A prosperous future starts here
Lines Constructed by the JRTT

Legend
- Shinkansen Lines
- [Conventional Lines]
- Lines under construction (JRTT is in the entity of construction)
- Lines in operation
- [Shinkansen lines] (JRTT is the entity of construction)
- Local lines

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JRTT is performing construction on the Hokkaido Shinkansen between Shin-Hakodate-Hokuto and Sapporo, the Hokuriku Shinkansen between Kanazawa and Tsuruga, and the Kyushu Shinkansen between Takeo-Onsen and Nagasaki.

Projected Shinkansen Lines

Urban Railways

JRTT has been commissioned to perform construction on the Eastern Kanagawa Lines (through lines between Sotetsu Line and JR Line, and between Sotetsu Line and Tokyu Line) as a project to enhance the convenience of urban railways, as well as construction on Echizen Railway lines and others.

Railway Construction Technology

JRTT continues to build on its achievements in technological development in a wide range of fields, namely tunnels and bridges, and its abundant design and construction technology by always using the latest technology to consistently provide railway facilities that meet the needs of clients and passengers.

Project Research

Our research departments select lines, create operation plans and facility plans, project demand, analyze profitability and socioeconomic effects and more. The departments provide a wide array of services, from general research in the conceptual stage to detailed research in the implementation stage.
Comprehensive Technical Capacity for Railway Construction

A wide ranging technical capacity is needed to construct a railway. An immense amount of time and money are also required. As a public institution and general engineer's organization, JRTT secures funding, holds discussions with railway operators and various entities in affected regions, and works to reduce costs in an effort to rapidly construct convenient railways. We accomplish this on the strength of an abundance of experience and technical capacity in the various stages of railway construction—research, planning, design and construction—gained from many years of constructing railways throughout Japan.

Research and Plans for Railway Construction

1. Research and Creation of Construction Plans
   JRTT uses its wealth of experience and technical capacity in railway construction—in the selection of routes and station locations, coordination and discussions with relevant organizations, land acquisition, the design and construction of railway structures and more—to create effective, efficient construction plans.

2. Fundraising
   An immense amount of money is required to construct railways; however, as a highly trustworthy public institution, JRTT easily secures a wide array of construction funds, including private sector loans.

3. Performance of Construction
   In the course of performing construction, JRTT holds briefings to elicit the cooperation of local governments and local residents, holding various discussions as appropriate. In addition, we combine the technical capacities of our civil engineering, mechanical engineering, electrical engineering and architectural departments to engage in construction under appropriate management.

   Everyone involved in the construction comes together to make efforts to reduce noise and vibrations during construction and otherwise conserve local environments, and prevent accidents involving third parties and other construction accidents.

Railway Construction Process

Cost Reduction
Our abundant achievements in technological development helps us pioneer the incorporation of economical design and construction technology and make other efforts to reduce construction costs and improve the quality of facilities, thereby reducing their life cycle costs.

Efficient Scheduling
All JRTT departments have expert technology required for railway construction, so we can coordinate schedules between departments and construct railways quickly and efficiently. This leads to the earlier opening of lines we construct, which reduces costs.

Technological Development
JRTT continues to build on its achievements in technological development in a wide range of fields, namely tunnels and bridges, and its abundant design and construction technology by always using the latest technology to provide structures that meet the needs of clients.

Simplification of Procedures
When JRTT is used to create designs, the forms, drawings and other documents and information required to apply for construction permits is substantially simplified. (See “Special System for Designs below”)

JRTT uses its comprehensive technical capacity to construct railways that meet needs

Research and Creation of Construction Plans

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Comprehensive Technical Capacity for Railway Construction

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   Everyone involved in the construction comes together to make efforts to reduce noise and vibrations during construction and otherwise conserve local environments, and prevent accidents involving third parties and other construction accidents.
**Construction of Projected Shinkansen Lines**

"Projected Shinkansen Lines" refers to the five Shinkansen lines—the Hokkaido Shinkansen, the Tohoku Shinkansen (north of Morioka), the Hokuriku Shinkansen, and two lines of Kyushu Shinkansen (the Kagoshima route and the Nishi-Kyushu route)—set out in the Development Program drafted in 1973 based on the Nationwide Shinkansen Railway Development Act. Starting with the construction of the Hokuriku Shinkansen between Takasaki and Kanazawa in 1988, JRTT has completed a total of 929 km of Shinkansen lines to date, including the sections between Shin-Aomori and Shin-Hakodate-Hokuto on the Hokkaido Shinkansen, Takasaki and Kanazawa on the Hokuriku Shinkansen, Morioka and Shin-Aomori on the Tohoku Shinkansen, and Hakata and Kagoshima-Chuo on the Kyushu Shinkansen. After completion, we lend the railway facilities to the various branches of JR, which operate the lines and provide service to many people.

