Mumbai-Ahmedabad High Speed Railway
Core Staff Training
(Key O&M Leaders)

Project Completion Report

July 15, 2022

Japan International Consultants for Transportation Co., Ltd.

JR-East Personnel Service

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Mumbai-Ahmedabad High Speed Railway Core Staff Training (Key O&M Leaders)

1.2 Contract Implementation Period

From October 14, 2021 to July 29, 2022

1.3 Number of Training Participants and List of Participant Names

The participants of this training are Key Operation and Maintenance Leaders (hereinafter referred to as ”KOMLs”), thirteen people in total, who are positioned in the consultation between Japan side and National High-Speed Rail Corporation Limited (hereinafter referred to as “NHSRCL”) as candidates for persons responsible for practical Operation & Maintenance (hereinafter referred to as “O&M”) operations for NHSRCL (a position equivalent to GM), including (1) three people in charge of Train Operation, (2) two people in charge of Rolling Stock, (3) four people in charge of Facilities (Track and Civil Engineering), (4) two people in charge of Electrical, and (5) two people in charge of Signaling & Telecommunications (hereinafter referred to as “S&T”).

(See Appendix 1)

1.4 Training Period

The duration of this training was as shown in Table 1.1.

Table 1.1　Training period

Common Subject (theoretical training)	From Tuesday, April 19 to Friday, May 6, 2022 Classroom in Tokyo or online training
Division-wise Subject *Each course (by division)	From Monday, May 9 to Friday, June 17, 2022 (Some division sessions are also held on Wednesday, May 4 and Thursday, May 5) Classroom lectures and site observations (Tokyo or local cities)

1.5 Project Background

Japan and India jointly conducted a feasibility study (FS) on a high-speed railway construction project between Mumbai and Ahmedabad starting in 2013, and a final report was submitted in July 2015. Based on the results of the FS, a Memorandum of Understanding confirming the introduction of the Japanese Shinkansen system and the provision of financial and technical assistance from Japan was signed between the two governments at the Japan-India Summit Meeting held in December 2015.

Subsequently, at the second Japan-India Joint Committee on High-Speed Railway held in May 2016, the two governments agreed that consultants from the Japan International Cooperation Agency (hereinafter referred to as “JICA”) would undertake tasks such as design, preparation of bidding documents, and bidding support. In

September 2016, a Record of Discussion (hereinafter referred to as “ROD”) on general consultancy (excluding supervision) for the Mumbai–Ahmedabad High-Speed Railway (hereinafter referred to as “MAHSR”) project was concluded between JICA and the Ministry of Railways of India (hereinafter referred to as “MOR”), and in December 2016, a memorandum including the JICA consultant, Japan International Consultants for Transportation (hereinafter referred to as “JIC”) Consortium (hereinafter referred to as “JICC”), was signed by the three parties. With regard to the MAHSR, the construction of facilities (track, station buildings, rolling stock depots, signaling and telecommunications and other facilities) and the procurement of rolling stock and other equipment will be carried out under an ODA loan between the Japanese and Indian governments. And the design, preparation of bidding documents, and bidding support required for their procurement is being carried out as a joint D/D (Environmental Consultancy Services for Mumbai-Ahmedabad High-Speed Railway Project for Detailed Design, hereinafter referred to as "D/D") of the JICA project.

Meanwhile, there is also a vital need to develop the human resources for managing and operating the high-speed railways of NHSRCL in India. As the human resources to be developed range from those at the site operation level through to the managerial and executive level, education at each level is required. Managerial level training was conducted in FY2017 as the country-specific "Project for the Support and Establishment of Systems of High-Speed Railways in India" and in FY2018 as the “ Management Training for the NHSRCL” In addition, JICA, MOR, and NHSRCL reached an agreement as an amendment to ROD regarding D/D in September 2017 to implement the "Core Staff Training" for human resources who will be manager-level personnel through technical support under paid accounts. As part of D/D, JIC prepared the programs and teaching materials for the Core Staff Training as well as the basic plan of on-the-job trainings in Japan, and delivered them to JICA in March 2020.

Among the core staff, the Key O&M Leaders (hereinafter referred to as “KOMLs”) responsible for practical O&M in each department of NHSRCL are tasked with planning and establishing the O&M structure/system that forms the foundation of the high-speed railway project, and therefore the training of the KOMLs is positioned as the top priority of the Core Staff Training.

Through this training, KOMLs are required to fully understand the basic concepts of the Shinkansen O&M practices in Japan, the attitude to work, an outline of the Shinkansen business, the O&M work at the on-site level, the O&M methods for normal work and emergency or other situations. In this way, after completing the training they will be able to develop knowledge and skills for each job hierarchy by preparing operation manuals suited to the actual situation in India, and to determine the actual operation method for the MAHSR. Against this backdrop, this training in Japan was provided for KOMLs responsible for the O&M of the MAHSR.

1.6 Aim of the Project

The aim of this training is to teach the KOMLs, who will be responsible for practical O&M in each department of NHSRCL, professional knowledge and technologies regarding the O&M of the Shinkansen systems in Japan and their roles as leaders in order to build a thorough preparation system for the commencement of the MAHSR and ensure safe and stable high-speed railway operations.

1.7 Project Implementation System

JIC is in charge of the overall management of this project. In addition to allocating the Project Manager and the Vise Project Manager, JIC allocates staff in charge of the operation of Common Subject, the management of teaching materials, and the administrative work. In order to smoothly operate this project, a management system was established for each course and Tutors were assigned to each Division-wise course. JR-East Personnel Service (hereinafter referred to as "JEPS") was in charge of coordination with the sites, administrative procedures, and other tasks. Based on this scheme, training was conducted according to the division of roles shown in Table 1.2.

