on a test machine
- Understanding the causes of heat cracking on wheel treads and creation of a chart to judge whether heat cracking has occurred based on the maximum wheel temperature and car deceleration

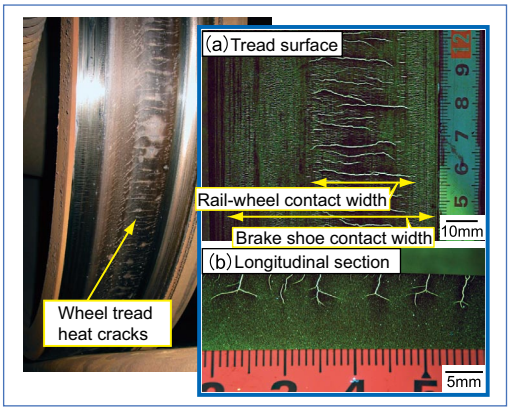


Fig.1 Heat cracks on an actual tread (left) and those reproduced on a tester-mounted tread (right)

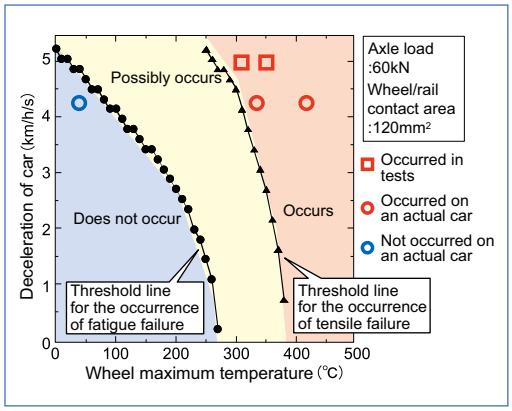


Fig. 2 A chart to judge whether tread heat cracking has occurred

(2) A technique to limit the temperature rises on the surface of brake disks

- Development of the methods to modify the surface layer of disk brakes and install cooling fins to limit temperature rises
- Confirmation of the fact that the temperature of the surface of remodeled brake disks is approximately 10% (90°C) lower than that of conventional brake disks

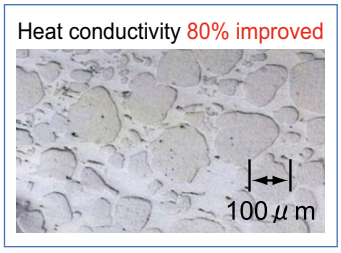


Fig. 1 A section of a material with the surface modified

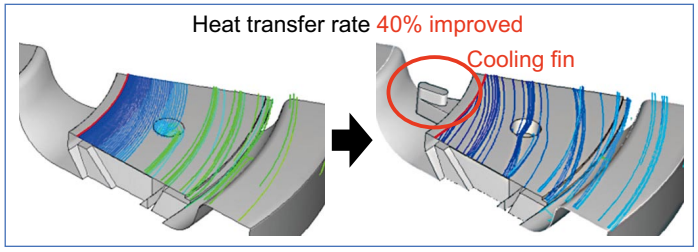


Fig. 2 Results of simulation of a heat fluid (streamlines)

Fig. 3 Remodeled disk

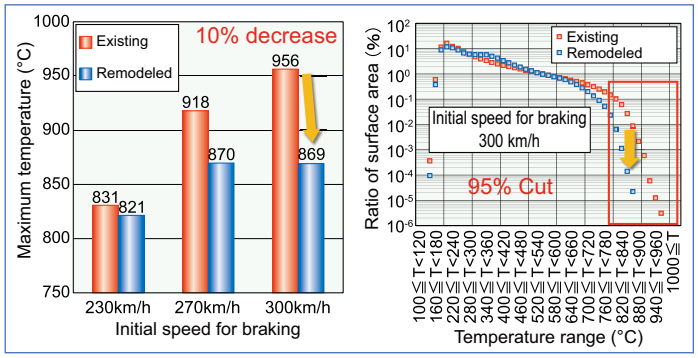


Fig. 4 Distribution of surface temperature (emergency brake)

(3) A failure point detection device for the straight brake command line on freight-car train sets

- Construction of algorithm to locate the failure points on the straight brake command line of freight-car train sets and development of a failure point detection device
- Confirmation of the capability to locate failure points on actual freight-car train sets in about 30 seconds

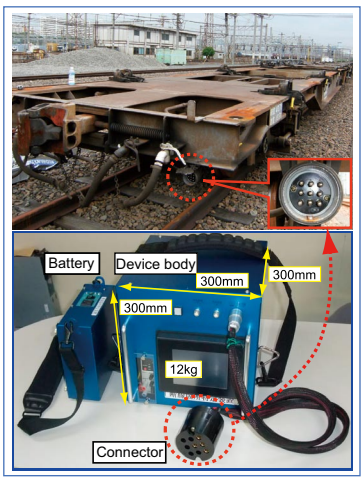


Fig. 1 A failure point detection device

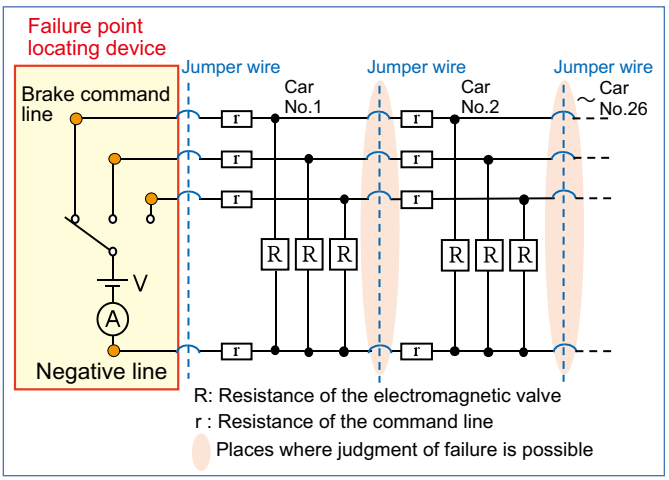


Fig. 2 An example of the electrical network on a freight-car train set

(4) An alkali-silica reaction (ASR) inhibiting material using lithium-containing zeolite

- Development of a method to compound a lithium-containing alkali absorber (lithium-containing zeolite) that significantly inhibits the alkali-silica reaction of concrete and manufacture of a prototype crack injection material

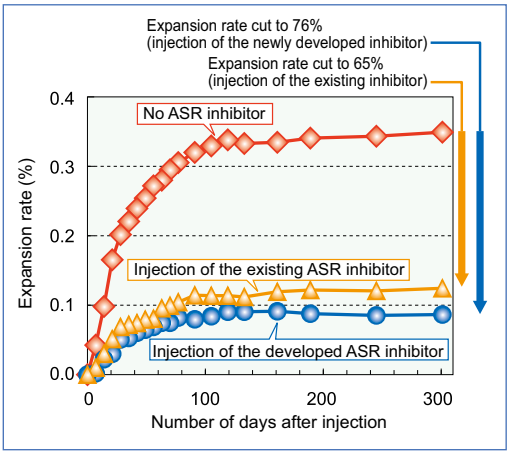


Fig. 2 Effect of the lithium-containing zeolite to inhibit ASR expansion

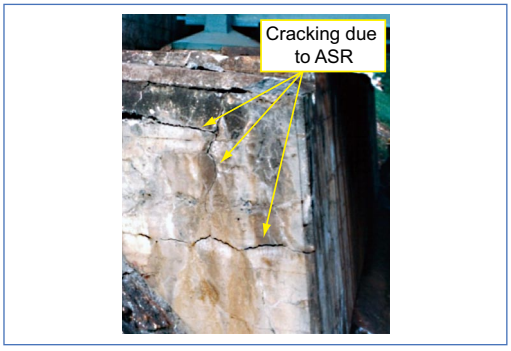


Fig.1 Deterioration due to ASR

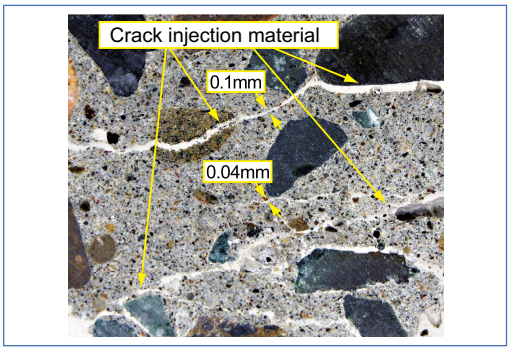


Fig. 3 Application of the crack injection material

(5) A portable corrugated rail wear monitoring device

- Development of a portable corrugated rail wear monitoring device to enable monitoring from a car
- Capability to determine the conditions and positions of corrugated wear by measuring noise with the device placed on a car floor

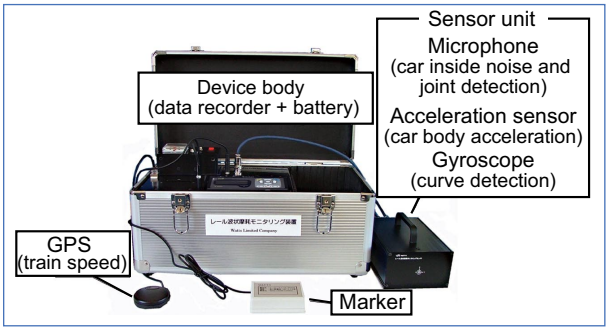


Fig. 2 A portable monitoring device

Fig. 1 Corrugated wear on a rail top

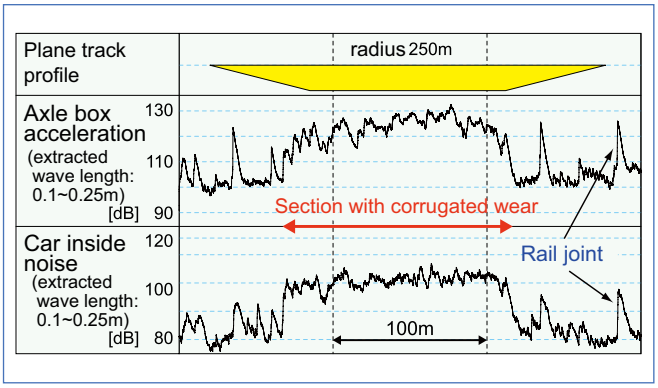


Fig. 3 Detection of the sections where corrugated rail wear exists

(6) A limited area radio train control system for light-traffic sections

- Development of a train control system to replace the electronic block system
- Easy replacement with the existing system as large-scale renewal of equipment is not required
- Introduction without implementing large-scale changes in the train operation procedures or the concept of system operation