**Kyushu Shinkansen**

The Kyushu Shinkansen consists of two sections: the 257-km section between Hakata and Kagoshima-Chuo, and the 117-km section between Shin-Tosu and Nagasaki.


The section between Takeo-Onsen and Isahaya opened in March 2008, and JRTT began construction on the section between Isahaya and Nagasaki in June 2012. Presently, we are working mainly on land acquisition and tunnel and viaduct construction.

When this section opened in March 2011, it became possible to travel from Shin-Osaka to Kagoshima-Chuo without transferring.

Opened ahead of the rest of the line in March 2004. From that time until the entire line opened, we enabled passengers to transfer between local express trains and the Shinkansen on the same platform for their convenience.

**Legend**

- Shinkansen lines in operation
- Shinkansen under construction (JRTT is the entity of construction)
The Hokuriku Shinkansen connects Takasaki and Osaka over a stretch of some 600 km. The section between Takasaki and Nagano opened in October 1997, and the section between Nagano and Kanazawa opened in March 2015.

We began construction on the section between Kanazawa and Tsuruga in June 2012. Presently, we are working mainly on land acquisition and tunnel and long bridge construction.

Kanazawa to Tsuruga [125km]
We began construction on this section with the intent to complete it a little more than 10 years after the opening of the section between Nagano and Kanazawa.

In a January 2015 government-ruling party agreement, we pledged to expedite the scheduled completion and route opening date of FY 2025 to FY 2022 with help from the strongest efforts of local governments along the line.

Nagano to Kanazawa [228km]
When this section opened in March 2015, it drastically reduced the travel time between Tokyo and the Hokuriku region. Tourism, business and other positive effects are expected.

110 Japan Railway Construction, Transport and Technology Agency (JRTT)
Shin-Aomori to Shin-Hakodate-Hokuto
[149km]
When this section opened in March 2016, it drastically reduced the travel time between Hokkaido and Tokyo and the Tohoku region. Tourism, business and other positive effects are expected.

Hachinohe to Shin-Aomori
[82km]
Opened in December 2010. The extension of the Shinkansen to Shin-Aomori completed the Tohoku Shinkansen, which is the main artery of the Tohoku region.

Hakkoda Tunnel
A 26.5-km tunnel that was completed in February 2005. As of April 2017, it is the world’s longest double-tracked, single-section terrestrial tunnel.

The Tohoku Shinkansen was complete when the section between Hachinohe and Shin-Aomori opened in December 2010 to form a 675-km connection from Tokyo to Shin-Aomori. The Hokkaido Shinkansen spans some 360 km from Shin-Aomori to Sapporo. The 149-km section between Shin-Aomori and Shin-Hakodate-Hokuto opened in March 2016.

We began construction on the 211-km section between Shin-Hakodate-Hokuto and Sapporo in June 2012, and are presently working mainly on land acquisition and tunnel construction.
Effects of Projected Shinkansen Lines Since Opening

Many people are able to travel faster.

The expansion of the Shinkansen network has allowed many people to travel faster from towns along the Shinkansen lines to Tokyo, Fukuoka and other destinations.

Hokkaido Shinkansen (between Shin-Aomori and Shin-Hakodate-Hokuto Stations) Travel Time to Sendai Station

Before opening
- 2.5-hour radius
- 3-hour radius
- 3.5-hour radius

After opening
- 2.5-hour radius
- 3-hour radius
- 3.5-hour radius

Changes caused by the opening of the Shinkansen
- Transition in 2.5-hour radius: 1.07 million people to 1.08 million people
- Transition in 3-hour radius: 1.25 million people to 1.22 million people
- Transition in 3.5-hour radius: 1.3 million people to 1.65 million people

Note: Transition to 2.5-hour radius in the total population of the 2.5-hour radius and the 3-hour radius. Transition to 3-hour radius in the total population of the 2.5-hour radius, the 3-hour radius and the 3.5-hour radius.
Sources: The 2015 Population Census (Table for municipalities as of March 2015)

For travel time, timetables were used to calculate the time required to access Shinkansen stations from administrative offices in each municipality.

The timetable published in March 2014 was used for the period before opening, and the timetable published in April 2016 was used for the period after opening.

Hokkaido Shinkansen: Present and Future

JRRTT is continuing to perform construction on the Hokkaido Shinkansen between Shin-Hakodate-Hokuto and Sapporo, the Hokkaido Shinkansen between Kanazawa and Tsuruga, and the Kyushu Shinkansen between Takeo-Onsen and Nagasaki.

Hokkaido Shinkansen
(Shin-Hakodate-Hokuto - Sapporo)

Before expansion
- 2 h 28 min
- 5 h 22 min

After expansion
- 1 h 17 min
- 3 h 59 min

55 minutes shorter

5 hours 22 minutes shorter

Shinkansen: Present and Future

Note: - "Before expansion" travel times are those published in the last timetables before the expansion of each line; that is, the December 2010 timetable for the section between Tokyo and Shin-Aomori, the March 2011 timetable for the section between Hakata and Kagoshima-Chuo, the March 2015 timetable for the section between Tokyo and Shin-Aomori, and the March 2016 timetable for the section between Tokyo and Hakodate.
- "After expansion" travel times for all sections are those published in the April 2016 timetable.