Table 1.2 Division of roles in the implementation of Key O&M Leaders training

Training course	Consortium		Outsourcing (subcontract)	
	JIC	JEPS	JR East	JR East's group companies and partner companies
Train Operation Rolling Stock Facilities (Track and Civil Engineering) Electrical S&T	**・Overall supervision ・Planning and operation of training ・Arrangement of translation of teaching materials ・Check of the level of understanding**	**・Coordination with lecturers, observation sites, etc. ・Arrangement for transportation, accommodation, etc. ・Response to some lectures and site observations**	**・Implementation of lectures and acceptance of site observations**	**・Implementation of lectures and acceptance of site observations**

Position	Name	Details of task
Project Manager	Kazunori Nakamura	・Supervision of training plans and operation of training
Vise Project Manager /Overall operation of training	Sumiko Kubo	・Coordination of the work of members ・Supervision of operations in the absence of the Project Manager
Operation of Common Subject classes	Yuichi Miyama (until March 2022) Yukiko Kimishima (from April to July of the same year)	・Planning of Common Subject, preparation and revision of teaching materials, assignment of training lecturer s, ・Operation of Common Subject classes ・Preparation of the project completion report, etc.
Management of teaching materials and administration	Yukiko Kimishima (until March 2022) Yutaro Tamaoki (from April to July of the same year)	・Preparation of various training materials, work processes and quality control of translation (supervision of railway English, etc.) ・Establishment of a crisis management system including measures against infectious diseases ・Coordination of administrative procedures ・Transportation, allocation of staff, arrangement of goods, preparation of materials, etc.

Train Operation supervisor (Tutor 1)	Kazuya Yumikura	・Operation of Division-wise Subject classes ・Provision of technical advice on each Division-wise course and guidance to individual training participants
Assistance in the implementation of Train Operation training (Tutor 2)	Naoko Takahashi	・Assistance to the Train Operation supervisor (Tutor 1) ・Response to questions from training participants
Rolling Stock supervisor (Tutor 1)	Haruo Yamada	・Operation of Division-wise Subject classes ・Provision of technical advice on each Division-wise course and guidance to individual training participants
Assistance in the operation of Rolling Stock training (Tutor 2)	Daisuke Tokura	・Assistance to the Rolling Stock supervisor (Tutor 1) ・Response to questions from training participants
Facilities (Civil Engineering) supervisor (Tutor 1)	Osamu Suzuki	・Operation of Division-wise Subject classes ・Provision of technical advice on each Division-wise course and guidance to individual training participants
Assistance in the operation of Facilities (Civil Engineering) training (Tutor 2)	Takanori Hirano	・Assistance to the Facilities (Civil Engineering) supervisor (Tutor 1) ・Response to questions from training participants
Facilities (Track) supervisor (Tutor 1)	Hirotsugu Tabuchi	・Operation of Division-wise Subject classes ・Provision of technical advice on each Division-wise course and guidance to individual training participants
Assistance in the operation of Facilities (Track) training (Tutor 2)	Sodbilig Batjargal	・Assistance to the Facilities (Track) supervisor (Tutor 1) ・Response to questions from training participants
Electrical supervisor (Tutor 1)	Tetsuo Fujita	・Operation of Division-wise Subject classes ・Provision of technical advice on each Division-wise course and guidance to individual training participants
Assistance in the operation of Electrical training (Tutor 2)	Takuya Takematsu	・Assistance to the Electrical supervisor (Tutor 1) ・Response to questions from training participants
S&T supervisor (Tutor 1)	Gen Kogure	・Operation of Division-wise Subject classes ・Provision of technical advice on each Division-wise course and guidance to individual training participants

Assistance in the operation of S&T training (Tutor 2)	Junpei Takeyama	・Assistance to the S&T supervisor (Tutor 1) ・Response to questions from training participants
Training support supervisor	Masaki Yamashita	・Operation, management, and coordination of overall logistics ・Compilation and submission of expense reports
Person in charge of logistics 1 (Lecturer s and observation sites)	Shigehito Mizuta	・Coordination with lecturer s and observation sites, and management of schedules ・Printing and distribution of teaching materials and other materials, and retention, storage, and sharing of e-materials ・Recording and storage of training records ・Provision of meal information and reservation of restaurants ・Preparation of the list of training participants, name tags, and lists of accompanying persons
Person in charge of logistics 2 (Transportation arrangement/online training)	Ryoko Okubo	・Arrangement for transportation and accommodation facilities ・Management of online tools, confirmation and dissemination of operation rules, arrangement for equipment rental ・Payment and management of expenses related to arrangement for transportation, accommodation, and materials and equipment ・Compilation and submission of expense reports

In implementing subjects for each course, JR East and its group companies and partner companies, which have abundant experience and knowledge in the operation of High-Speed Railways, were subcontracted to conduct lectures, accept site observations, and prepare teaching materials for training.

The following companies have concluded subcontracts for the implementation of lectures and acceptance of site observations.

	Division	Company name
1	All divisions	East Japan Railway Company
2	Train Operation	JR East TESSEI Co., Ltd.
3	Rolling Stock	JR East Rail Car Technology & Maintenance Co., Ltd.
4	Rolling Stock	JR East Techno Service Co., Ltd.
5	Facilities	Railway Technical Research Institute
6	Facilities	Japan Railway Track Consultants Co., Ltd.
7	Facilities	Union Construction Co., Ltd.
8	Facilities	Totetsu Kogyo Co., Ltd. (Totetsu Kiko Co., Ltd.)
9	Facilities	Kensetsu Tosou Kougyou
10	Electrical and S&T	JR East Information Systems Company
11	Electrical and S&T	JR East Facility Management Co., Ltd.
12	Electrical and S&T	Nippon Rietec Co., Ltd.