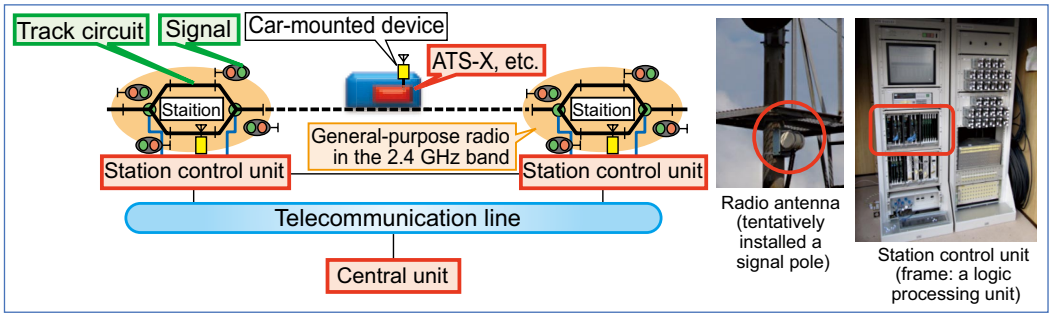


Fig. 1 Composition of the limited area radio train control system

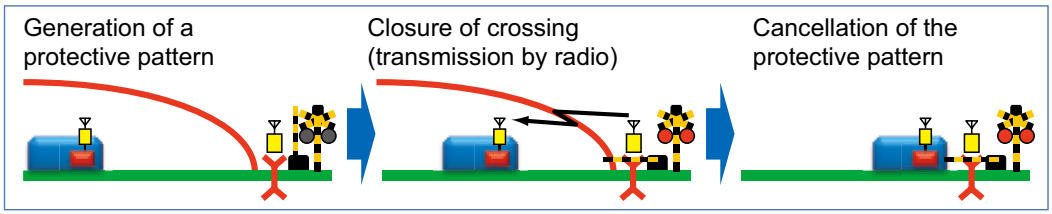


Fig. 2 Crossing protecting function

Harmonization with the Environment

(1) A high response pressure actuator for tilt control

- Development of an actuator to realize high response and improve the maximum operating force
- Development of an air pressure circuit to generate a damping force equivalent to that of tilting dampers and installation of the damper function to the developed actuator to simplify the tilt mechanism

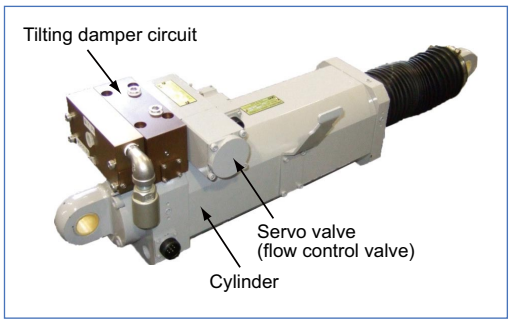


Fig. 1 The developed high response pneumatic pressure actuator

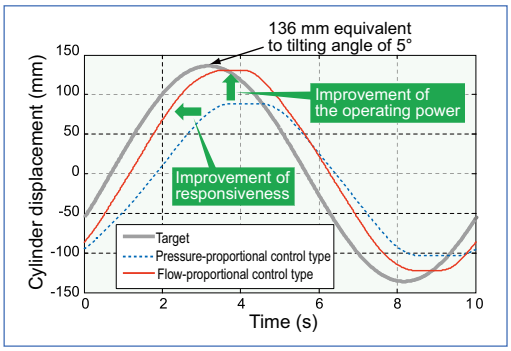
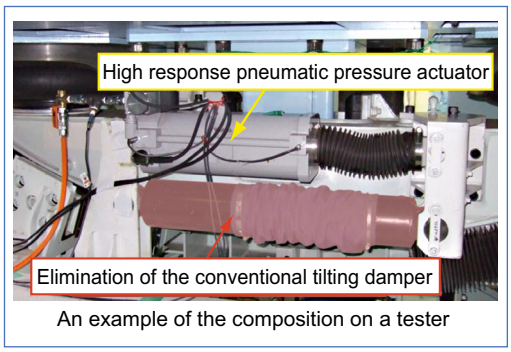


Fig. 2 Improvement of responsiveness and operating power by redesigning the servo values



An example of the composition on a tester

Fig. 3 Simplification of the tilt mechanism

(2) A proposed equivalent sensibility curve to reflect the human sensibility to high-frequency vibration

- A proposed "equivalent sensibility curve" having higher sensitivity to high-frequency vibration, which is closer to the bodily sensation of passengers for the evaluation of ride comfort on high-speed trains
- Confirmation of the fact that low-frequency noise has little effect on the evaluation of the vibration on running trains

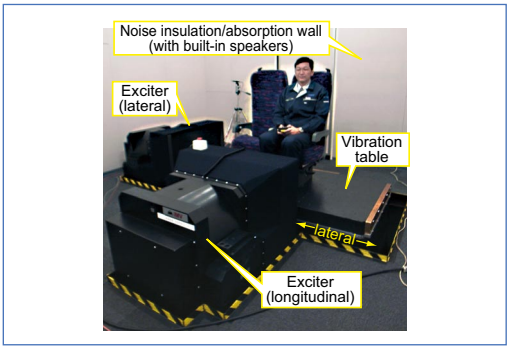


Fig. 2 A simulator to evaluate the vibration/noise in the passenger room

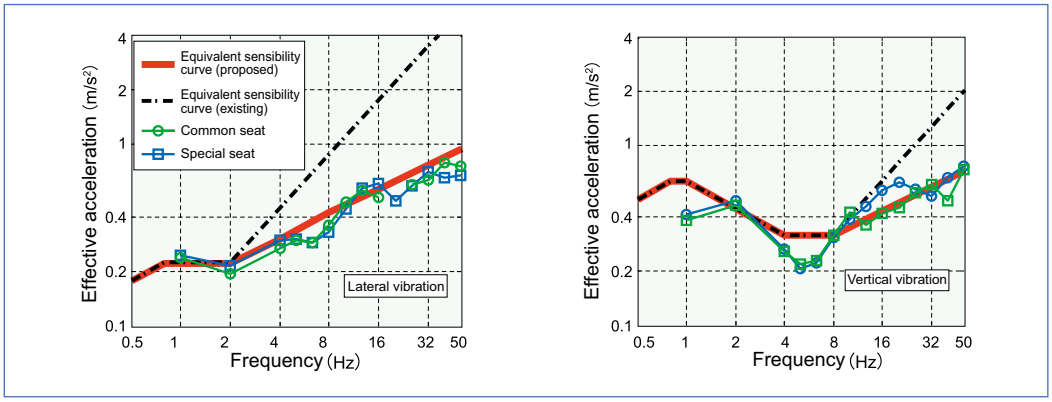


Fig. 1 Test results of the existing and proposed equivalent sensibility curves (proposed and existing)

(3) A decision model for the selection of transport facilities considering the preference of users

- Development of a decision model for the selection of transport facilities considering that some passengers prefer to use only particular transport means because of likes and dislikes
- Improvement of the precision in predicting the trend in demand for Shinkansen and limited express trains

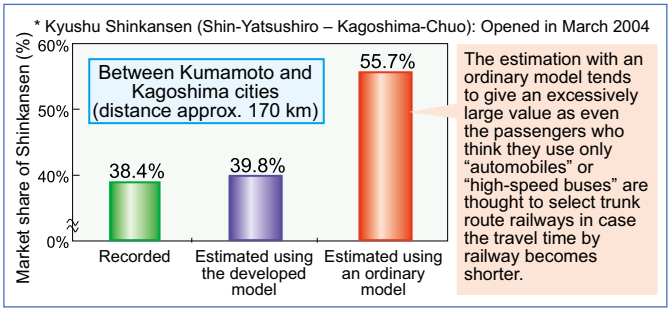


Fig. 2 An example of the verification of the precision in estimating market share for different transport facilities (for non-business purpose passengers)

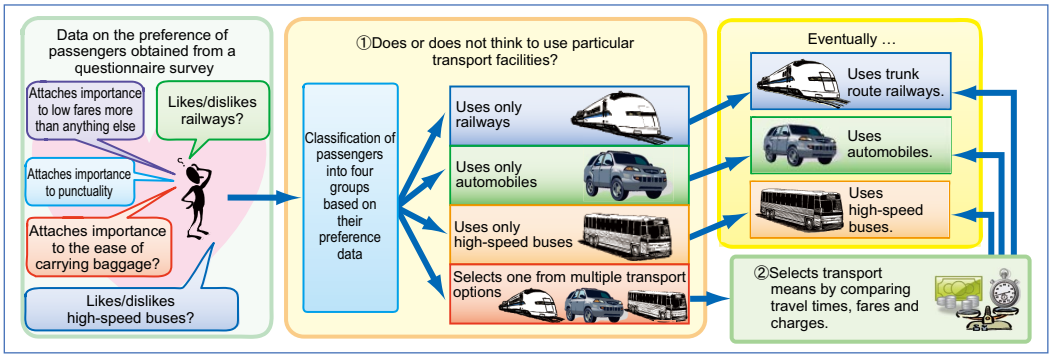


Fig. 1 An outline of the developed decision model for the selection of transport facilities

Basic Research

(1) Simulation of passenger vulnerability during a collision of commuter trains

- Development of a technique to simulate passenger motion during a collision of commuter trains
- Presentation of techniques and salient points to be observed to improve safety during collisions through simulation

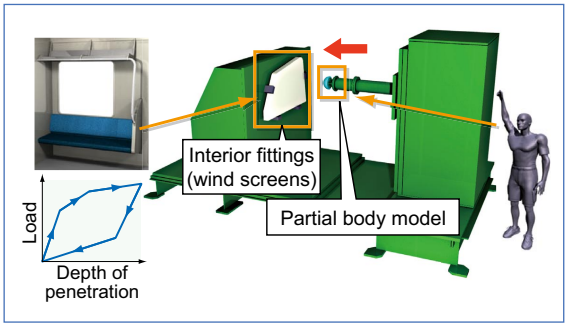


Fig. 1 A collision test with a partial body model and interior fittings (measurements at wind screens)

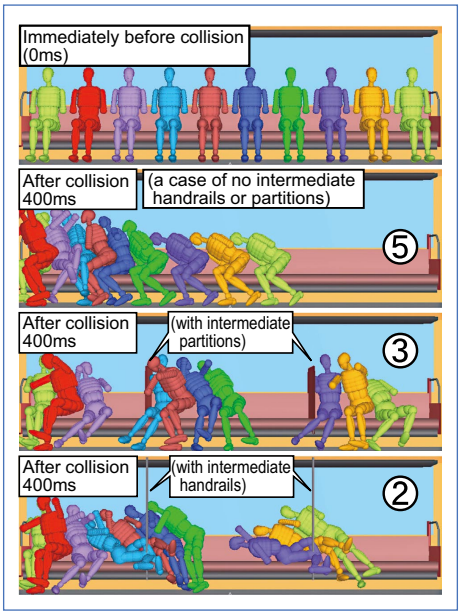


Fig. 2 An example of the analysis of the effect of long seat intermediate hand rails
* The circled number indicates the number of passengers potentially subject to a chest injury.