Kyushu Shinkansen
(Between Naiku and Kagoshima-Chuo)

Before opening
- 1.5-hour radius
- 2-hour radius
- 2.5-hour radius

After opening
- 1.5-hour radius
- 2-hour radius
- 2.5-hour radius

Changes caused by the opening of the Shinkansen
- Transition in 1.5-hour radius: 1.91 million people to 3.34 million people
- Transition in 2-hour radius: 2.48 million people to 3.5 million people
- Transition in 2.5-hour radius: 3.38 million people to 3.9 million people

Note: Transition to 2-hour radius in the total population of the 1.5-hour radius and the 2-hour radius. Transition to 2.5-hour radius in the total population of the 1.5-hour radius, the 2-hour radius and the 2.5-hour radius.
Sources: The 2015 Population Census (Table for municipalities as of March 2015)

For travel time, timetables were used to calculate the time required to access Shinkansen stations from administrative offices in each municipality.

The timetable published in March 2013 was used for the period before opening, and the timetable published in March 2015 was used for the period after opening.
Construction of Urban Railways

**Eastern Kanagawa Lines (through lines between Sotetsu Line and JR Line, and Sotetsu Line and Tokyu Line)**

“The Eastern Kanagawa Lines” refer to two lines: the through lines between Sotetsu Line and JR Line, on which trains from Nishiya Station can enter the JR Tokaido Freight Line near Yokohama-Hazawa Station on the JR Tokaido Freight Line; and the through lines between Sotetsu Line and Tokyu Line, on which trains from the area near Yokohama-Hazawa Station on the JR Tokaido Freight Line can travel via Shin-Yokohama Station to enter the Tokyu Lines from Hiyoshi Station on the Tokyu Toyoko and Tokyu Meguro Lines.

The improvement of these lines will directly connect western Yokohama City and central Kanagawa Prefecture to central Tokyo, thereby improving the convenience of transportation between those regions by improving promptness, increasing route options, reducing the number of transfers, easing traffic on existing lines, and improving access to the Shinjinkansen. These improvements will also contribute to the formation of a wide-ranging railway network, the advancement of services and the reinvigoration of communities along the routes. These lines represent the first effort toward improving promptness based on the Act on Enhancement of Convenience of Urban Railways, etc. (see Overview below), which includes provisions on improving railways using the separation of infrastructure and operation method, in which the entity of construction is separated from entities of operation, and the like. The promptness improvement plan for these lines has been approved with JRTT as the entity of construction, and the Sagami Railway Company and Tokyu Corporation as the entities of operation.

**Overview of Eastern Kanagawa Lines (Through Lines; Sotetsu-JR /Sotetsu-Tokyu)**

**Route Overview:** Eastern Kanagawa Lines (Through Line; Sotetsu-JR/Sotetsu-Tokyu)

**Legal measures**

- Create plans jointly
- Make the entity of construction and operation the primary measure
- Legal measures for improving juridical measures

**System Overview:** Projects to Enhance the Convenience of Urban Railways

**Overview of the Act on Enhancement of Convenience of Urban Railways, etc.**

The Act on Enhancement of Convenience of Urban Railways, etc. sets out new methods of improving railways involving the effective use of existing urban railway stock to improve promptness and facilitate the use of station facilities. One method employed in this system is the separation of infrastructure and operation, in which the entity of construction (third-sector and other public entities) is separated from the entity of operation (railway operators and the like).

According to the procedures set out in the Act, when the Minister of Land, Infrastructure, Transport and Tourism approves a plan, the entity responsible for the approved concept creates and submits plans to improve promptness. Once the minister approves the plans, they are regarded as having received permission to implement railway operations under the Railway Business Act.

It is worth noting that the Japanese government, local governments (Kanagawa Prefecture and the city of Yokohama) and JRTT will each cover one-third of the project costs of the through lines between Sotetsu and JR Line, and Sotetsu and Tokyu Line, and that the Sagami Railway Company and Tokyu Corporation will pay rail access charge (commensurate with profit) to JRTT.