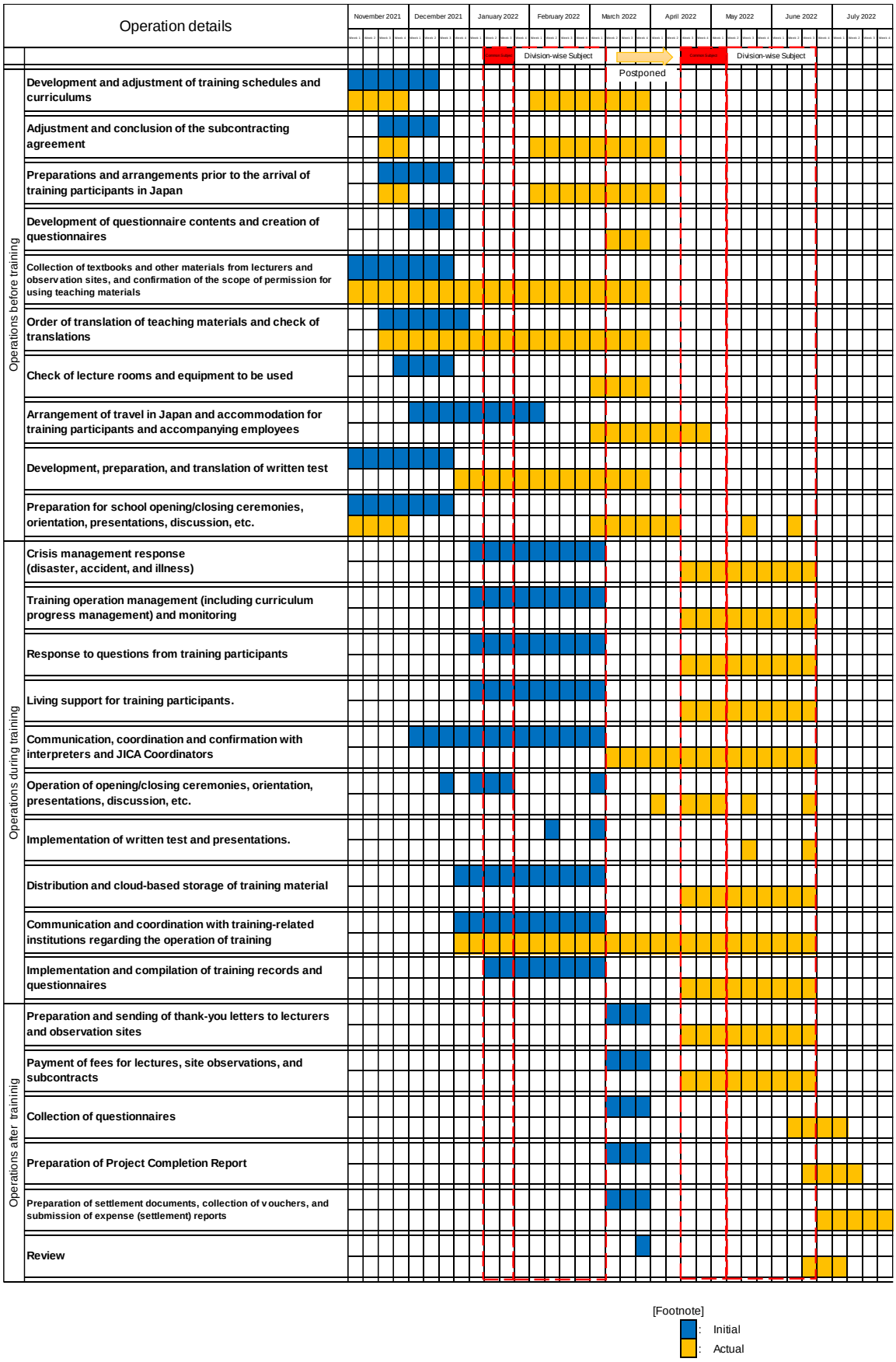
13	Electrical and S&T	Nippon Densetsu Kogyo Co., Ltd.
14	Electrical and S&T	Total Electric Management Service Co., Ltd.

In addition, in order to ensure the implementation of the training programs, (1) curriculums were formulated to ensure practical and effective training; (2) training lecturers were selected; (3) observation sites were selected in line with the objectives of the project; (4) training materials and equipment, and training materials for lectures and exchange of opinions were prepared; and (5) other preliminary procedures (issuance of written requests to lecturers, preparation of handouts, training materials, etc.) were done before implementing the training programs. Subsequently, a system has been established to ensure smooth operations by flexibly dealing with any amendment to training contents or any problems caused by external factors, utilizing past knowledge and experience and a backup system among relevant parties.

1.8 Operation Flow Chart

The operation plan for this project was set up as shown by the blue bars in the table below, but the actual operation was carried out as shown by the orange bars due to changes in the training schedule.

Table 1.3 Operation Implementation Flow Chart



1.9 Background to the Training Schedule Changes

Initially, there was a consultation regarding the contract for this training on the premise of a schedule from January 7 to March 4, 2022 (hereinafter referred to as "the Initial Schedule"), and an entrustment contract was concluded between JICA and a consortium consisting of JIC and JEPS (hereinafter referred to as "the Consortium") on October 14, 2021. Due to the impact of COVID-19, however, it was necessary to drastically revise the training schedule. Details are as follows.

After the conclusion of the entrustment contract on October 14, 2021, the Consortium was working to implement the training according to the Initial Schedule. Due to the prolonged impact of COVID-19, however, it became difficult to hold the training according to the Initial Schedule, and JICA requested to reschedule the training so it would be completed within the fiscal year. The Consortium considered, therefore, the possibility of a schedule from January 25 to March 18, 2022, which is two weeks behind the Initial Schedule, and started arrangements including amending various curriculums due to the postponement.

However, on November 30, 2021, JICA said that the suspension of new entry of foreign nationals due to the COVID-19 Omicron variant made it impossible to start the training from January 25, 2022. Since this decision made it impossible to complete the training by March 31, 2022, which is the last day of the initial contract implementation period, JICA and the Consortium concluded an amendment agreement on January 13, 2022, and agreed on three points: (1) to extend the last day of the contract implementation period from March 31 to July 29, 2022; (2) to confirm the time of submission of an appropriate project completion report and the contract implementation deadline by concluding a negotiation book once the training schedule has been finalized, as it was not possible to finalize a new training schedule at the moment; and (3) to make partial payment for the operations conducted from October 14, 2021 to the last day of February 2022.

Subsequently, on February 24, 2022, JICA said that the government had approved the implementation of this training. After consultation on a new training schedule, a training schedule was determined to be from April 19 to June 17, 2022, and preparations for the start of the training began in earnest.

Chapter 2　Outline of the Training

2.1 Concept of the Training

The goal of this training was to have KOMLs (training participants), who will be responsible for the practical operations of each operational division of NHSRCL,

・Systematically and comprehensively understand the overall picture of O&M of the Shinkansen in Japan; and

・Acquire knowledge, insights, and know-how useful for problem-solving and practical operations based on JR East's experience, with KOMLs' duties in mind, such as planning preparations for the commencement of operations in order to enable them to build an appropriate system for preparing for the commencement of operations of the High-Speed Railway in India and to enable safe and stable operation of the High-Speed Railway business.

In understanding the overall picture of O&M for the Shinkansen system in Japan, it is essential to have not only individual technologies for each division, but also the perspective of a total system ranging across divisions, such as ensuring safety and improving customer service quality. For this training, therefore, the training program was designed based on the following five pillars of the basic policy.

1　Understanding of the safety philosophy; highest-priority value axis
Understand the safety philosophy, which is the highest-priority value axis for the Shinkansen system in Japan, as well as various initiatives to ensure safety taken in the organization as a whole and at the frontline level.