(2) Piezo-electric rubber for load and force detection sensors

- Development of a method to manufacture piezo-electric rubber having higher performance
- Confirmation of the applicability of piezo-electric rubber for load and force detection sensors

Fig. 1 Photograph of piezo-electric rubber

Table 1 Performance of piezo-electric rubber

Category	Concentration of piezo-electric particles (Vol%)	Modulus of elasticity (MPa)	Piezo-electric performance {d constant (pC/N)}
Conventional method	74	470	17
Developed method	56	283	90
Piezo-electric ceramics	-	55000	360

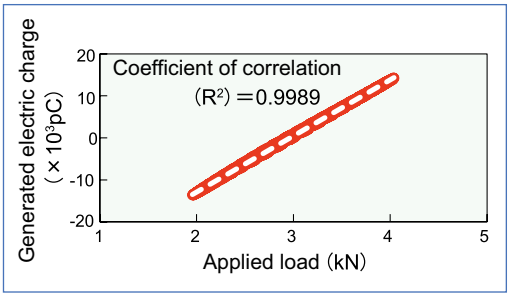


Fig. 2 Relation of load versus generated electric charge

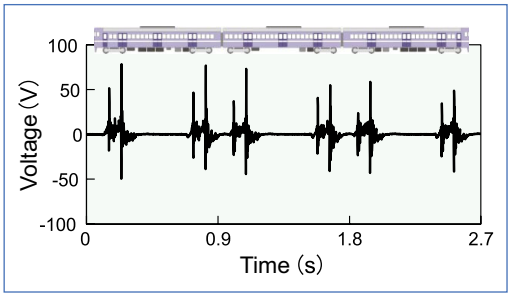


Fig. 3 Voltage measured at the sensor during train passage

(3) A technique to measure the contact force of pantographs by image processing

- Development of a technique to measure the contact force between the contact wire and pantographs by image processing
- A technique to measure the contact force realized by the total or partial elimination of pantograph built-in sensors even in the case where the conventional method is impractical

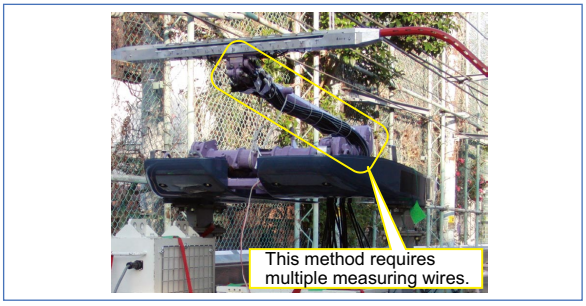


Fig. 1 Photograph of the measurement devices using the conventional method

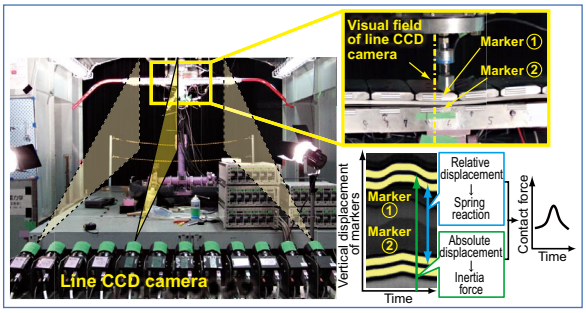


Fig. 2 Principle of the contact force measurement by image processing

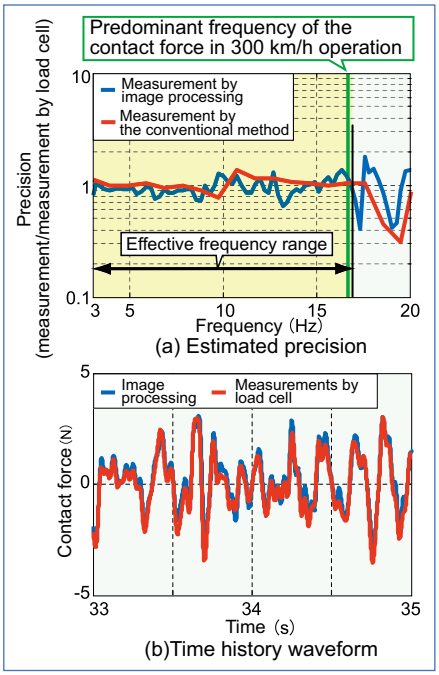


Fig. 3 Precision of the technique of contact force measurement by image processing

(4) A technique to experimentally evaluate aerodynamic noise sources by measuring the distribution of flow velocity

- Development of a technique to experimentally evaluate the noise levels at the source and measuring points by measuring the distribution of flow velocity
- Confirmation of the agreement between the measured sound pressures and those estimated by the new technique

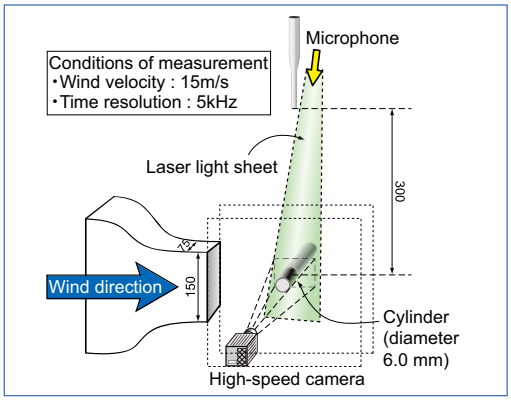


Fig. 1 A schematic drawing of a wind tunnel test

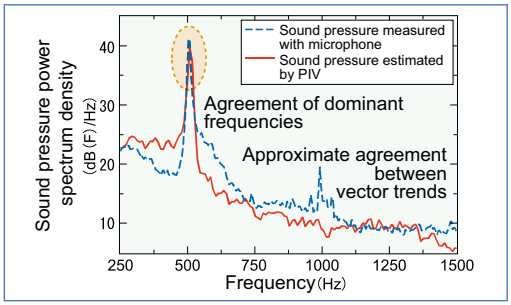


Fig. 2 A comparison between the Particle Image Velocity (PIV) estimated and measured radiation noises from a cylinder

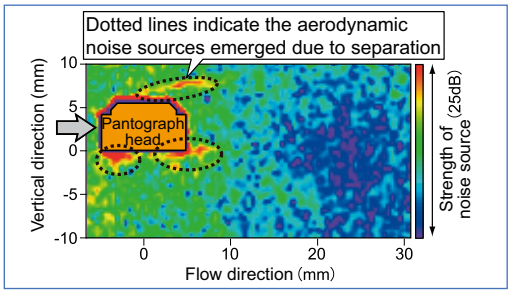


Fig. 3 Distribution of the dynamic noise sources around the pantograph heads estimated from the measurement of flow velocity distribution

(5) Simulation of the large-scale deformation and collapse behavior of the ground using the moving particle method

- Development of an analytical tool to predict and evaluate the large-scale deformation and collapse behavior of the ground
- Capability to analyze slope collapse at earthquake and avalanches of sand and stone at rainfall

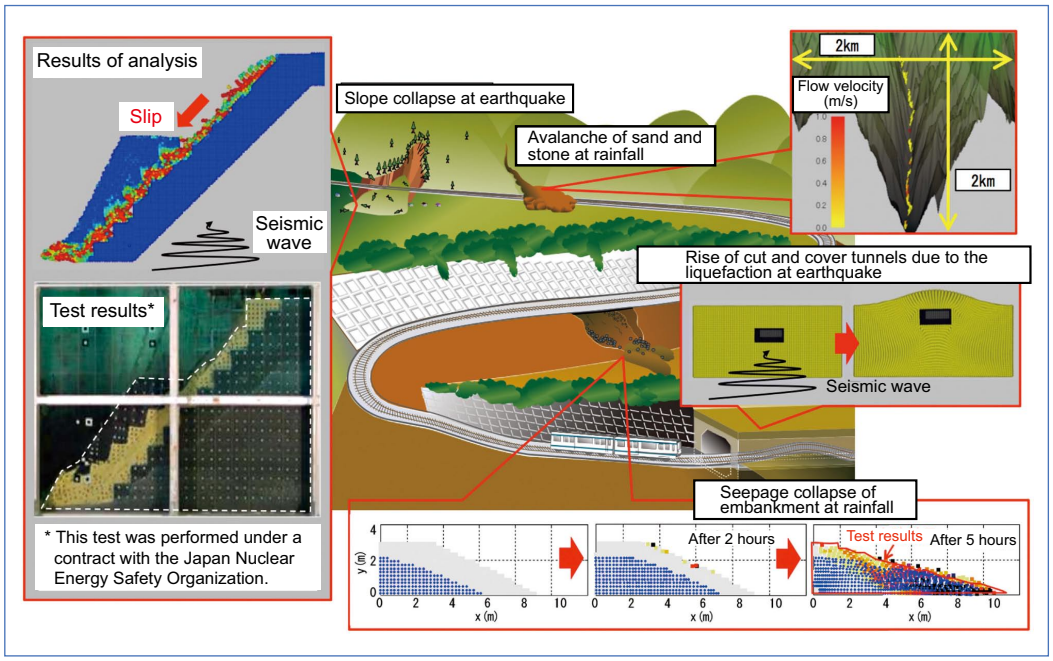


Fig. 1 Simulation of the large-scale deformation and collapse behavior of the ground by the moving particle method

(6) A technique to maintain/control ground coils using the Radio Frequency Identification(RFID) technology

- Establishment of a technique to record the information on the maintenance of ground coils in radio frequency tags and collect the data with a maintenance car

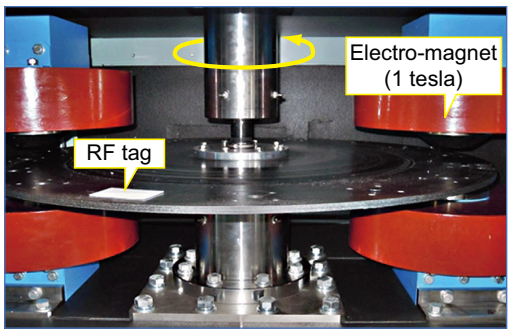


Fig.1 An RF tag environmental test in an electromagnetic field with a rotating test machine

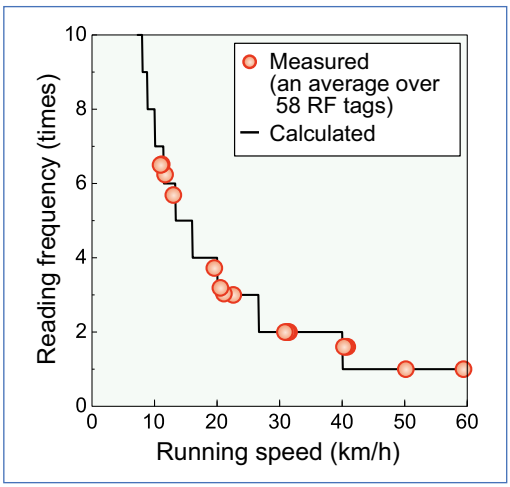


Fig. 2 Car running speed versus tag reading frequency

(7) A small superconducting magnet

- Development of a small superconducting magnet using a high-temperature super-conducting material usable for material analyzers and similar instruments
- Confirmation of the magnetizing performance equivalent to that of commercially available magnets

Fig. 1 A small superconducting magnet (outside diameter of superconducting bulk 80 mm, inside diameter 50 mm, 10 layers)

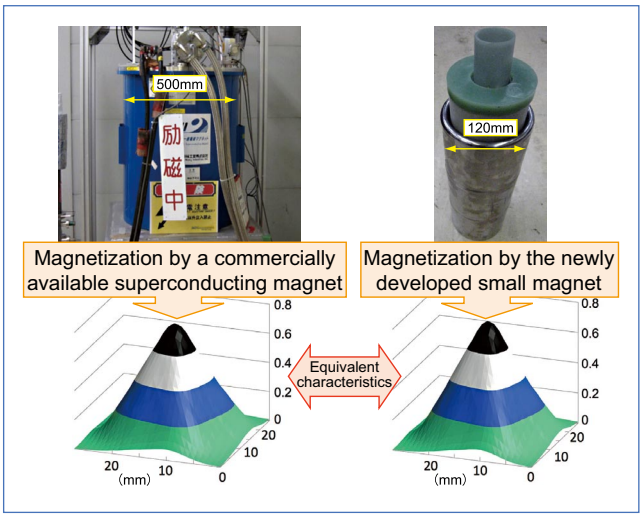


Fig. 2 A comparison of the magnetization to a test specimen (diameter 30 mm) and the distribution of magnetic fields between a commercially available magnet and the newly developed magnet

2 Contract-Based Projects

In FY 2010, we earned income of about 2.89 billion yen against the target of 3.43 billion yen, while accepting 537 orders for contract-based projects. Major titles of the contracts include "Surveys and researches on technical standards" (placed by the Ministry of Land, Infrastructure, Transport and Tourism), "Operation and management of a structure management support system" (a municipal railway), "Tests, surveys and researches related to the projected Shinkansen" and "Slope surveys" (Japan Railway Construction, Transport and Technology Agency), "Researches on seismometers" (JR companies) and "Researches on gauge-changeable trains" (a manufacturer in the private sector). To disseminate research results and secure contract orders, we held meetings on technology exchanges (about 800 participants in total) and workshops on technologies seven times with individual railway operators.