**Overview of the Act on Enhancement of Convenience of Urban Railways (tentative name)**

The main measures to improve promptness include:

- Creating plans jointly
- Making the entity of construction and operation the primary measure
- Legal measures for improving juridical measures

**Project Overview**

- **Sections:**
  - Sotetsu-JR: From Nishiya Station on the Sotetsu Line to the area near Yokohama-Hazawa Station on the JR Tokaido Freight Line
  - Sotetsu-Tokyu: From the area near Yokohama-Hazawa Station on the JR Tokaido Freight Line to Hiyoshi Station on the Tokyu Toyoko and Tokyo Meguro Lines

- **The entity of construction:**
  - Sotetsu-JR: Sotetsu Railway Company
  - Sotetsu-Tokyu: Sotetsu Railway Company, Tokyo Corporation

- **Frequency of operations (plan) during the peak of the morning rush hour:**
  - Sotetsu-JR: Around 4 trains
  - Sotetsu-Tokyu: Around 10 to 14 trains

- **Scheduled operation start:**
  - Sotetsu-JR: Second half of FY 2019
  - Sotetsu-Tokyu: Second half of FY 2023

**Project Overview**

- **Through Line; Sotetsu-JR**

  Construction on this section will result in a direct connection between the Sotetsu Line and central Tokyo via the JR Tokaido Freight Line.

- **Through Line; Sotetsu-Tokyu**

  Construction on this line will result in a direct connection between the Sotetsu Line and central Tokyo via the Tokyu Toyoko and Tokyu Meguro Lines.

**Progress of Construction**

- **Through Line; Sotetsu-JR**

  - Construction on Shin-Yokohama Station (tentative name)
  - Completed civil engineering works near Nishiya Station

- **Through Line; Sotetsu-Tokyu**

  - Track-laying in Nishiya Tunnel
  - Construction on Shin-Yokohama Station (tentative name)
Construction of Urban Railways

Construction to Elevate the Echizen Railway (Katsuyama Eiheji Line/Mikuni Awara Line)

The Fukui prefectural government has planned to elevate the Echizen Railway Katsuyama Eiheji Line, Mikuni Awara Line and spur lines to the depot as part of a project to create a consecutive series of grade-separated crossings near Fukui Station. In September 2013, Echizen Railway commissioned JRTT to perform the elevation construction, which involves rerouting the original ground-level line (in yellow) to a temporary line on the existing Hokuriku Shinkansen viaduct (in blue), and then building a viaduct for the new line (in red) over the original line.

The temporary line went into operation in September 2015. Construction on the new line is ongoing, and the new line is scheduled to open in 2018.

Tsuikuba Express Line (opened in August 2005)

The Tsukuba Express Line is a 58-km express train that travels up to 130 km/h to connect Akihabara to Tsukuba Science City in as little as 45 minutes. Since its opening on August 24, 2005, the line has provided a highly convenient, improved transportation system and improved the comfort of commutes into the northeastern part of the capital by easing congestion on the JR Joban Line and others.

The hallmarks of this line are the high quality of convenience and promptness that spur the continual construction of housing and the opening of a large shopping mall along the line, which produced a 120% increase in the number of passengers in the line's first 11 years since opening.

In light of increasing congestion, in March 2013, the Metropolitan Intercity Railway Company commissioned JRTT to perform construction to add a track to the spur line from Moriya Station to a rolling stock depot. The original spur line consisted of a single track, and the second line was added to ensure the fulfillment of rolling stock depot functions. We completed the construction in March 2017, at which time the new line went into service.

Transportation Performance (Average Passengers/Day)

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*Created based on data from the Metropolitan Intercity Railway Company

Overview of construction to add a track to the spur line to the rolling stock depot

Inbound

Outbound

Spur line

Construction of tracks at Fukui Station

Panoramic view of Fukui Station

Japan Railway Construction, Transport and Technology Agency (JRTT)
Sendai Subway Tozai Line (opened in December 2015)

The Sendai Subway Tozai Line is a new, 14.4-km subway line that connects the area near Yagiyama Zoological Park in the southwestern part of the city to the Sendai-Higashi Interchange in the eastern part of the city via Sendai Station in downtown Sendai. The Tozai Line joins the Namboku Line, which is already in operation, to create a transportation network that forms the backbone of the city of Sendai. JRTT was commissioned with civil engineering construction and track installation over a 4.3-km section starting at Yagiyama Zoological Park Station, the origin of the line.

Notable characteristics of the zone entrusted to us include the large-section excavation of the Yagiyama Tunnel using NATM, the construction of the Tatsunokuchi Bridge, a double-decked truss bridge for both rail and automobile traffic with few precursors in Japan; and the steep section between Omachi Nishi-koen and Yagiyama Zoological Park, which features an elevation difference of 110 m and a maximum gradient of 97%. A lean linear motor system is used to propel the rolling stock in an effort to reduce construction costs, account for the steepness of the route and consider factors such as demand for train boarding and exiting.

Narita Sky Access Line (opened in July 2010)

The Narita Sky Access Line is an airport access railway that connects Narita Airport, the main gateway to Japan, to central Tokyo. The 51.4-km line opened on July 17, 2010. Trains operate at a maximum speed of 130 km/h in the 32.3-km section between Keisei-Takasago Station and Inba-Nihon-Idai Station on the Hokuso Line, a stretch on which improvements were made to the existing Keisei Line; and a maximum speed of 160 km/h in the newly constructed 10.7-km section between Inba-Nihon-Idai and Tsuchiya as well as the 8.4-km section between Tsuchiya and Narita Airport Terminal 1 on the Narita Airport Rapid Railway Line.