2　Understand the Shinkansen-specific technologies, facilities and rules; basics to understand as a service provider - I
Understand an outline of technologies, facilities, and rules unique to the Shinkansen system including those in other divisions

3　Risk management
- Learning from past accidents/events; basics to understand as a service provider - II
Based on past accidents/events, understand what risks may arise in O&M of the Shinkansen and measures to mitigate risks.

4　Improve transportation quality; evaluation axis from the perspective of the service recipient
Understand initiatives to improve transportation quality from the perspective of customers (passengers), as well as the role and importance of inter-divisional coordination.

5　Understand the work of each Shinkansen division and Site Office; thorough implementation of "on-site-first policy"
By taking examples of the roles of the head office organization and the Site Offices in O&M of the Shinkansen of JR East and the division of roles among each division's departments in charge and the Site Offices, comprehend the way the organization in charge of O&M of the Shinkansen should be. Also understand the importance of "on-site-first" in railway O&M.

2.2 Training Curriculum

In order to achieve the above training goals, based on the curriculum created by the aforementioned D/D, this training consisted of Common Subject in which training participants learned basic knowledge and skills necessary for the operation of Shinkansen in Japan from a broad perspective regardless of divisions, and Division-wise Subjects in which training participants learned division-specific practical operations required when taking various measures toward the commencement of operations.

It had been determined that training participants would be required to be quarantined for a certain period of time after entering Japan due to border-control measures to prevent the spread of COVID-19, but the number of days was uncertain until just before the training. Accordingly, in order to provide the equivalent training online even if the quarantine period was extended, classroom (lecture) sessions in the Common Subject curriculums were set up intensively at the beginning of the training.

These curriculums were coordinated and determined through exchanges of opinions with relevant parties in India and Japan so as to include as many contents as possible that would contribute to the construction of the future O&M system for the Indian High-Speed Railway project.

2.2.1 Curriculum Structure of Common Subject

The curriculums of the Common Subject incorporated basic theories necessary for Shinkansen O&M, initiatives to ensure safety and improve customer service quality in Japanese railways, and basic knowledge on workplace management required for workplace supervisors through lectures by experts in various fields and cross-divisional group discussions. During the COVID-19 quarantine period after arrival in Japan as border-control measures designated by the Japanese government, online lectures were held using Zoom so as to enable the training participants to learn about JR East Shinkansen's organizational outline, safety basics, improvement of customer service quality, workplace management basics, collaboration between divisions, and Shinkansen basics and mechanisms.

2.2.2 Curriculum Structure of Division-wise Subject

In the Division-wise Subject curriculums, training participants were divided into five subject courses: Train Operation, Rolling Stock, Facilities (Track and Civil Engineering), Electrical, and S&T, and learned the O&M of the Shinkansen. Specifically, the program was structured around site observations and explanations centered on practical operations at Site Offices involved in the O&M of JR East's Shinkansen. The KOMLs also learned about the roles and relationships of JR East's head office, branch offices, and Site Offices. The training implementation process table (curriculums) and necessary teaching materials and explanatory materials were also prepared. In addition, training participants held discussions with each other, exchanged opinions with lecturers and Tutors, and checked their level of understanding at regular intervals in order to deepen their understanding and broaden their perspectives.

Details of each course are as follows.

(1) Facilities (Track and Civil Engineering)

The Facilities Division manages tracks such as track floors, sleepers, slabs, rails, and rail fasteners, and civil engineering structures such as bridges, viaducts, tunnels, earth work facilities, and platforms. The training covered topics ranging from the concept of maintenance and management of these facilities to practical

operations such as inspections. In addition, track management by General Inspection Trains (East-i) and inspection and patrol methods during abnormal weather such as heavy rainfall and earthquakes were incorporated into the training.

Through the site observations, KOMLs learned the concept of maintenance management at the Facilities Department and Shinkansen Facilities Department of JR East, the operation of facility controller services at the Shinkansen General Control Center, and practical operations at the Track Maintenance Center, Civil Technology Center (Site Office), and partner companies in charge of maintaining tracks and civil engineering structures.

(2) Signaling and Telecommunications (S&T)

The S&T Division manages signaling-related facilities, which include ATC devices, interlocking devices, track circuits, point machines, automatic train supervision and other equipment. Telecommunication-related equipment includes telephone apparatuses, train radio systems, data transmission systems, and Shinkansen information control monitoring equipment (rain gauge, anemometer). In the training, the KOMLs learned an outline of these facilities, procedures for maintenance inspection and other items. Mainly with the aid of the Electrical and S&T Department, the Signal Communication Unit and System Unit of the Shinkansen Electric & Signal Network System Department, and the Shinkansen General Control Center of JR East, KOMLs gained an overall understanding of practical services concerning the plan adjustment work related to the maintenance of the signaling and telecommunications facilities for Shinkansen and the operation of the services of S&T Controllers and OCC System Controller services. In addition, the KOMLs received training on the practical services of the Shinkansen S&T Technology Center (Site Office), group companies, and partner companies in charge of maintaining signaling and telecommunications facilities.

(3) Electrical

The Electrical Division is broadly divided into power transformation, power distribution, and overhead contact lines. Facilities related to power transformation include AC Traction Substation facilities, power traction facilities, AC sectioning posts, AC sub-sectioning posts and other facilities. Facilities related to power distribution consist of power distribution facilities for stations, rolling stock depots and other facilities. Facilities related to overhead contact lines include supports such as masts, beams and anchors, contact wires, catenary wires, and accessories, and facilities related to feeder lines such as feeder lines, lightning arresters, and switches. KOMLs learned an outline of these facilities, maintenance and inspection procedures, and facility management methods using the General Inspection Train. Furthermore, facility inspections and patrol methods during extreme weather such as strong winds and earthquakes were included in the training.

At the Electrical and S&T Department, the Electrical Unit of the Shinkansen Electric & Signal Network System Department, and the Shinkansen General Control Center of JR East, KOMLs gained a full understanding of practical operations for planning and adjustment work related to the maintenance of the Shinkansen's electrical facilities and the operation of Electric Power Controllers. Moreover, the KOMLs received training on the practical work of the Shinkansen Electric Power Technology Center (Site Office), group companies, and partner companies in charge of maintaining electrical facilities.