3 Other Projects

3.1 Surveying Projects

We sent RTRI members to Union Internationale des Chemins de fer (UIC) to collect information on railways in Europe and utilize it for the purpose of research and development. Furthermore, we surveyed the sensing monitoring technologies in non-railway industrial fields to watch the development of technologies related to the future of railways.

3.2 Projects of Technical Standards

We promoted the work to draft the standards (revision) on the design of steel-concrete composite structures and surveys/researches on a simple method to check railway bridges, the extension of the life of existing earth-retaining walls and the rolling displacement of car bodies. We also promoted the development of design tools related to technical standards.

3.3 Information Services

We collected the information, publications and materials on the railways in Japan and abroad and released them through the Internet and document retrieval services. Customers were provided with the whole text of the periodicals issued by RTRI on its Home Page. We continued electronic archiving of the materials stored in the library, with the accumulated number of important electronic materials amounting to about 61,000 in total.

3.4 Publications and Lectures

We issued many reports such as "RTRI Report," "RRR," "QR," "Railway Technology Avalanche" or newsletters on the latest technologies developed by RTRI, "Worldwide Railway Technologies" and other periodicals, while holding the annual RTRI Lecture titled "Creation of Technologies for the Future of Railways" (427 participants), Monthly Presentation 10 times (1,047 attendants in total) and Workshops on Railway Technologies 27 times (1,443 attendants).

3.5 Diagnosis Guidance Services

To respond to the request by railway operators, we offered technical guidance and implemented consulting services 380 times on the theme of the investigation of the causes of rolling stock accidents and power supply equipment failures.

3.6 Railway Technology Promotion Center

While keeping close conjunction and cooperation with its member organizations and local railway associations, the Railway Technology Promotion Center made efforts to understand their common technological needs and promoted a number of activities.

Regarding the technical support services, the Center dealt with 33 inquiries on the subjects submitted by the members, implemented site surveys five times and conducted advisory visits twice. To intensify the rail advisor activities, we now have 32 registered advisors and made presentations five times at the training sites of local railway associations. The Center organized the Lecture by the Railway Technology Promotion Center at Sendai, Tokyo, Osaka and Fukuoka and compiled "Railway Technologies Learnt from Accidents (edition on the contact wire system), a textbook for middle-class engineers. We also started work to compile the edition for disasters and preventive measures.

Regarding the Railway Design Engineer Examination, 133 engineers out of 719 applicants passed it in Tokyo and Osaka.

Based on the requirements from the members, the Center promoted six survey and research themes, of which four themes were completed including "the survey and research on a new maintenance system." We also made efforts to transmit information by means of Home Page and other media to provide members with valuable information. The railway safety database continued to store the information on railway accidents and incidents.

As already reported, a great earthquake occurred in the Pacific Ocean offshore, the northeastern section of Japan, on March 11, 2011. Taking into consideration the chaotic ruins caused by the earthquake, we are now considering exemption of the members who suffered serious damage at this incident from the membership fees.

4 Administrative Organization

4.1 Management

In view of the severe financial conditions and decreases in the funding contribution from JR companies, we made efforts to improve the efficiency of management and drastically cut the expenditure according to the spirit of the master plan – RESEARCH 2010. As a division in charge of compliance, observance of decrees and improvement of research ethics, we organized the Compliance Promotion Office in July 2010 and had the first meeting of the Compliance Promotion Committee in February 2011. Regarding the labor safety and hygiene, we enhanced the safety mindedness of the staff and improved the research environment to achieve a safer and more comfortable workplace.

At the meeting of the board of directors in March 2011, it was resolved to reinforce the organization to

guarantee the compliance of the duties of the executive members along with laws.

4.2 Human Resources

We recruited 18 new graduates and two mid-career employees to avoid technology gaps between generations and preserve the potential for research and development. We also re-employed 11 retiring researchers, called "silver workers" to smoothly transfer technologies and skills from veterans to young employees.

As a means of personnel exchange, we temporarily transferred 50 researchers in total to other organizations (including 22 to JR companies) and accepted 89 researchers in return (including 52 from JR companies). The recipient organizations include the Ministry of Land, Infrastructure, Transport and Tourism (MLITT), Japan Railway Construction, Transport and Technology Agency, NEDO and UIC, while the dispatching organizations include MLITT and private railway companies. Furthermore, seven researchers took office as visiting professors by request and 37 as part-time instructors from different universities.

We have now 157 doctors, 84 consultant engineers, 17 registered metrological engineers, 17 first-class registered architects and one patent attorney.

We introduced a short-time working system, in order to diversify the working style to take into consideration the work-life balance to harmonize labor and household life.

4.3 Improvement of Equipment and Facilities

We completed the renewal of the high-speed wheel-rail contact fatigue testing machine in October 2010 and completed installation, remodeling and renewal work of 14 testing machines and facilities.

As for non-research facilities, we renewed three testing laboratories for safety reasons and two air conditioning machines as an energy saving measure.

4.4 Expenditure

The income from the contribution of JR companies recorded an increase of 350 million yen from the amount in the budget but a decrease of 800 million yen from the level in FY 2009. Bearing in mind this severe financial situation, we made efforts to save expenditure, while discussing measures to cut costs as a whole.

4.5 Preparation for the Rebirth as a Public-Interest Corporation

We obtained the approval of the Ministry of Land, Infrastructure, Transport and Tourism for the method to nominate trustees, recommended candidates for trustees by the Board of Trustees and the Board of Directors for the first time and promoted the preparatory procedures to apply for its reorganization as a public-interest corporation or a juridical person for public interest.

4.6 Others

(1) Industrial Property Rights

We applied for 230 patents and utility models in FY 2010, (242 patents, etc. in FY 2009). By the end of the fiscal year, 165 cases were registered (163 within FY 2009). As a result, the number of the patents and utility models in possession reached 2,237 in total at the end of FY 2010.

(2) Visitors

The Kunitachi Head Office Laboratory and the Maibara Wind Tunnel Technical Center had approximately 2,200 and 360 guests, respectively, in FY 2010. About 1,700 participants attended the RTRI Technical Forum held at the Kunitachi Head Office on August 26 and 27. In addition, approximately 3,300 people visited the RTRI open house festival on October 9.

International Activities

1 Joint Research with Overseas Research Organizations

In FY 2010, we promoted joint research projects in three frameworks with overseas railway research organizations. Each division also implemented joint research based on its own will with railways and universities in foreign countries.

1.1 Joint Research with the China Academy of Railway Sciences (CARS) and Korea Railroad Research Institute (KRRI)

The two joint research projects between RTRI and CARS and between RTRI and KRRI have now developed into one consolidated version called the Japan-China-Korea Joint Research Project encompassing the railways in the three countries. Since 2001, joint research seminars have been held in turn by Korea, Japan and China in this order. The 10th seminar was held at KRRI in the suburbs of Seoul in Korea in September 2010.

The research themes in which RTRI is involved are surveys and co-ownership of the literature on railways, sciences and technologies, measurement technologies for the contact wire/pantograph system, derailment limits of physical quantities at high-speed running, human factors, adhesion between wheel and rail, EMC test standardization and methods to use and control testing facilities by plural parties, recover contaminated soils and investigate microorganisms.

1.2 Joint Research Agreement with French National Railways

RTRI and French National Railways, or Société Nationale des Chemins de fer Français (SNCF), have been promoting joint research projects since November 1995 when the two organizations concluded an agreement. Currently being in the course of the 5th term of the agreement, the two organizations held a seminar in April 2010 where the two parties reported their research results. Major fields of joint research are inspection of overhead contact wires, ride comfort, wireless sensor networks and management of research and development.

1.3 Joint Research with the Railway Safety and Standards Board (RSSB)

We concluded an agreement of joint research with RSSB in October 2008, started activities related to the agreement in December 2008 and held a meeting to report the results thereof in London in November 2010. From now on, we will exchange information on new materials for railways and methods to increase the track capacities, with consideration given to the bottlenecks and nodes of railway networks.

1.4 Joint Research with Other Research Organizations

We have concluded an agreement on collaborative research with the Swiss National Railways, or Schweizeriche Bundesbahnen (SBB), a railway operator, and are implementing joint research in the field of transport information. Universities with whom we have concluded collaborative agreements are Cambridge University, UK (monitoring equipment conditions), Massachusetts Institute of Technology, US (high-temperature super-conducting) and Chalmers University of Technology, Sweden (calculation of air flow).

2 Support of WCRR Sessions

The World Congress on Railway Research (WCRR) has its origin in the international seminar held by RTRI in 1992 in Tokyo by inviting the leading members in charge of research and development in major railways across the world. It has developed into an international conference organization for worldwide railway engineers whose primary concerns are in the research field to meet and exchange information on research and development issues.

We sent executives and researchers to the Executive/Organization committee meetings, made efforts to invite sponsors, encouraged the presentation of projects, sent more than 40 members (including 34 speakers) to the 2010 conference in Lille, France and promoted preparatory work for the booth exhibition by JR group companies.

3 Cooperation with Domestic Organizations

We are in cooperation with the Ministry of Land, Infrastructure, Transport and Tourism and contribute to strengthening relations with overseas railways. For example, we introduced energy-saving technologies in Thailand in August. In September, we participated in a meeting of railway frontline workers held in Beijing by the governments of Japan and China. In October, we introduced measures to prevent earthquake damage on high-speed railways in the US. We accepted long-term trainees from Brazil and various study tour groups.

4 Collection of Overseas Technical Information

We dispatched researchers to UIC to collect information on the research and development activities in European railways. Furthermore, we participated in the UIC high-speed railway seminar in Paris in June, the UIC international railway research committee held in Saint-Petersburg, Russia in July and the InnoTrans 2010 in Berlin in September.

5 International Conference

From October 18 to 22, we sponsored the 10th International Workshop of Railway Noise (IWRN) at Nagahama, Shiga Prefecture, where 147 researchers gathered from 15 countries to extend heated discussions. Major events were 50 oral and 20 poster presentations while 13 technical exhibitions were organized at booths.

6 Transmission of Information

We issued the Newsletter four times and an annual report of FY 2009 (English version).

7 Overseas Visitors to/from RTRI

Table 1 and Table 2 summarize the number of overseas visitors to/from RTRI, respectively.

Table 1 Number of overseas visitors to RTRI

China	Europe	Korea	North America	Others	Total
87	95	43	9	69	303

Table 2 Number of overseas visitors from RTRI

	Asia	Europe	North America	Oceania	South America	Total
Conference/meeting	37	62	17	6	2	124
Survey/Research	7	5	1	0	0	13
Joint research	22	17	1	0	0	40
Technical cooperation	0	0	0	0	0	0
Contract	21	3	4	0	0	28
Miscellaneous	10	16	1	0	0	27
Total	97	103	24	6	2	232

8 Railway International Standards Center

We organized the Railway International Standards Center in April 2010 to continue the activities of the International Electrotechnical Commission (IEC) /TC 9 (Electric Facilities and Systems of Railways) as a national reviewing body, took over the duties of the secretariats that are performed by the organizations managing the railway standards of the International Standardization organization (ISO) and started the activities of ISO/TC 17 (Steel) /SC 15 (Rails and Auxiliaries) as a national reviewing body. To reflect the needs of the members in the activities of the Center, we performed a questionnaire survey, had meetings to ensure close communications among different divisions and held a meeting to plan strategies for international standardization.