Compared to the Keisei Main Line, which was the original route, the new line trims 15 minutes from the travel time between central Tokyo and Narita Airport (on the fastest trains between Nippori and Narita Airport Terminal 2 and 3 Stations). The new line has also improved convenience for passengers from northwestern Chiba Prefecture and contributed to the linking and enhancement of functions of the city of Narita and the Chiba New Town development.

Effects of improvements

Before opening

Shortest travel time: 51 min

After opening

Shortest travel time: 36 min

15 minutes shorter

(Source: Created from the Keisei Electric Railway Company website)
Construction of Urban Railways

Odakyu Odawara Line Quadruple Track Construction (between Higashi-Kitazawa and Izumi-Tamagawa) [Private Railway Project]

To increase the transportation capacity of railways in major urban areas (Tokyo, Osaka, Nagoya and their environs), JRTT implements rush hour projects for private railways to construct new tracks, upgrade to quadruple tracks and the like. Presently, we are constructing quadruple tracks on the 10.4-km section between Higashi-Kitazawa and Izumi-Tamagawa on the Odakyu Odawara Line. We are integrating this upgrade to quadruple tracks on the Odawara Line into the city planning project to create consecutive series of grade-separated crossings throughout Tokyo, and have already completed work on the 8.8-km section between Setagaya-Daita and Izumi-Tamagawa on the line. As for the remaining 1.6-km section between Higashi-Kitazawa and Setagaya-Daita, we completed the process of moving the double tracks underground (for use by the express line) in March 2013 to remove all level crossings. We completed construction of the quadruple tracks at the end of FY 2017 and are presently performing construction with the aim to complete the project within FY 2018. The upgrade to quadruple tracks is expected to reduce travel times and enable the departure of more trains, which should ease congestion and produce other positive effects.

Assistance for Restoration after the Great East Japan Earthquake

Sanriku Railway Kita-Rias Line/Minami-Rias Line (fully reopened in April 2014)

The former Japan Railway Construction Public Corporation began construction on the Kuji and Sakari Lines in 1965, but construction was suspended in 1980 under the Japanese National Railways Reconstruction Act. Sanriku Railway was founded as a third-sector corporation (a public-private joint venture) in November 1981, and on April 1, 1984, the corporation opened the first Special Local Lines after the transition to third-sector management. The lines were dubbed the “Kita-Rias Line” and the “Minami-Rias Line.” The enormous tsunami waves generated by the Great East Japan Earthquake on March 11, 2011 caused destructive damage to the Sanriku Railway lines. On November 1, 2011, Sanriku Railway commissioned JRTT to perform restoration work and other tasks, and we provided assistance for the restoration on all fronts. This restoration work mainly consisted of recovering embankments, tracks and communication cables swept away by the tsunami waves, rebuilding stations and bridges, and repairing bridges damaged by the earthquake. Operation on the lines resumed in stages until the lines were fully reopened, starting with the section of the Kita-Rias Line between Tanchata and Fukucho-Noda on April 1, 2012, followed by the section of the Minami-Rias Line between Sakari and Yoshima on April 3, 2013, the section of the Minami-Rias Line between Yoshimas and Kamaishi on April 5, 2014, and the section of the Kita-Rias Line between Komoto and Tanohata on April 6, 2014.

Overview of Sanriku Railway Kita-Rias Line/Minami-Rias Line Restoration Work

1. Route Overview

2. Progress of Restoration
Seikan Tunnel

1. Overview

The 1954 sinking of the Toya Maru, a ferry that ran between Aomori and Hakodate, by a fierce typhoon was the second-worst maritime disaster in history, and spurred the construction of an undersea tunnel. However, the long road to completion ran through unprecedented difficulty.

The series of difficult construction work, particularly for the excavation of the undersea portion, included four separate cases of major infiltration by water that threatened to submerge the tunnel. However, the strenuous efforts of everyone involved in the construction resulted in the commencement of conventional line service in 1988. The new technology developed for this construction made major contributions to the progress of tunneling methods for subsequent undersea tunnels as well as tunnels through mountains and in urban areas.

The Seikan Tunnel is the only land-based connection between the islands of Honshu and Hokkaido, and its importance has only increased since the opening of the Hokkaido Shinkansen between Shin-Aomori and Shin-Hakodate-Hokuto, which was the true objective of constructing the tunnel, 27 years after it first opened.

Seikan Tunnel Cross-Section

2. Renovation Projects

The Seikan Tunnel has facilities required for train operation and disaster risk reduction equipment required as safety measures for the tunnel and train operation. These facilities have deteriorated due to the passage of time, and the results of surveys conducted 10 years after the tunnel opening were used as the basis to begin repair construction to preserve tunnel functions in FY 1999.