(4) Rolling Stock

The Rolling Stock Division is responsible for the overall maintenance and management of High-Speed Railway rolling stock. This training course was based on the Series E5 Shinkansen, which forms the base of the rolling stock that will be introduced in the High-Speed Railway in India: lectures were given regarding the basic structures of rolling stock such as their car bodies and bogies, an outline of various devices including main circuit equipment, brake systems, safety devices, and service devices, and furthermore the circuits related to these devices. Several opportunities to observe actual rolling stock were provided so that basic knowledge of rolling stock and an understanding of their overall picture could be acquired. Lectures on rolling stock management were also held to deepen the training participants' understanding of the concepts necessary for safe operation of rolling stock.

In the first half of the site observations, the KOMLs visited both the Shinkansen Transport & Rolling Stock Department and the Shinkansen General Control Center of JR East to attain an overview of the rolling stock maintenance plan and traffic control. And in the second half, they visited a Site Office equivalent to the Tane Surat Sabarmati Rolling Stock Depot to attain a complete picture of rolling stock maintenance, including management services and group company operations, from daily maintenance such as Daily Inspection and Regular Inspection to train car overhaul such as Bogie Inspection and General Inspection.

(5) Train Operation

The Train Operation Division is responsible for overall railway operations, and operations are carried out with the slogan "all for customers" in mind. KOMLs comprehensively learned about daily operations centered on "stations and rolling stock depots" from a point perspective, "train conductors and train operators" that assumed roles linearly, and "Operation Control Centre" (OCC, including traffic controller, train & crew controller, and passenger & information management controller), which were managed from a plane perspective. And the training participants deepened their understanding of the work they perform on site through site observations based on the Principle of Three Actualities (Actual site, Actual part, and Actual people: go to the site, make a direct observation, and listen to the people involved). They also deepened their knowledge of the management of Site Office operations, development of human resources in charge of Site Office management, and the abnormality-response system of the OCC that supervises all divisions. Additionally, KOMLs learned from a management perspective the concepts and viewpoints of transport planning and crew and rolling stock scheduling that leverage management resources, such as human resources, facilities, systems, and rules. They also learned facility planning that contributes to better railway operations.

Site observations were conducted at JR East Shinkansen stations, train crew offices, rolling stock depots, passenger cabin cleaning depots, and the OCC. Training was also conducted on planning and arrangements undertaken by the Shinkansen Transport & Rolling Stock Department.

The details of the planned five courses of the Common Subject and the Division-wise Subject are as shown in the Appendix 2.

2.3 Training Materials

In this training, necessary training materials (explanatory materials used in individual lectures and site observations, and supporting materials for further deepening the understanding of training participants,

hereinafter referred to as "Training Materials") were prepared and provided to training participants in accordance with the training plan developed by D/D and the "Core Staff Training" textbooks. In some of the lectures by division, the " Implementation Standards for MAHSR" (hereinafter referred to as "IS"), which was also prepared by D/D of JICA, and the "Basic Manuals" (hereinafter referred to as "BM"), which was prepared by the "Preparation of Basic Manuals for Operation and Maintenance of the MAHSR Project" were used as Training Materials.

The Consortium prepared Training Materials for lectures and site observations that it was in charge of, and concluded a subcontract with JR East, which was in charge of many lectures and site observations, on November 24, 2021, and requested the preparation of Training Materials. After compiling them, the Consortium started work on having them translated.

The Consortium provided guidance on railway terminology (English) to translators and provided advice on the translation of highly specialized Training Materials. In addition, the Consortium made efforts to improve the quality of Training Materials by providing Training Material creators with advice on the railway English terminology.

The set of Training Materials for the next week's training was uploaded on Friday of the previous week to the shared drive of Google Workspace dedicated to this training, so that the training participants can pre-study them beforehand. On the day of the training, paper-based materials were also distributed so that the participants can take notes on them during the lecture.

2.4 Level of Understanding Check

This training, which plays a part in the development of staff responsible for O&M operations of High-Speed Railways, covers not only the acquisition of specialized divisional knowledge on Shinkansen, but also the acquisition of various elements, such as a wide range of knowledge including areas other than the training participants' own specialty, advanced communication skills, and the attitude of observing rules and punctuality required of a leader. It was decided, therefore, to check the training participants' level of understanding of the training from various angles. Specifically, the level of understanding of the training participants was checked by combining (1) written tests, (2) various training reports, (3) presentations, and other tasks, as described below.

(1) Written test

In order to check the level of understanding of basic knowledge learned in the theoretical training by division, a written test was conducted immediately after the completion of the theoretical training (May 27). The written test consists of mostly multiple-choice questions using the closed book method so as to measure the level of understanding fairly and objectively. Training participants whose scores did not meet certain criteria in the test on the day were retested to gain a better understanding of their knowledge.

(2) Various training reports

1 Site Observation Report

The details of site observations at Shinkansen-related facilities must be recorded so that the training participants can build the O&M system after returning to their home country. The contents of the report prepared by the training participants were checked by the Tutor, and if there was any discrepancy in recognition, the Tutor pointed it out. Main items to be described are as follows.

・Outline of the office at the observation (lecture) site

・Outline of operations of the observation (lecture) site
・Major operational flows (processes) at the observation (lecture) site
・Points to note in operational management at the observation (lecture) site
・As many other points to be referred to in O&M of MAHSR as possible

2 Weekly Report

This is a report of two to three A4-size pages (800 to 1,200 words in English) written according to important learning topics specified in advance for each week and for each division, and submitted once a week. While the aforementioned Site Observation Report delves deeply into the observation sites from a point perspective, the purpose of this Weekly Report is to deepen the training participants' own understanding of the week-long training from the perspective of a line.

3 Final Report

As the final stage of this training, the purpose of this Final Report is to describe the achievements of the training in a multifaceted manner, discussing lessons learned from the training, a desirable O&M system for the Indian High-Speed Railway and its issues, and stating the medium- to long-term goals and short-term goals of the training participants.

(3) Presentations

1 Interim presentation

To promote inter-divisional cooperation requires an understanding of fundamental technologies and operational outlines of multiple divisions. In this presentation session, the training participants themselves played the role of a lecturer and explained the basic theories and outline of their own division to training participants of other divisions in order to deepen knowledge of their own division and to acquire knowledge of other divisions.

2 Final presentation

This was an opportunity for the training participants to present their achievements in the training, a desirable O&M system for the Indian High-Speed Railway in the future, and their personal goal-setting to guests invited from JICA and the JR East Group.