Furthermore, we collected information through the linkage with those related to railways in other countries and opened a homepage for information transmission to members and overseas countries. As of the end of FY 2010, we have 83 members participating compared with only 38 in number when the home page was installed.

8.1 Administration and Management

To smoothly promote the activities of the Railway International Standards Center, we have a planning/management consulting meeting twice or more each year with representatives of the members. At this meeting, the members have discussions on activity plans and budgets of income/expenditure, report of activity results, settlement of accounts, entrance/withdrawal of members and other important issues related to the administration/management of the Center. To establish close communications with the members, the Center has a member liaison meeting more than once every year to positively exchange opinions with the members.

The planning/management consulting meeting and the settlement of accounts in FY 2010 are as follows.

(1) Planning/Management Consulting Meeting

We had the planning/management consulting meeting in May 2010 and February 2011, where the members had discussions on the report of activities in FY 2009 and the plan for activities in FY 2011.

(2) Settlement of Accounts

In FY 2010, we had an income of approximately 264 million yen, including 86 million yen (membership fees), 4 million yen (subsidies), 130 million yen (contribution by JR companies) and 44 million yen (appropriation from the general account, or a carry-over from FY 2009). We spent approximately 91 million yen for operation, 22 million yen as traveling expenses and 107 million yen for personnel expenses, amounting to 220 million yen in total.

(3) Number of Members

As of the end of FY 2010, we have 83 member enterprises, compared with only 38 in number in April 2010 when the Railway International Standards Center was organized.

(4) Members Liaison Meeting

We held the member liaising meeting in May 2010 and February 2011, where we reported the proceedings at the planning/management meeting and exchanged opinions with members.

8.2 Review of IEC and ISO Standards

The Railway International Standards Center is now acting as a national reviewing body for the International Electrotechnical Commission (IEC) /TC 9 (Electric Facilities and Systems of Railways) and the International Standardization organization (ISO) /TC 17 (Steel) /SC 15 (Rails and Auxiliaries).

(1) IEC/TC 9 Activities

We held an IEC/TC 9 National Committee meeting in June 2010, October 2010 and February 2011 to have discussions on how to deal with approximately 30 standard-compilation projects.

The 50th IEC/TC 9 Annual Plenary Session was held at Shanghai China on October 26 to 29, 2010, in which seven delegates (including four from the Railway International Standards Center) participated from Japan. Regarding the proposal from Japan on the international standard for wireless train operation control, it was decided that Japan would submit formal documents to start discussions. The session also resolved to have the 2010 annual session in November in Japan.

In regard to the standard reviewing activities, we had more than 70 meetings of the ISO/TC 17/SC, 15 domestic working group and sent about 100 researchers from the Center and other divisions to international conferences.

(2) ISO Activities

In May 2010, the role of the ISO/TC 17/SC 15 national reviewing body was transferred to RTRI from the Japan Railway Civil Engineering Association.

As the ISO/TC 7 general assembly and the SC 15 meeting were held in Beijing, China on September 7 to 9, 2010, the Railway International Standards Center participated in the discussions of ISO Standard for the first time (four delegates participated from Japan).

We also made efforts to collect the information on the railway-related ISO standards other than those of ISO/TC 17/SC 15 in conjunction with the national reviewing bodies in the respective fields.

8.3 Discussions on the Strategies for International Standardization in the Field of Railways

We discussed how to promote the international standardization in the field of railways.

(1) Collection of Opinions on the Strategies

To assess the needs of the members for the Railway International Standards Center and the compilation of international standards, we implemented a questionnaire survey. We utilized the results of the survey as the basic input for discussions at the member liaison meetings among different divisions and for those to plan strategies for international standardization.

(2) Discussions on the Issues Proposed from Japan

(a) Opening of Liaising Meetings for the Members of Different Divisions

We held liaison meetings for members of nine different divisions (rolling stock, car electric components, parts, power, contact wires, signals, station facilities, tracks and JR companies) and exchanged information on the needs to develop international standards and the trends in Europe in each field.

(b) Opening of Strategy Planning Meetings for International Standardization

In August 2010 and February 2011, we held strategy planning meetings for international standardization, where it was decided to create concrete strategies and road maps for each field.

(3) Discussions on the Organization of a Railway Technical Committee in ISO

Regarding the issue of organizing a railway technical committee in ISO, it was agreed that we shall have further discussions to compare the needs, merits and demerits of the issue.

8.4 Proposals on Domestic Standardization

We supported proposals to formulate four JIS standards corresponding to different international standards. Effective utilization of JIS in the country will guarantee the quality and safety of products and facilitate the export of Japan-made products to overseas countries.

8.5 Collection, Analysis and Proposals of Information

(1) Collection of Information

To collect the information on the progress of standard development in the US and Europe, we surveyed the following.

- Surveys of related standards
- Translation of important standards into Japanese

(2) Overseas Transmission

We translated the following into English as a means to transmit the railway technologies in Japan.

- Japanese technical criteria (Ministerial ordinances and criteria for interpretation) (under a contract with the Ministry of Land, Infrastructure, Transport and Tourism)
- Design standards for railway structures and explanations (earthquake-resistant design)

(3) Support of the Publication of International Standards in Japanese

We translated into Japanese the EMC (electromagnetic compatibility) standards (IEC 62236 - 1~5 Ed. 2) prescribing the limit and resistance against the spurious waves emitted from railway systems and published a Japanese version from the Japanese Standards Association.

8.6 Overseas Transmission of Japanese Railway Technical Information

To transmit the Japanese railway technical information related to international standardization, we opened a homepage in English, through which we introduced the status of the discussions on international standards in Japan. We also compiled an English brochure to explain the activities of the Railway International Standards Center to the related organizations in overseas countries.

8.7 Improvement of the Recognition of International Standardization and Outstanding Personnel Achievement

(1) Opening of Seminars

We prepared and summarized various reference materials for international standardization, opened a number of seminars and disseminated basic knowledge and recent movements of railway technologies.

(2) Commendation for Standardization Activities

As a means to recognize outstanding work in international standardization activities, we selected and recommended candidates for the prize for standardization activities by the Ministry of Economy, Trade and Industry and the commendation by the Railway Technology Standardization Survey/Review Committee sponsored by the Ministry of Land, Infrastructure, Transport and Tourism. Two people were awarded with a prize by the Director, Industry, Technology and Environment Bureau, Ministry of Economy, Trade and Industry, one person won the IEC 1906 prize and 10 persons won a prize presented by the Railway Technology Standardization Survey/Review Committee for those who contributed to standardization activities. We contributed to the human resource recognition, in that the awardees were selected from those related to railways in the country.

8.8 Strengthening the Cooperation with Those Related to Railways in Overseas Countries

(1) Cooperation with Railway Standard-Related People in Europe

In September 2010, members from RTRI visited the chairman of the Commité Européen de Normalization (CEN)/TC 256 (Railways) to exchange information.

A Railway System WG was jointly organized by the Commité Européen de Normalization Électrotechnique (CENELEC) and CEN on the occasion when the Japanese Industrial Standards Committee (JISC)-CENELEC-CEN information exchange meeting was

held in Tokyo on November 24 to 26, 2010, where we actively exchanged information with five visiting members from Europe.

(2) Cooperation with Railway Standard-Related People in Asia

On the occasion of the ISO/TC 17 general assembly and an SC 15 meeting held in Beijing in September 2010, we exchanged information with the China Academy of Railway Sciences and the China Academy of Railway Economics Planning. With these two organizations, we agreed to continue exchanging information on international standards further.

In December 2010, we visited the Chairman, TC 9 National Committee, Singapore, to confirm the cooperative relationship between Japan and Singapore. We also visited Malaysian Railways, Thailand Railways and Korea Railway Research Institute for the same purpose. We will strengthen the cooperative relationship with the railways in Asia by taking advantage of the relationships with these organizations.

Seminars held by RTRI on International Standardization

Title	Contents	Dates
Seminar on the standards to protect rolling stock from fire	Movements in the US and Europe on the fire prevention standards	November 2010
Electromagnetic compatibility (EMC) standards	Training using EMC standards with translation into Japanese	December 2010
Seminar on international standards	Guidance to and Introduction of the status of the discussions on the international standards (contracted with the Ministry of Land, Infrastructure, Transport and Tourism)	January 2011
Introduction of international standards	Seminar to introduce international standards	February 2011

Newly Installed and Remodeled Testing Facilities

We remodeled three laboratory machines/facilities to improve safety and renewed two air conditioners to save energy.

We completed the renewal work of the high-speed wheel-rail contact fatigue testing machine in October 2010 and performed installation, remodeling and renewal work of 14 testing machines. Highlights of the work carried out on the more important machines are outlined below.

1 High-Speed Wheel-Rail Contact Fatigue Testing Machine (Fig. 1)

We installed the high-speed wheel-rail contact fatigue testing machine in FY 1987, with a principal purpose to investigate the mechanism of shelling crack occurrence on rails, which posed a serious problem for the Tokaido and San-yo Shinkansen railways, and establish effective preventive measures against this phenomenon. To reproduce the dynamic environment between wheel and rail, this machine was developed to conduct rolling tests while controlling the wheel load, lateral thrust, tangential force and the slip rate between wheel and rail. To reproduce the conditions of contact between wheel and rail as close to actuality as possible, it is possible to set different attack/rail tilt angles. As shelling occurrence can be related to the presence of liquids, water or oil is provided by spraying the contact point while the machine is rotating.

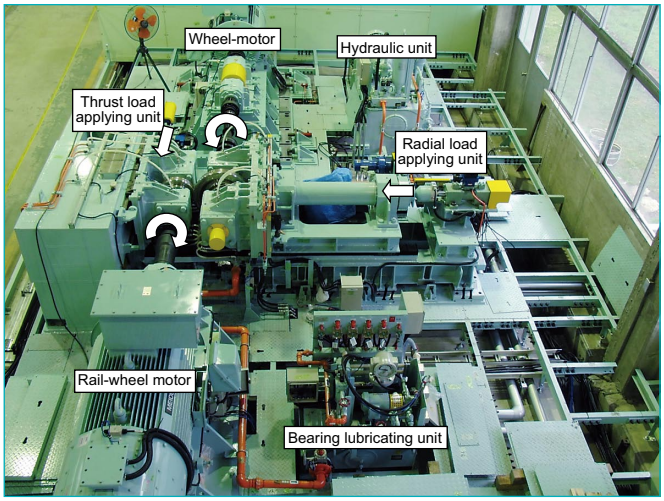


Fig. 1 High-speed wheel-rail contact fatigue testing machine

2 Renewal of the Wheel-Set Y/Q Calibrating Machine (Fig. 2)

This machine is used to calibrate the output sensitivity of the strain gauge circuits on both wheels instrumented by applying vertical wheel load, lateral pressure and tangential force to measure the Y/Q value. The conventional unit was renewed as its precision decreased over time (20 years).

Whereas the conventional unit was installed on a welded-structure frame placed on the ground floor, the distortion of the base was thought to be a cause of the decrease in the precision. Therefore, we fixed a surface plate, 5,000 × 4,000 × 250 mm in size, as a base on the concrete foundation, on which we installed a gantry structure (height 2,600 mm, pole-center distance 3,000 mm) to bear the reaction of calibration load).