To date, we have performed repair work on drainage facilities such as pumps installed throughout the tunnel, and on train fire detection equipment and other fire prevention facilities.
Surveys conducted by JRTT

JRTT provides a wide array of services, from general research in the conceptual stage to detailed research in the implementation stage and more. We also use our abundant experience to conduct government-financed research and other surveys at the request of local governments and operators. Our surveys are:

- Appropriate and based on reliable technical capacity
  We conduct appropriate technical investigations and proposals backed by technical capacity cultivated from a wealth of railway construction.

- Based on appropriate plans
  Our investigations and proposals are based on appropriate plans that take full advantage of our abundant survey experience.

- Unbiased
  As a public institution, we conduct highly objective, reliable surveys.

- Detailed and tailored to site conditions
  Our regional branches cover the entire country to enable us to conduct surveys and provide assistance appropriately and when needed.

General Flow of Project Surveys

- Full understanding of needs
  - Full understanding of railway development needs and national/local government plans

- Basic surveys
  - Traffic condition surveys, organization of conditions, etc.
  - Full understanding of overall transportation demand
  - Organization of the significance, relevance and urgency of routes
  - Investigation of application plans

- Investigation of general route
  - Survey/organization of route investigation conditions, comparison of multiple routes
  - Estimation of overall project cost
  - Estimation of transportation demand, investigation of operation plans

- Determination of general route
  - Investigation of project viability, evaluation of socioeconomic effects, etc.
  - Determination of routes, locations of stations and rolling stock depots, etc.

- Determination regarding project implementation
  - Determination of application plans
  - Determination of project entities, fundraising methods

- Creation of construction plans
  - Implementation of geological surveys and surveying, investigation of design conditions
  - Investigation of line alignment design, structure classifications and configurations
  - Preliminary design of structures, etc., estimation of construction cost, project permit procedures, etc.
  - Negotiation with the parties concerned, environmental impact assessment, finalization of urban planning and other procedures

- Commencement of construction

GRAPE Transportation Plan Assistance System

**GIS for Railways Project Evaluation**

GRAPE is a new system to assist in the development of transportation plans, namely for railways. The system provides visual and efficient assistance for project evaluation and present-state analysis of passenger behavior.

**Basic Surveys/Present-State Analysis**

- Consolidated display/analysis of various data
- Detailed investigations on 100-m grids

**Investigation of Overall Routes, Consideration of Alternative Proposals**

- Compare levels of service between each route
- Create longitudinal profiles of routes under investigation and calculate overall figures

**Project Evaluation**

- Analyze/display convenience from any location
- Isochrone maps

*JRTT provides assistance for each of the items above.*
**Participation in Overseas High-speed Rail Projects**

Recently, awareness of global environmental issues has grown, and the demand for inter- and intra-city transportation has increased along with economic growth in developing countries in Asia and elsewhere. Therefore, expectations of railways have increased as an excellent mass transit system with a small environmental burden. Presently, many railway projects are being planned and investigated throughout the world, and the railway market is projected to expand to roughly 24 trillion yen by 2021.

However, the construction of high-speed rail requires concerted efforts in construction work for civil engineering, buildings, tracks, electricity and machinery from the investigation stage through to completion. Private companies lack the capacity to fully execute all of these functions in addition to coordinating between departments. Therefore, JRTT is expected to play a proactive role in coordinating the construction of projected Shinkansen lines in high-speed railway projects overseas. The Japanese government enacted the Act on the Promotion of the Participation of Japanese Business in Overseas Infrastructure Projects in August 2018. This act enables JRTT to participate in high-speed rail projects all over the world.

We intend to make full use of the know-how and knowledge we have cultivated through the construction of Shinkansen and other railway lines to date in order to build the transportation networks of tomorrow both inside and outside Japan.

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**Overseas Technical Cooperation**

Since 1964, JRTT has contributed to build railways all over the world by dispatching many railway experts based on requests from MLIT and others. To date, we have dispatched more than 2,000 experts to a total of 70 countries and regions. We have also accepted fellows and review missions from overseas, and have explained Japan’s advanced railway technology to over 4,000 fellows and others from 100 countries and regions.

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**Prominent High-Speed Rail Projects**

- **United Kingdom**: HS2 High Speed Two
- **Thailand**: Bangkok-Chiang Mai High-Speed Rail Plan
- **Malaysia/Singapore**: Malaysia-Singapore High-Speed Rail Plan
- **India**: Mumbai-Ahmedabad High-Speed Rail Plan
- **USA**: Washington DC-Baltimore Super-conducting Maglev Plan
- **China**: Guangzhou-Changsha High-Speed Rail Plan
- **Japan**: East Japan Railway Company

High-speed rail projects extracted from “Action Plan 2016 of JRTT for the Overseas Expansion of Infrastructure System” (March 2018)

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**Technology Exchange with Sweden**