2.5 Measures for Preventing COVID-19

In this training, the majority of practical training was site observation at the Shinkansen-related facilities of JR East. In order to prevent the spread of COVID-19 at these observation sites responsible for social infrastructure, the following infection countermeasures were taken in this training.

(1) Thorough implementation of infection-prevention measures

- Thorough implementation of preventive measures by individual training participants

  Wear a mask properly at all times (in principle, non-woven fabric), wash or sanitize hands, avoid the "Three C's," "eat in silence", and whatever.

- Thorough implementation of preventive measures in training management

  Thorough implementation of ventilation, social distancing (ensuring a distance of 2 meters or more, at least 1 meter), thorough disinfection of commonly used items, and whatever.

(2) Daily reports on physical condition including temperature measurement results

KOMLs, Tutors and the JICA Coordinators who participate in site observations, as well as attendants from JICA and other organizations, were required to measure their temperature every morning from two weeks prior to visiting the JR facility and to report on their temperature and physical condition in an online report format ("Daily Health Check Form").

(3) PCR test before observation of the Shinkansen General Control Center

Since the Shinkansen General Control Center plays a central function in Shinkansen operations, the entry of external visitors is prohibited in principle even after the quasi-state of emergency was lifted, and especially strict infection-prevention measures are required. As part of it, as per JR East's request to confirm the PCR negative certificate before a site observation in addition to the two items above, all visitors to the Shinkansen General Control Center took a PCR test within 72 hours before the site observation starts at the Operation & Control Centre.

(4) Alternative curriculum while infections are spreading

Even if sufficient infection countermeasures were taken, it was assumed that site observations at critical Shinkansen facilities might not be allowed during periods when infections are spreading, such as when a state of emergency or a quasi-state emergency was imposed. In case of such a situation, an alternative curriculum (backup plans) were planned, such as changing the site observation program to a lecture (face-to-face or online) on the work of these essential facilities.

Chapter 3 Training Details

3.1 Common Subject

3.1.1 Training Overview

Of the five pillars of this training mentioned in Chapter 2, the Common Subject of this training was designed with special emphasis on the following points.

[1] Understanding of the safety philosophy

[2] Understanding Shinkansen-specific technologies, facilities, and rules

*Understanding the outline of technologies, facilities, and in-house rules unique to the Shinkansen ystem as a total system

[3] Risk management—learning from past accidents and incidents

[4] Improvement of transportation quality

(*) [2] Details regarding Shinkansen-specific technologies, facilities, and rules, and [5] Understanding the operations of related departments/site offices of each division are implemented in each Division-wise Subject.

In order to understand the above points, it is effective to learn from the know-how of JR East, which is in charge of O&M on the Tohoku, Joetsu, and Hokuriku Shinkansen lines. During the first 10-day Common Subject period of this training, approximately 60% of the lectures were given by JR East. And in addition to cross-division concepts such as ensuring safety and improving service quality and efforts to achieve these, the training provided sessions about the current state of Shinkansen O&M, including the organizational structure of each department of the Shinkansen General Management Department, which is in charge of O&M on the Shinkansen line, and the Shinkansen General Control Center, inter-division coordination, and specific business outlines.

At the same time, JIC gave lectures on subjects such as basic theories necessary for Shinkansen operation and the basics of labor management, in addition to subjects learned from past accidents and the Tohoku Shinkansen's opening.

With this training, preparations were made to hold online training through the seventh day of training (April 25)—the quarantine period specified in the measures to prevent the spread of COVID-19 designated by the Japanese government—and for the in-person training period to commence starting on the eighth day (April 26). However, as two training participants were infected with COVID-19 at the time of entry and immediately after entry into the country, the online training period was extended to May 4 and in-person training began on May 6 in order to take all possible measures to prevent infection.

After the start of the Division-wise Subject beginning on May 9, a tour of the JR General Education Center for training participants of all divisions was conducted. In addition to confirming the level of comprehension (written test), the Interim Presentation, the Final Presentation, to confirm the level of understanding of subjects each time, we also provided an opportunity to encourage cooperation and mutual exchange between divisions.

3.1.2 Objectives and Aims of the Training Sessions

[Objectives and Aims of the Lectures]

Implementation date	Lecture name	Objectives and aims of the lectures
Tuesday, April 19	Lecture by Director General of JR East SHINKANSEN General Management Department	This lecture aims to improve the organizational strength of the MAHSR Project by developing an understanding of the JR East Shinkansen (network covering five Shinkansen lines, through operation of Shinkansen and conventional lines, etc.) and the role of the Shinkansen General Management Department.
Tuesday, April 19	Role of Key O&M Leaders <JR East Senior Executive Officer>	A lecture by Mr. Kumamoto, Senior Executive Officer at JR East. This is an opportunity for Key O&M Leaders to consider issues that should be kept in mind when establishing the management policies of NHSRCL, a public corporation, by discussing the bankruptcy of JNR and the circumstances that led to the reform of JNR. In addition, Key O&M Leaders are expected to be involved in the management of NHSRCL in the future. Therefore, explanation of the JR East Group Philosophy, Basic Principles, and the medium-term Management Vision Move UP 2027 are given to encourage an understanding of the importance of establishing a management philosophy. Finally, in terms of the roles of Key O&M Leaders, Key O&M Leaders learn that they are required to proactively carry out NHSRCL's O&M preparations based on their awareness of the issues in both the preparation and post-commencement phases.
Wednesday, April 20	JR East's Safety Initiatives <JR East Transport Safety Department>	JR East, reflecting on the JNR era, has formulated and promoted a five-year safety plan since the company's establishment. This lays out its basic stance in efforts to raise employee safety awareness. As a result, JR East has been able to halve the number of train operation accidents since the company was established, and introduce key cases for raising safety awareness as described above at NHSRCL. In order to raise safety awareness, it is necessary to understand the essence of the work involved. Therefore, we introduce seven points to better understand the essence of the work as well as introduce education to enable employees to think and act on their own in the event of unforeseen situations.