The wheel load (maximum 98 kN) is applied with

(a) A scene of wheel-set calibration (b) A scene of coupler calibration

Fig. 2 Wheel-set Y/Q calibrating machine

hydraulic jacks fixed at the gantry from the top of the two wheels. To improve the precision of the loading points, the wheel-set support table is guided beneath the gantry with a linear guide installed on the surface plate. The hydraulic jacks on the left and right sides slide in the direction of axle through handle manipulation to facilitate minor adjustment of track gauge and wheel load applying points on the wheel treads. The lateral pressure (maximum 98 kN) is applied with hydraulic jacks between the backs of the wheels in the same manner as before.

Using the two gantry support poles, this machine can also calibrate the couplers used to measure the force of automatic couplers, up to the maximum calibration loads of 980 kN (compression) and 490 kN (tension). When fixed with a jig of appropriate profile on the surface plate, it can also be used to calibrate normal automatic couplers, tight lock type automatic couplers for Shinkansen and narrow-gauge railways and semi-permanent type couplers for narrow-gauge railways.

The measurement of Y/Q value is an effective measure to evaluate the running stability of cars and investigate the phenomenon of derailment. We will utilize this machine to improve the precision of the evaluation/investigation of these phenomena.

3 Installation of a Shinkansen Turnout for Switching Tests (Fig. 3)

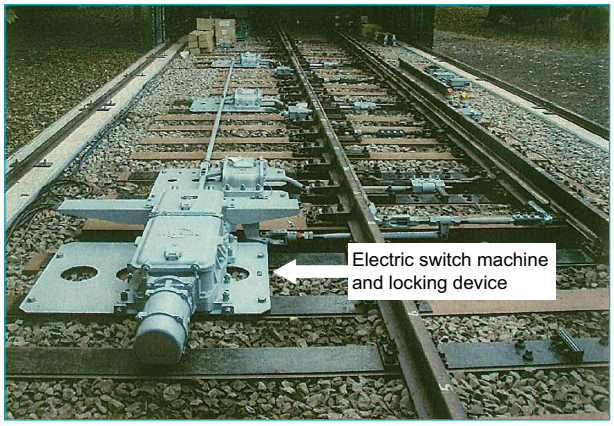
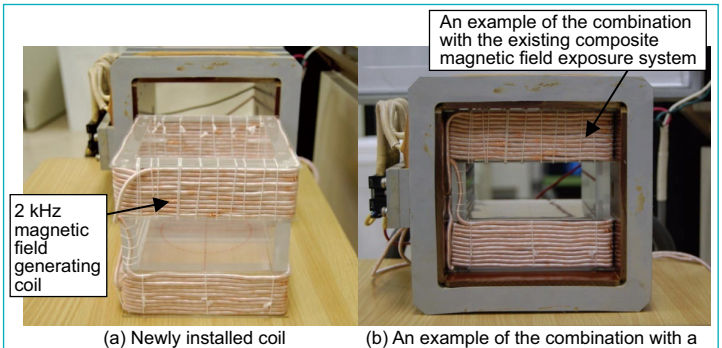


Fig. 3 A Shinkansen Turnout for switching tests

We are now promoting research to develop a mechanical model to design/evaluate switch and lock devices. As the characteristics of the object devices differ from unit to unit, however, it was difficult to develop a universal model. Therefore, we installed a No. 18 Shinkansen turnout for switching tests. As it shall be used for research purposes, we performed the installation work at high precision, with the escape crank and other components fixed in a manner so that the system components can be changed. As a result, it is possible to correctly evaluate the influence of each component on the switching motion, thereby ensuring high precision of the mechanical model.

4 Installation of an Intermediate Frequency Magnetic Field Coil System for Exposure of Specimens to a Composite Magnetic Field (Fig. 4)



(a) Newly installed coil (b) An example of the combination with a composite magnetic field exposure system

Fig. 4 An intermediate frequency magnetic field coil system for exposure of specimens to a composite magnetic field

Using a rolling stock main inverter, this coil system generates a 2 kHz magnetic field to expose biological specimens thereto. When it is added to anotherexisting composite magnetic field exposure system, biological specimens can be exposed to magnetic fields, static, ultralow frequency (50 Hz, 60 Hz, etc.) and intermediate frequency (2 kHz), each at a magnetic flux density of 0.5 to 1.0 mT (equivalent to or dozens of times the magnetic flux density in the normal environment) simultaneously, thereby enabling the evaluation of the composite effect.

Appendix

1 Publications

(1) RTRI Report

Vol. No.	Titles
Vol. 24 No. 4 (Apr. 2010)	**Special Features: Railway Dynamics** REVIEW: Recent Trend of Research on Railway Dynamics PAPERS: Fundamental Study on the Remoto Vibration Measuring System for Evaluating Rock Slope Stability PAPERS: Analytical Study on Impact Factor of Reinforced Concrete Rigid-Frame Viaduct PAPERS: Load Transmission Characteristic to the Ballast Layer Focused on the Deformation Mode of the Sleeper PAPERS: Experimental Investigation of Friction Coefficient between Steel Wheel and Concrete Slab PAPERS: Effect of Axle Load on Adhesion Coefficient between Wheel and Rail under Wet Conditions PAPERS: Test for Performance of 2nd Suspension of Vehicle in Large Vibration PAPERS: Dynamic Characteristics Control of Pantographs Using Variable Stiffness Springs PAPERS: Aerodynamic Noise Reduction of a Pantograph by Relaxation of Interference between Pantograph Members and by the Surface Covering with Porous Material
Vol. 24 No. 5 (May 2010)	**Special Features: Disaster Prevention Technology** REVIEW: Recent State of Research and Development on Disaster Prevention Technology PAPERS: Development of an on-board Earthquake Early Warning Receiving Unit using Satellite Broadcasting PAPERS: Evaluation of Earthquake Ground Motion Equipped with Probability of its Occurrence Based on the Seismic Hazard Analysis PAPERS: A Method to Predict the Change of the Water Level and to Evaluate the Stability of the Slope Surface Layer Considering the Topography PAPERS: Experimental Evaluation of Earth Pressure of Weathering Layer Act on Protection Work for Cutting Slope PAPERS: A Method to Detect Strong Wind Sections Along Railway Lines by Using Numerical Simulations PAPERS: Development of Snowplow Shape Suitable for Heavy Snow Area OTHER PAPERS: Drainage Continuation of Acid Water Containing Toxic Metal from Mudstone Rock Muck Disposal Site OTHER PAPERS: Influence of Hydraulic Conductivity Distribution of Sandy Ground on Groundwater Flow
Vol. 24 No. 6 (Jun. 2010)	**Special Features: Vehicle Technology** REVIEW: Recent Research and Development on Improvement in Ride Comfort PAPERS: Improving the Rigidity of Railway Vehicle Carbodies Using Ceiling Frames and Rails for Hand Straps PAPERS: A Hardware-in-the-loop Simulation System Duplicating the Actual Running Condition of the Train Consisting of Multiple Cars PAPERS: Suppression of Vertical Vibration of Railway Vehicles by Damping Control of Secondary Vertical Oil Damper PAPERS: Analysis of Loss Reduction Effect of Space Provided in Induction Motor Rotor Slots PAPERS: Evaluation of Crack Propagation Property on the Wheelseat of Hollow Axles with Adjoining Fitting Seats PAPERS: Method for Decreasing Stress and Noise by Modifying Shape of Wheel Plate PAPERS: Development of Re-adhesion Control Method Considering Axle-weight Transfer of Electric Locomotive PAPERS: The Analysis of the Adhesion Characteristics on Train Set by Monitoring Date of the Service Train
Vol. 24 No. 7 (Jul. 2010)	**Special Features: Foundation Design Technology** REVIEW: Recent Trends on Railway Foundation Design Technology PAPERS: Relationships Between Angular Rotation of Railway Structures and Type of Structures,Foundations After the Earthquake PAPERS: Estimation of Deformation Modulus of Ground and Coefficient of Subgrade Reaction Depending on Ground Investigation Method PAPERS: A Method of Evaluating Compressive Strength for Cast-In-Place Concrete Focused on Drilling Fluid Density PAPERS: An Evaluation Model of Residual Settlement of a Structure with Spread Foundation by Means of a Distributed Spring Model PAPERS: Estimation of Coefficient of Vertical Subgrade Reaction of Pile Based on Database of Load Test PAPERS: Seismic p-y Model of Pile Foundation Taking into Account Soil Non-linearity REVIEWS: A Trial Design of Spread Foundations Applying a New Design Code and a Comparative Design between the New and Current Design Code REVIEWS: A Trial Design of Pile Foundations Applying a New Design Code and a Comparative Design between the New and Current Design Code
Vol. 24 No. 8 (Aug. 2010)	**Special Features: Materials Technology** REVIEW: Recent Trend of Research and Development on Materials for Railway PAPERS: Evaluation of Durability on Cement Based Repair Materials PAPERS: Method of Alkali Contents Measurement by Acid Dissolution PAPERS: Mechanism of Corrosion of Reinforcement in the Vicinity of the Patch Repair Area of Concrete PAPERS: Development of Detecting System of Fatigue Crack in Steel Railway Bridge Using Electric Conductive Surface Material PAPERS: Development of Grinding Stones Improving Efficiency of Rail Grinding PAPERS: Experimental Reproduction and Generation Conditions of Wheel Tread Thermal Cracks PAPERS: A Method for Detecting Non-metallic Inclusions under the Raceway of Axle Bearing by Ultrasonic Testing PAPERS: Application of Nanocomposites to Floor Sheet for Railway Vehicle RESEARCH REPORT: Investigation of Advanced Welding Technology for Railway Vehicles
Vol. 24 No. 9 (Sep. 2010)	**Special Features: Environmental Technology** REVIEW: Recent Studies on Environmental Technology PAPERS: Investigation of Radiation Characteristics of the Noise from a Rail PAPERS: Method of Prediction for Structure-Borne Noise Radiated from Railway Concrete Viaduct PAPERS: Measurement of Unsteady Flow Field and Estimation of Sound Source in Wind Tunnel Tests PAPERS: A Theoretical Model on Micro-pressure Wave Emission Considering the Effects of Geography around a Tunnel Portal PAPERS: Interior Explosive Sound Caused When a Train Encounters a Compression Wave Inside a Tunnel PAPERS: Screening of the Allelopathic Potential in Herbaceous Plants to Suppress the Growth of Weeds on a Bank PAPERS: Development of a Biosensor for the Detection of Underground Water Pollutions PAPERS: Correlation between Customers' Views on Hygiene Environment and the Concentration of Airborne Microorganisms in the Railway Stations OTHER PAPER: Numerical Simulation of Flow around an Embankment under Side Wind