As interest in high-speed rail grows in Sweden, the Japanese MLIT and Swedish ministry of industry concluded a memorandum of understanding regarding cooperation in the railway sector. Based on this memorandum, JRTT has engaged in technical exchange regarding high-speed rail with the Swedish Transport Agency since 2013. The technical exchange involves efforts such as participating in working groups regarding high-speed rail and having our employees serve as lecturers at various seminars, and we introduce Japanese railway technology to Sweden while we learn about Swedish railway technology. We have also accepted fellows from Sweden, and have deepened our exchange through efforts such as tours of Shinkansen construction sites.
For slab tracks, which are the basic structure of Shinkansen tracks, it is difficult to employ the use of conventional structures made of earth, such as cut earth or embankments, due to subsidence and other disadvantages. However, we conducted surveys, research and tests to develop an economical new trackbed structure capable of supporting slab tracks. (The technology won the Japan Society of Civil Engineers Technological Development Award)
Railway Construction Technology

**Shinkansen Track Structure**

Slab tracks are employed as the basic structure of Projected Shinkansen Lines.

- The structure of slab tracks supports high-speed Shinkansen operation in that it is easier to maintain than that of ballasted tracks.
- Slab tracks comprise flat slabs and frame-shaped track slabs. The economical frame shaped slabs were used inside tunnels and warm areas.

![Flat track slabs (Tohoku Shinkansen)](image1)

![Frame-shaped track slabs (Kyushu Shinkansen)](image2)

**Local Line Track Structure**

[Track Structure on Urban Railways]

Tracks on urban railways must blend in with surrounding environments. In recent years, we have used tracks with directly fastened elastic sleepers, which have the effect of damping vibration.

The structure of tracks with directly fastened elastic sleepers supports safe urban railway transportation in that it is easier to maintain than that of ballasted tracks.

![Tracks with directly fastened elastic sleepers (Narita Rapid Rail Access Line)](image3)

**The Fastest High-Speed Switches in Japan**

We developed the No. 38 Switch (the “38” refers to the roughly 38 meter length of track required to achieve separation of 1 meter) to enable Shinkansen trains to travel on the switch side at the high speed of 160 km/h, and installed it where the Hokuriku Shinkansen (from Takasaki to Nagano) diverges from the Joetsu Shinkansen.

We have also installed the No. 38 Switch on the Narita Rapid Rail Access Line.

![Expanded view](image4)

**Enabling Safe Transportation in Winter**

We have installed various facilities to prevent damage from snow on railways in regions that experience heavy snowfall during the winter, and these facilities, which include sprinklers that sprinkle water on tracks to melt snow and high-speed snow removal devices that remove lumps of snow that inhibit point switching, have made major contributions to safe transportation in winter.

- Snow removal sprinklers (Hokuriku Shinkansen)
- High-speed snow removal device (Hokuriku Shinkansen)

**User-Friendly Station Facilities**

We have installed platform edge doors, elevators, escalators and other facilities to enable everyone to move safely and smoothly through station buildings.

- Platform edge doors (Hokuriku Shinkansen)
- Escalators (Hokuriku Shinkansen)

**Air Conditioning/Ventilation/Smoke Extraction Facilities in Underground Stations and Tunnels**

These facilities maintain safety and comfort in underground stations and tunnels, and comprise air conditioning, ventilation and smoke extraction facilities on platforms and concourses, and station offices and the like; and ventilation and smoke extraction facilities for tunnels.

**Equipment of Rolling Stock Depots for Maintaining the Safety of Rolling Stock**

Rolling stock depots contain equipment that inspect, repair and wash rolling stock to enable the provision of safe, comfortable train cars for passengers.

- Emergency repair equipment (Hokuriku Shinkansen)

**Machinery for Railway Construction**

We have developed and introduced special machinery specifically for railways, which we use to install rails during track construction and to install overhead wires during electrical construction. This machinery enables us to perform construction work safely and efficiently.

- Rail feeder car
- Overhead wire operation car (left rear) and overhead wire drawing car (right front)
Railway Construction Technology

Symbolic Stations that Harmonize with Surrounding Communities

JRTT uses public comments and otherwise solicits opinions directly from local communities as to what kinds of stations they want, and works together with local communities to create those stations, which capture the identity of the community, reflect the local scenery, natural characteristics and culture, or serve as symbols or landmarks.

Safe, Comfortable and User-Friendly

We use the principles of universal design to construct stations that are safe and secure for people of all ages and abilities.

Eco-Friendly Stations

We proactively undertake measures to combat global warming and other measures to improve the natural environment in our construction of station buildings, rolling stock depot buildings and other railway structures.

Use of domestic wood

Using locally sourced wood is an eco-friendly solution that fixes carbon dioxide and conserves transportation energy. The use of wood for station building interiors creates pleasing atmospheres with a sense of warmth. We received the Kumamoto Local Materials Promotion Association Award for our work on Shin-Tamana Station.