		Key O&M Leaders also work to improve safety awareness with the MAHSR project by learning and understanding JR East's safety initiatives.
Wednesday, April 20 Friday, May 6	Shinkansen Safety (Understanding the Truth about Shinkansen) <Executive Vice President, JIC>	A lecture by Executive Vice President of JIC. Based on his extensive work experience with the Shinkansen and other transportation systems at JR East, the lecturer mentions on the basic concept of Shinkansen safety, using cases of transports and disasters. Everyone involved across the different divisions shares the value of working for the customers, and the lecture teach the importance of managing hidden potential risks.
Thursday, April 21	Basic Labor Management, Railway employee's Spirit <Former JIC Advisor and Former CEO of JEPS>	A lecture by the first president of JEPS and former advisor to JIC. Based on his extended experience in human resource development at JR East, the lecturer give a lecture on the aspirations of railway workers embodied in the Railway Spirit and the development of how it is passed down. The labor management session teaches the way of thinking and actions required as railway managers.
Thursday, April 21	Fundamentals of Shinkansen Operations <Former JIC Technical Advisor>	A lecture by former JIC Technical Advisor. Based on his various work experience such as operation management and safety education at JR East and preparations for the commencement of operation of the Tohoku Shinkansen line, this lecture by former JIC Technical Advisor covers the Shinkansen system as a total system from a wide range of perspectives, including legal systems, facilities, transportation plans, operation management, disaster countermeasures, and safety education.
Friday, April 22	Concept and endeavors of quality improvement of transportation and customer service at JR East <JR East Customer Service Quality Reformation Department>	In order to improve customer satisfaction, JR East Customer Service Quality Reformation Department actively and efficiently collects customer feedback online, over the phone, and on social media, as well as in face-to-face surveys by using on-site employees. After explaining the importance of collecting customer feedback, the processes for improvement decision-making, implementing improvements, and disseminating information are explained by the lecturer. Through this lecture, Key O&M Leaders examine what the service quality in MAHSR should be so that they could improve the customer service quality of the MAHSR after the commencement of operations.

Friday, April 22	Overview of JR East General Education Center <General Manager, General Education Center Department, JEPS>	Outline of the JR East General Education Center, which KOML will visit on May 10, and the human resources development system at JR East is explained.
Friday, April 22	Material Procurement for the JR East SHINKANSEN <JR East Finance Department>	The lecturer explains that JR East Group is working to ensure that high-quality materials are supplied fairly, equitably, and quickly at low prices and in a stable manner in the material procurement by JR East. MAHSR project is the first in India, and it is very important to conduct fair and equitable transactions in order to gain public understanding of the project. The aim is to correctly understand material procurement by JR East and to utilize it in procurement at NHSRCL.
Monday, April 25	Lecture by General Manager of JR East SHINKANSEN Electrical & Signal Network System Department	The aim is to understand the initiatives and operations of JR East's Shinkansen Electrical and S&T Division. The mission of the Shinkansen Electrical and S&T Division is to realize safe and stable transportation, and here the lecturer introduces the efforts in place so that small signs are never missed. In addition, the lecturer introduces how the operations of the Shinkansen Electrical and S&T Division are divided into roles with partner companies in regards to maintenance so that operations are more efficient, as well as the direction of human resource development in order to realize future plans. With the MAHSR project, it is very useful for NHSRCL to have a better understanding of the structure of technology and maintenance centers in the power division.
Monday, April 25	Lecture by General Manager of JR East SHINKANSEN Facilities Department	The aim is to understand the initiatives and operations of JR East's Shinkansen facilities. KOMLs can understand Shinkansen the following two points: [1] high-speed Shinkansen operations are based on highly reliable structures and materials and careful management, which are achieved through human resources, systems, and physical objects; and [2] human resource development based on the ability of employees in the field to work with pride, motivation, and rigor.
Monday, April 25	Lecture by General Manager of JR East SHINKANSEN Transport & Rolling Stock Department	The aim is to understand the initiatives and operations of JR East's Shinkansen Transport & Rolling Stock Department. JR East has worked to increase the speed of its Shinkansen lines, increase the number of operating trains, and diversify its network. The Shinkansen General Management Department was

		established for the purpose of responding to and managing unknown risks, continuously developing Shinkansen human resources, maintaining and improving Shinkansen technologies, and making prompt decisions. The aim is to contribute to the safe and stable transportation at NHSRCL by providing a wide range of services such as crew training, train crew guidance systems, and roles at the Shinkansen Transport & Rolling Stock Department.
Wednesday, April 27	Service quality improvement in JR East SHINKANSEN operations <Planning and Strategy Office, JR East Shinkansen General Management Department>	The aim is to introduce Shinkansen efforts concerning five items (Preventing transport disruptions, preventing negative impacts on customers, serving and responding to customer needs, creating a comfortable environment for customers, and providing information in the event of an emergency) to improve the customer service quality of the JR East Shinkansen. By doing so, NHSRCL will be able to understand these items at the time of commencement of operations and provide customers with peace of mind and satisfaction.
Wednesday, April 27	Safety Initiatives in JR East SHINKANSEN Operations <JR East Shinkansen Planning & Strategy Office>	This lecture introduces the safety on the Shinkansen by showing the difference between the characteristics of conventional lines and Shinkansen lines. It is difficult for Shinkansen drivers to confirm abnormalities visually during high-speed operations, which poses a safety risk. However, it is shown how systems independent of humans as much possible are being built by introducing various devices (ATC, CTC, train radio system, etc.). The aim is to improve safety awareness and knowledge at NHSRCL, which will operate India's first Shinkansen.
Wednesday, April 27	Overview of JR East SHINKANSEN General Control Center <General Manager of JR East SHINKANSEN General Control Center>	The aim is to contribute to the construction and introduction of the MAHSR OCC by introducing the roles, systems, and purpose of the OCC, which controls the JR East Shinkansen. Key O&M Leaders also get an overview of COSMOS, which integrates seven subsystems involved in the operations of the Shinkansen.
Thursday, April 28	Examples of Operations at the Commencement of Operations of the Tohoku SHINKANSEN line <Former JIC Technical Advisor>	A lecture by former JIC Technical Advisor. Building on the former JIC Technical Advisor’s experience in the actual commencement of operations of the Tohoku Shinkansen line, the lecture provides an opportunity to learn valuable examples and experiences from the planning stage, construction, maintenance of in-house rules to traffic control and completion inspection, using detailed explanations that follow the work flow.