Vol. No.	Titles
Vol. 24 No. 10 (Oct. 2010)	**Special Features: Transport Information Technology** REVIEW: Recent Research and Development on Transport Information Technologies PAPERS: Methods of Railway Transportation Planning Based on Day-to-day passengers' Demand PAPERS: Development of the Flexible Seat Class Assignment Method Based on Demand Estimation PAPERS: Freight Locomotive Rescheduling Algorithm under Disordered Train Operation PAPERS: Development of an Algorithm for Allocation of a Railway Crew Depot PAPERS: An Approach for Evaluating the Effectiveness of Railway Freight Transport in the Reduction of Logistics Cost & Carbon Dioxide(CO_2) Emissions PAPERS: Algorithm for Designing Energy-efficient Wireless Sensor Networks PAPERS: The Development of the Monitoring System for Railway Infrastructures with the Aim to Assist the Inspection in the Ordinary Time and after the Event of Disasters PAPERS: Store-carry-forward Date Collecting Network Using Intermittent Link with Trains PAPERS: Development of Mobile Broadband Laser Communication System for Railways
Vol. 24 No. 11 (Nov. 2010)	**Special Features: Human Factors** REVIEW: Applications of Simulation Technology for Human Scientific Approach in Railway PAPERS: Method to Support Risk Management of Human Error in the Track Maintenance Work PAPERS: Evaluation of a Driver's Behavior on Level Crossing Warning PAPERS: Development of Evaluation Method of Psycho-physiological State Based on CEM of Uttered Voice PAPERS: An Approach to Improving Fitness of Driver's Desks in Commuter Trains for Wider Range of Body Size PAPERS: Evaluation of Easiness to Hold a Strap in an Instant PAPERS: Estimation Method of Sitting Quality of Railway Passenger Seats for Long Time Riding PAPERS: Evaluation Method of Noise inside Railway Vehicles Closely Related with Unpleasant Feelings of Human OTHER PAPER: Methodology for Risk Assessment of Railway Based on Seismic Analysis Model
Vol. 24 No. 12 (Dec. 2010)	**Special Features: Track Technology** REVIEW: Current Status of Standards in Japanese and International Standards in Track Technology PAPERS: A Evaluation of Practical Performance of Improved Glued-Insulated Railjoint PAPERS: Functional Evaluation of Collar Part of Fastening of Aged Slab Track PAPERS: Evaluation of Deterioration Cause of Track-Slab in Cold Districts PAPERS: Assessment of Aseismic Performance of Ballasted Track for Large-Scale Shaking Table Test PAPERS: Estimation Method of Lateral Ballast Resistance of Ballasted Track Damaged by Earthquake PAPERS: Monitoring Method for Rail Corrugation by On-board Measurement PAPERS: Development of a Model for Analyzing the Propagation of Transverse Cracking of Rail PAPERS: The Dynamic Response and the Residual Deformation of Ballast Layer under Cyclic Impact Loadings RESEARCH REPORT: Measures and Evaluation by Track for Decreasing Environmental Vibration in Shinkansen
Vol. 25 No. 1 (Jan. 2011)	**Special Features: Vehicle Technology** REVIEW: Recent Trend of Brake System Technology for Railway Vehicles PAPERS: Development of Displacement-Dependent Rubber Bush to Reduce Carbody Vibration Induced by Mass-Imbalanced Wheelsets through Traction Links PAPERS: Influence of Passengers on the Vibration Suppression Performance of Primary Damping Control System of Railway Vehicles PAPERS: Improvement of Response Performance of Pneumatic Servo System for Tilting Control PAPERS: Search Method of Wheel/Rail Contact by Three Dimensions PAPERS: Numerical Analysis of Wheel/Rail Contact Characteristics Based on Actual Wheel Profiles PAPERS: Lord Estimation of Axle-box Rolling Bearings from Wheel Loads and Lateral Forces PAPERS: Development of Train Simulator for Diesel-hybrid Railway Vehicles PAPERS: Development of a New Skid Control Method Using a New Detection Algorithm RESEARCH REPORT: Historical Documents of Structure Gauge and Rolling Stock Gauge around a Platform
Vol. 25 No. 2 (Feb. 2011)	**Special Features: Structures Technology** REVIEW: Recent Research Trend on Structural Technology PAPERS: Method of Priority Judgment of the Seismic Countermeasure Based on Life Cycle Cost PAPERS: Evaluation Method for Load-carrying Capacity of Incompletely-grouted PC Girders with Broken Tendons PAPERS: Development of the Reinforcement Method for the Beams of Existing RC Rigid-Frame Viaducts Using Arch Shaped Steel Plates PAPERS: The Evaluation of Earthquke-resistance and Reinforcement Method of the Steel Bridge of Old Type Adopting the Pivot Bearings PAPERS: Seismic Retrofitting Effects of Reinforcement of Over-Track Building with Knee Brace Dampers PAPERS: An Evaluation Method of a Seismic Performance of Pier Structure Deeply Embedded in the Soil PAPERS: Evaluation Method of Seismic Performance of Provisionally Restored Embankments Reinforced by Reinforcement Bars like Skewers PAPERS: Fundamental Study on the Evaluation Method of Mechanical Stability of Rock Blocks by Remote Vibration Measurement PAPERS: Guideline for Selection of Seismic Countermeasures for Existing Mountain Tunnels in Poor Geological Conditions
Vol. 25 No. 3 (Mar. 2011)	**Special Features: Maglev Technology and its Application** REVIEW: R&D of Superconducting Maglev and Applications of its Technology to Conventional Railway System PAPERS: Cold Storage Experiments of Rare Earth HTS Magnet PAPERS: Cryocooler-free Superconducting Magnet System Using High-temperature Superconducting Wire Based on Rare Earth Barium Copper Oxide PAPERS: Study on Component of Superconducting Magnet for Maglev Using High-temperature Superconducting Wire Based on Rare Earth Barium Copper Oxide PAPERS: Vehicle Motion Characteristics of a Maglev Train Set PAPERS: Development of the On-board Maintenance Management System for Ground Coils of Maglev by Using RFID Technology PAPERS: Roller Rig Dynamic Bench Test of Rail Brake using Linear Induction Motor PAPERS: Development of Flywheel Test Equipment for Flywheel Energy Storage System with Cryo-cooled Superconducting Magnetic Bearings PAPERS: Electromagnetic Property of Bearingless Motor Based on Electromagnetic Induction RESEARCH REPORT: Status of High-temperature Superconducting Wires in the World

(2) Quarterly Report (QR)

Vol. No.	Titles
Vol.51 No.2 (May 2010)	• Repair Method for Ballasted Track by Composite Filling Material Consisting of Water Glass and Polymer • Expansion of Application Range of Continuous Welded Rail Integrated with Turnout • Occurrence Conditions and Preventive Methods for Solidification Cracks in Alumino-thermic Welds • An Algorithm for Freight Train Driver Rescheduling in Disruption Situations • A Method to Evaluate the Economic Burden on Passengers Affected by Rail Transport Disorder • An Approach for Real-time Estimation of Railway Passenger Flow • Development of Evaluation Method of Risk of Train Driver's Error with Consideration on Inducement Factors • Development of Evaluation Method of Safety Climate in Work Site • Fundamental Study on the Effect of High-frequency Vibration in the Vertical and Lateral Directions on Ride Comfort
Vol.51 No.3 (Aug. 2010)	• Carbody-side Strengthening Effects of an Inner Sub-frame Ring Structure • Energy Efficiency Evaluation of Fuel Cells and Batteries Hybrid Railway Test Vehicles • Restraint of the Scoring Phenomenon in Abrasive Blocks Using Control Techniques • The Mechanism behind Seismic Damage to Railway Mountain Tunnels and Assessment of their Aseismic Performance • Modeling the Phase Spectrum Characteristics of Ground Motion Considering Source, Propagation Path and Local Site Effect Amplification • Passenger Flow Simulation to Evaluate the Degree of Discomfort for Walking in Stations • Reduction of Micro-pressure Wave Emitted from Portal of Side Branch of High-speed Railway Tunnel • Study on Applicability of Rare Earth High-temperature Superconducting Wires to Superconducting Magnet for Maglev System • Numerical Analysis and Evaluation of Electromagnetic Forces in Superconducting Magnetic Bearings and a Non-contact Permanent Magnetic Clutch
Vol.51 No.4 (Nov. 2010)	• Vibration Suppression in Catenary Poles Using Viscoelastic Dampers • Applicability of Rain Flow Method to Fatigue Life Span Estimation of Overhead Contact Wire • Practical Application of a New Feeding Transformer for AC Electric Railway Substations • Development of New Type Automatic Train Protection ATS-Dx with Permissible Speed Profile Using On-board Database • Application of GPS to Train Control Systems for Secondary Lines • Risk Evaluation Method for Improvement of Railway Signaling Systems • Upgrading Pantograph Performance Using Variable Stiffness Devices • Aerodynamic Noise Reduction in Pantographs by Shape-smoothing of the Panhead and Its Support and by Use of Porous Material in Surface Coverings • Load Transmission Characteristic to Ballast Layer Focused on Deformation Mode of Sleeper
Vol.52 No.1 (Feb. 2011)	• Hardware-In-the-Loop Simulation System for Duplication of Actual Running Conditions of a Multiple-car Train Consist • Development of Re-adhesion Control Method Considering Axle-weight Transfer of Electric Locomotive • Vertical Vibration Suppression System for Railway Vehicles Based on Primary Suspension Damping Control - System Development and Vehicle Running Test Results - • A Method for Evaluating the Stability of Cutting Slope Protection Work Subject to Weathered Layer Earth Pressure • Method for Detecting Railway Line Sections Exposed to Strong Winds Using Numerical Simulations • Estimation of Ground Resistance Characteristics of Piles used in Different Construction Methods Based on a Load Test Database • Evaluation of Earthquake Ground Motion Together with Probability of Occurrence Based on Seismic Hazard Analysis • Seismic p-y Model of Pile Foundation Taking into Account Soil-Nonlinearity • Recent Trends in Railway Foundation Design Technology

(3) Newsletter

No.	Titles
No.31 (Jun. 2010)	• Preface • In Pursuit of Future Railway Technologies • RTRI's New Master Plan (RESEARCH 2010) • Establishment of the Railway International Standards Center • 4th Phase Final Seminar of the SNCF-RTRI Collaborative Research Programme • 10th International Workshop on Railway Noise (IWRN10) • Approach to the Geological Survey of Sandy Ground in Consideration of the Stratigraphic Classification • Improving the Reliability of Aluminothermic Welding
No.32 (Sep. 2010)	• Preface • Reviewing RESEARCH 2005 • Improvement of the Interference Performance of Low-frequency Track Circuits by Simple Code Transmission • A Study on the Practical Application of High Capacity Laser Communication Technology to Railways • Research Regarding New Environmental Load-Reducing Concrete Using Coal Ash by Employing Geopolymer Method • Development of a Silent Steel Railway Bridge
No.33 (Dec. 2010)	• Preface • 10th China-Japan-Korea Railway Research Technical Meeting • Development of a Workload Evaluation Scale for Drivers • Development of a Small-Scale Superconducting Magnet Using YBCO High-Temperature Superconducting Wire • Research on the Prediction and Evaluation Method of Rolling Noise • Mass Production of Low-Cost LREBa$_2$Cu$_3$O$_y$ Bulk Superconductors for Railway Systems Using a Novel Seed in the Batch Process
No.34 (Mar. 2011)	• Preface • IWRN10 (The 10th International Workshop on Railway Noise) • Co-operative Study with RSSB • Activities of RTRI at UIC HIGHSPEED 2010 • A Noise Reduction System Using Piezoelectric Materials • Development of a Train Simulator for Diesel-hybrid Railway Vehicles • Determining Priorities for Seismic Countermeasures on the Basis of Costs and Benefits • Simple Catenary Equipment Offering High Speed Operation and Maintainability

2 Lectures

(1) RTRI Lecture

Special address	Tasks and Trends of Computer Simulation - Principle to Application -
Key note address	Research and Development for the Future of Railways - Simulation and Integration -
General address	• Investigation and Control of Rolling Stock Motion • Improvement of the Earthquake Resistance of Railway Structures • Utilization of Information Transmission Technologies • Utilization of Human Relation Technologies • Innovation of Track Technologies • New Energy and Power Storage Technologies