Use of natural energy

We proactively consider ways to use sunlight; solar heat; natural wind, which does not require power, for ventilation; and other natural energy, and incorporate it into the construction of station buildings and the like where appropriate.

Green roofs and railway property greening

We plant trees and undertake other greening efforts on the roofs of buildings and on railway properties to counter the heat island effect and combat global warming.

Use of products made with recycled materials

We use tiles created from stones, bricks, ceramics, roof tiles and other leftover materials from construction sites, and other products that are eco-friendly in that they reduce trash and effectively use resources.

Stations that Strike a Balance between Economic Efficiency and Good Design

We developed our patented Hybrid Structure, which integrates civil engineering structures and architectural structures to reduce work schedules and costs and improve freedom of design. We have employed the Hybrid Structure on many railway lines.

We changed the conventional four-pillar viaduct structure to a two-pillar structure, incorporating the pillars on each side into the roof to open up more options for the layout of concourses, escalators, elevators and other station facilities.
Economical Overhead Wires with Outstanding High-Speed Performance

We put PHC trolley wires into practical use as economical, simple overhead lines for the high-speed operation of the Projected Shinkansen lines. PHC trolley wires are well suited for the Projected Shinkansen lines because they are lightweight and have high tensile strength, are made of a precipitation hardening copper alloy, which is oxygen-free copper with chromium, zirconium and other additives, and have excellent electroconductivity among trolley wires for high-speed operation.

New Train Control System

To improve the comfort of the ride and shorten operation times and intervals on the Tohoku Shinkansen between Hachinohe and Shin-Asaomori Stations, we used the car-initiated ATC that we introduced on the Tohoku Shinkansen between Morioka and Hachinohe Stations to create a fully jointless track circuit—the first of its kind on a Shinkansen line—in an effort to simplify both facilities near the tracks and maintenance. To further spread the application of these effects, we also developed the technology so that it is applicable in the section of the Hokkaido Shinkansen between Shin-Asaomori and Shin-Hakodate-Hokuto Stations where the Shinkansen and local lines run side by side, and we introduced an ATC for a three-rail system compatible with both the Shinkansen and local lines.

Eco-Friendly Roof-Delta Connected Transformers

We put roof-delta connected transformers to practical use as alternating current feeding transformers for superelevation power reception on Shinkansen lines to replace conventional modified Woodbridge-connected transformers, and began using the new transformers. Compared to conventional transformers, the new transformers have a simpler structure and are smaller and more lightweight, which prevents the loss of electricity and is more environmentally friendly.

Awards

JRTT has received many awards from domestic and foreign organizations alike for the technology we have used in railway development projects and railway construction to date.

Awards for Railway Development Projects

(1) Projected Shinkansen Lines
- Construction of the Hokuriku Shinkansen between Nagano and Kanazawa
  2013 Japan Society of Civil Engineers Outstanding Civil Engineering Achievement Award
  Japan Railway Award (Railway Day Executive Committee)

(2) Urban Railways, Assistance for Restoration after the Great East Japan Earthquake
- Construction of the Narita Rapid Rail Access Line
  2010 Japan Society of Civil Engineers Outstanding Civil Engineering Achievement Award

- Restoration of Sanriku Railway lines damaged in the Great East Japan Earthquake
  2014 Technology Award, Japan Railway Civil Engineering Association
  2014 Zenkin Award, Japan Construction Engineers’ Association

Awards for Railway Construction Technology

- High-speed excavation using SENS, a method on the frontier of the Bedrock Tunneling Method and the Shield Method
  2012 Japan Society of Civil Engineers Outstanding Civil Engineering Achievement Award

- Use of verification/evaluation of durability to confirm the health of the Seikan Tunnel
  2013 Japan Society of Civil Engineers Outstanding Civil Engineering Achievement Award

- Haipesawa Bridge, Sanriku Railway
  2014 Japan Society of Civil Engineers Tanaka Award

Awards for Railway Construction Technology

- Construction of the Hokkaido Shinkansen between Shin-Asaomori and Shin-Hakodate-Hokuto
  2016 Japan Society of Civil Engineers Outstanding Civil Engineering Achievement Award
Awards

Architectural
- Shin-Yatsushiro Station, Kyushu Shinkansen: 2011 Station Structure Award, Association of Railway Architects
- Toyama Station, Hokuriku Shinkansen: 2015 Ministry of Transport Railway Bureau Chief Award, Association of Railway Architects

Electrical Equipment
- Development and Practical Application of Jointless DS-ATC for Projected Shinkansen Lines: 2016 Electrical Science and Engineering Promotion Award (EMMA Award)
- Lighting at Shin-Hakodate-Hokuto Station on the Hokkaido Shinkansen: 2016 Hokkaido Most Outstanding Lighting Technology Award, The Illuminating Engineering Institute of Japan

Other

JRTT has won many awards for the railways it has constructed, both recently and since the days of the former Japan Railway Construction Public Corporation.