(2) Monthly Presentation

Theme	Date
The latest Research and Development Related to Track Technologies	April 21, 2010
The latest Research and Development Related to Human Sciences	May 20, 2010
The latest Research and Development Related to Environmental Engineering	June 17, 2010
Research and Development for the Future of Railways - Highly Reliable/Convenient Railways	July 14, 2010
Research and Development for the Future of Railways - Environment-Friendly/Low-Cost Railways	August 18, 2010
The latest Research and Development Related to Rolling Stock Technologies	September 24, 2010
Research and Development for the Future of Railways	October 7, 2010
The latest Research and Development Related to Signal/Telecommunication Technologies	December 20, 2010
The latest Research and Development Related to Structure Technologies	January 17, 2011
The latest Research and Development Related to Railway Dynamics	February 16, 2011

3 Statistics

(1) Record of Recognition

Title	Name of awardee	Category of prize	Date of reward
Commendation by the Minister of Education, Culture, Sports and Technology	Fumiaki UEHAN	Prizes for Science and Technologies	April 13, 2010
	Masamichi OGASA and Yoshiteru TAGUCHI	Prizes for Science and Technologies	April 13, 2010
	Kenji WATANABE	The Young Scientists' Prize	April 13, 2010
Medal with Purple Ribbon	Kiminori ASHIYA		April 29, 2010
Commendation by the Minister of Land, Infrastructure, Transport and Tourism	RTRI	Information Technology Promotion Division	October 1, 2010

Commending organization	Category of prize
Academic societies	• The Japan Society of Mechanical Engineers - A Prize for the Presentation of an Excellent Thesis in the Traffic/Physical Distribution Division - A Prize for Achievements in the Traffic/Physical Distribution Division, a Prize in Commemoration of the Traffic/Physical Distribution Division General Assembly (J-RAIL Special Prize) - A Prize to Encourage Research and Development, Environmental Engineering General Symposium
	• The Japan Society of Civil Engineers - A Prize to Encourage Excellent Presentation, Tunnel Engineering Forum - A Prize for Excellent Presentation, Tunnel Engineering Forum, a Prize to Encourage Theses
	• A Prize for the Speaker of an Excellent Thesis, The Japan Geotechnical Society
	• A PE Publisher Prize Nominated by the Editorial Committee, The UK Society of Mechanical Engineers - A Prize of Railway Division - Best Original Paper, George Stephenson Prize
	• A Prize for Scientific Theses, The Japan Fluid Power System Society
	• A Prize to Encourage Young Scientists, Reliability Engineering Association of Japan
	• A Prize for the Presentation of an Excellent Thesis, Industry Application Division, The Institute of Electrical Engineering of Japan
	• A Prize for the Best Thesis, International Workshop on Railway Noise (IWRN 10)

Commending organization	Category of prize
Associations	• A Prize for Invention, National Invention Commendation, Japan Institute of Invention and Innovation
	• A Prize for Distinguished Services for Prevention of Radio Disturbances, Central Consulting Committee on the Clean Radio Receiving Environment
	• A Prize to Encourage Theses, Association of Japan Concrete Institute
	• A Thesis Prize, Japan Railway Civil Engineering Association
	• Sakata Commemoration Excellence Prize, Japan Railway Engineers' Association
	• A Railway Electrical Technology Prize, Japan Railway Engineering Association
	• FY 2010 Commendation of the Contributors to Standardization Activities, the Railway Technology Standardization Survey/ Review Committee
	• Thesis Division Prize, Association of Railway Architects
	• An Encouragement Prize, Railway Freight Promotion/Encouragement Prize Management Committee
RTRI	**Prizes for Research and Development Achievements**
	• Development of a technique to evaluate Rolling Stock Characteristics through a Hybrid Simulator
	• Development of a technique to evaluate the Rolling Stock Behavior after Earthquake
	• A Technique of Comprehensive Prediction for Rolling and Structure-Borne Noise and Evaluation of the Effects of Countermeasures
	Prizes for Service Achievements
	• Technical Guidance on the Rail Profiling Range
	• A Contract-base Project on the NATM/Shield Merged Tunneling Method (SENS)
	• Technical Support of Designing New Stations for the Projected Shinkansen
	Prizes for Achievements in Research and Development
	• Numerical Simulation of the Air Flow around the Cars Subjected to Lateral Winds
	• Development of a Technique to Judge the Priority of Seismic Damage Preventive Countermeasures for Railway Facilities
	• A proposal of the Technique to Extend the Lubricant Life for Traction Motor Bearings
	• Investigation of the Vibration Characteristics of Structural Members against High-Speed Running
	• Research and Development of a Technique to Evaluate the Digital Broadcast Wave Receiving Quality
	• Development of a Technique to Evaluate the Soundness of Cut Slope Protection Work
	Awards for Service Achievements
	• Technical Guidance Related to Wireless Disturbances for Signal Equipment
	• Establishment of Design Standards and Related Tools for Steel Composite Structures
	• Investigation of the Simultaneous Ground Fault Phenomenon of Cars and Substations
	• A proposal and Practical Use of a High-Speed Contact Wire System for Shinkansen Revenue Service Sections
	• Compilation of the Textbooks for Middle-Class Railway Engineers in the Technical Support Services

(2) Patents in Possession

Regarding the patents applied for, we do not claim examination of those with little operability or for which improvements have been applied for registration.

We also scrutinized the patents in possession with respect to the necessity of holding or possibility of abandonment. We positively disclaimed the patents for which 10 years or over have passed after registration and little operability is expected.

As of FY 2010, the results of the scrutiny are as flows.

Newly registered patents, etc.

Patents: 164, Design patents: 1, Total: 165

Patents of which the rights has expired

Patents: 10

Abandoned patents, etc.

Patents: 109, Design patents: 1, Total: 110

Consequently, we have 2,258 registered industrial property rights (including 21 trademarks). See Tables 1 and 2.

Table 1 Domestic Industrial Rights in Possession (As of March 31, 2011)

Category		Independently owned	Jointly owned	Subtotal
Patent	Registered	528	488	1016
	Applied for (Examination applied for)	763 (421)	431 (230)	1194 (651)
	Subtotal	1291	919	2210
Utility model	Registered	0	0	0
	Applied for	0	0	0
	Subtotal	0	0	0
Design patent	Registered	14	13	27
	Applied for	0	0	0
	Subtotal	14	13	27
Trademark	Registered	21	0	21
	Applied for	0	0	0
	Subtotal	21	0	21
Total	Registered	563	501	1064
	Applied for	763	431	1194
	Grand Total	1326	932	2258

Table 2 Overseas Industrial Rights in Possession (As of March 31, 2011)

Status		Number of applications	Number of the countries of registration
Registered		39	98
Registered or applied for	Registered	4	16
	Applied for		-
Applied for		13	-
Total		56	114

4 Press Release

April 1, 2010	Inauguration of the Railway International Standards Center
May 19, 2010	A party held in "Celebration of the Start of the Railway International Standards Center"
May 21, 2010	Acceptance of the role of the "ISO/TC 17/SC 5 National Reviewing Body"
May 24, 2010	A meeting held to exchange technologies on LRT
June 30, 2010	A small superconducting magnet using yttrium-base high-temperature superconducting wire
July 1, 2010	Organization of the Compliance Promotion Office
August 2, 2010	A meeting held to exchange technologies on structures (design and construction work)
August 26 and 27, 2010	A technical forum held
September 30, 2010	A meeting held to exchange survey and diagnosing technologies (signal and telecommunications)
October 1, 2010	A meeting held to exchange survey and diagnosing technologies (power)
October 9, 2010	The Hehbeh Festival held
October 15, 2010	A meeting held to exchange survey and diagnosing technologies (rolling stock)
October 18, 2010	A meeting held to exchange survey and diagnosing technologies (train operation)
October 27, 2010	Training held for the experts to diagnose railway structures
November 5, 2010	A meeting held to exchange technologies in the Kansai district
November 22, 2010	A meeting held to exchange survey and diagnosing technologies (tracks)
March 11, 2011	Development of vibration suppression system using variable secondary vertical dampers

(FY2010: April 1, 2010 - March 31, 2011)

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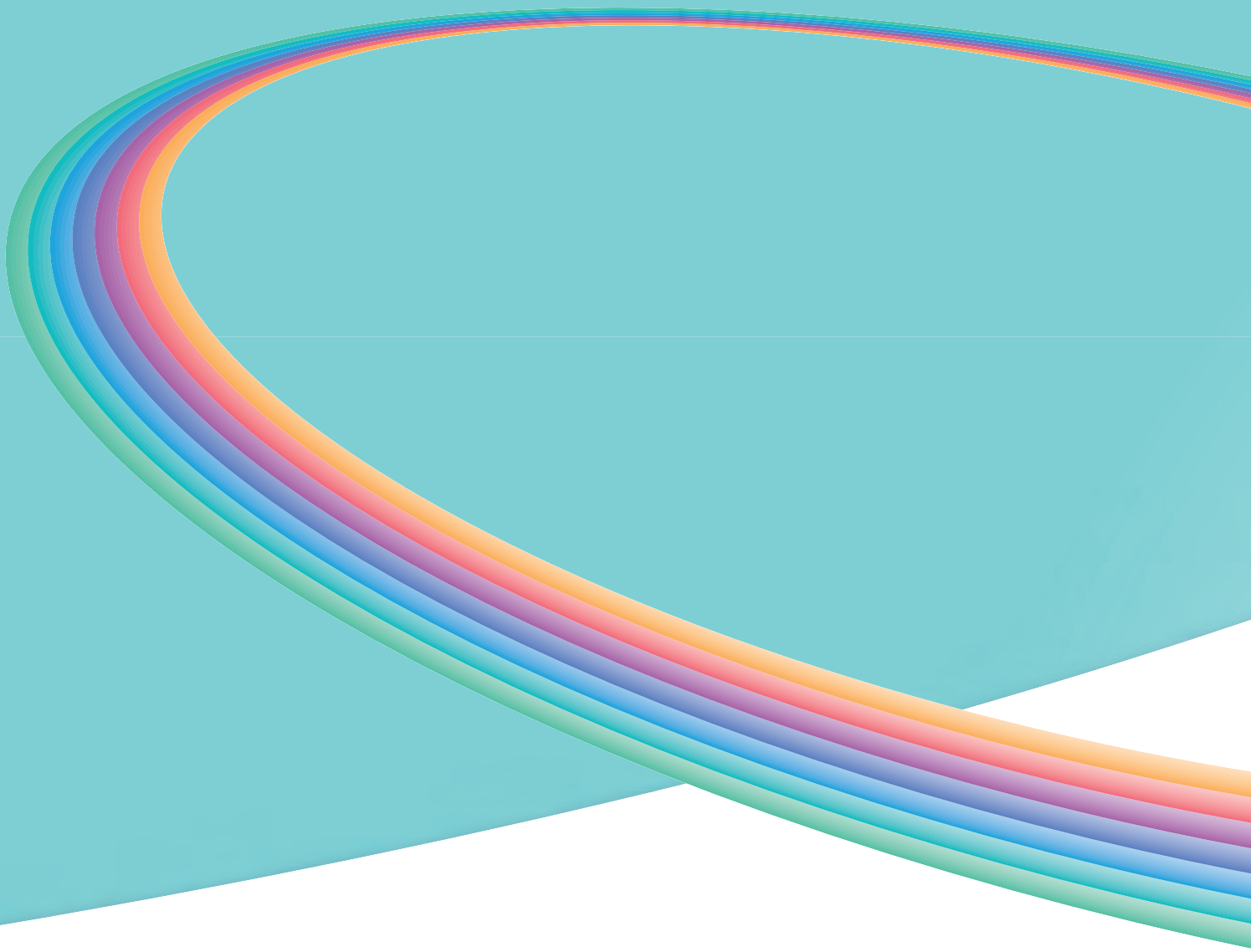

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