Thursday, April 28	Importance of Inter-departmental Cooperation at JR East [1] <JR East SHINKANSEN General Control Center>	The top priority at JR East is safety. The aim is to learn how the inter-departmental cooperation works to ensure that customers can use them with peace of mind beyond safety. This lecture introduces how normally, series that coordinate during normal train operation times and maintenance work times are different, and how in abnormal situations, division that coordinate depending on the scale of the transport disruption differ. In addition, this is an opportunity to understand the importance of inter-departmental cooperation in the MAHSR project by introducing recent examples of response to abnormal situations and good examples of inter-departmental cooperation.
Thursday, April 28	Importance of Inter-departmental Cooperation at JR East [2] <JR East SHINKANSEN Facilities Department>	This lecture focuses on JR East's inter-departmental cooperation in the event of a major disaster and how to handle it. Key O&M Leaders understand the need to share information on the overall state of damage, recovery details, methods, and time of each division, coordinate sufficiently between divisions, and aim for recovery at an early stage without any rework in the event of a major disaster following the commencement of operation of MAHSR.
Monday, May 2	Importance of Inter-departmental Cooperation at JR East [3] <JR East International Affairs Headquarters>	Through group work, training participants discuss how inter-departmental cooperation should work and issues to enable the smooth operation of the railway project as a whole, and how Key O&M Leaders should act to facilitate the smooth operation of MAHSR. The purpose is to gain awareness and better understand the importance of inter-departmental cooperation.
Monday, May 2	Special Lecture from experts <Professor Emeritus Shigeru Morichi, National Graduate Institute for Policy Studies>	In addition to covering characteristics of the Shinkansen compared with other high-speed railways around the world, this lecture also suggests the role and expectations of engineers who leads preparations for the opening of India’s first high speed railway.
Monday, May 2	JR East’s concrete actions for untiringly pursuing safety <JR East Transport Safety Department>	This lecture introduces JR East’s various initiatives related to safety management from the viewpoints of human resource development (pointing and calling by train crew and overview of education center facilities), facility improvement (introduction of ATS, ATC, railroad crossing obstacle detection system, emergency stop system, and platform screen doors), and natural disaster countermeasures (measures against strong winds and gusts and reinforcement of facilities). It also provide Key O&M Leaders with an understanding of JR East's approach to safety. In

		addition to introducing JR East's General Principles of Safety and Five Cultures for Safety, the lecture also presents the amount of capital investment to allow training participants to understand the importance of a sincere approach to safety by all employees.
Friday, May 6	JR East Techno Heart TESSEI from a Management Perspective <JIC> [In-person training]	TESSEI, a group company of JR East in charge of cleaning Shinkansen trains, is known overseas as a for their seven-minute miracle. This introduces how the miracle team was born from the perspective of superior management.
Friday, May 6	Action Plan Presentations <JIC> [In-person training]	Each training participant formulates and presents his Action Plans for the Division-wise training.
Tuesday, May 10	Site observation of JR East General Education Center (JEPS) [In-person training]	Training participants develop an understanding of ideal human resource development and safety education at JR East. In addition, the introduction of Shinkansen specific technologies are taught using the technology education training facilities at the education center.
Friday, May 27	Written Comprehension Test <JIC> [In-person training]	This test confirms that basic knowledge learned through division-specific theoretical training has been acquired without bias
Friday, May 27	Interim presentation <JIC> [In-person training]	- Deepen the understanding of the training participants of the O&M theory of the division to which they belong by providing other training participants with an overview of the O&M of their division. - Understand and deepen understanding of the outline of other divisions' O&M. - Promote inter-divisional coordination by deepening mutual understanding between training participants and other divisions.
Friday, June 17	Final presentation <JIC> [In-person training]	- To summarize this training, the training achievements of each KOML are presented to all persons involved in this training. - Goals are set for future OJT programs and the commencement of operation of the MAHSR based on the lessons learned in this training.

*All subjects except those noted as [In-person training] are conducted online.

3.1.3 Findings

(1) Curriculum structure and training content

Most of the Common Subject sessions were lectures by related departments in charge of the JR East Shinkansen, JR East, well versed in the operation and maintenance of the Shinkansen, contributed a cross-division and practical curriculum structure for safety, service, and other topics so that training participants would be able to use it in their actual work after returning to India. Hence the overall training was well-received by training participants.

At the same time, in the lectures given by JR East, training participants asked many questions about the organizational structure of JR East, including each department, branch office, and operating organization, as well as the group companies and partner companies. When conducting the next training session with similar content, we would like to set up a company outline session at the beginning covering the company's organizational structure and relationships with group companies, in order to promote early understanding.

There were several lecturers who added materials immediately before the training session in order to inform the training participants of the latest updates regarding the damage to Shinkansen facilities caused by the earthquake that occurred in Miyagi and Fukushima Prefectures in March 2022. As a result, some of the content overlapped, but other than that, prior adjustments were made so that the content of each lecture did not overlap.

It is regrettable that, from the viewpoint of measures to prevent the spread of COVID-19, during the first two weeks, we had to concentrate on online lecture training, and while we emphasized the importance of the Three Principles of Actualities (to confirm the actual site, actual objects, and actual persons) in railway operations in the Common Subject lectures, we had to make all subjects covered by this curriculum virtual in nature. In the future, when conducting other training course for MAHSR Project (e.g. Core Staff Staff Training) after the COVID-19 pandemic has ended, we would like to design a curriculum for Common Subject with a well-balanced structure that includes on-site observations for subjects that should be shared across divisions.

(2) Training Materials

As there were no Core Staff Core Staff teaching materials for the Common Subject, the materials used were explanatory materials (PPT) newly prepared by JR East and JIC for this training.

For these explanatory PPT materials, a set of materials for the next week's training were uploaded to a shared Drive in Google Workspace for training participants, and paper-based materials were sent in advance. Many training participants joined the online training while taking notes on the paper materials. In the case of online training in Japan, where not all the training participants can use another electronic device, it was indeed the right decision to deliver paper-based materials as well.

At the same time, in order to convey as much information as possible in a limited amount of time, many materials were used. However, whether these materials were actually necessary for the training should have been ascertained beforehand.

(3) Training Methods

Online training in the form of classroom lectures accounted for the majority of the Common Subject. More than 1/3 of the training time was devoted to Q&A, and the lectures could be conducted interactively by having training participants turn on video at all times and having the lecturers teach on a large screen while watching the reactions of all training participants. In order to find time for Q&A, English was used as the language of the lecture as much as possible. However, there was not enough time to cover all of the many questions from the training participants, and in many lectures, the number of questions had to be limited to one per person. Most of the questions asked by these training participants can be resolved at a later date during the two-month training curriculum, and we have come

to recognize once again the necessity of conducting Q&A management based on a bird's-eye view of the overall curriculum in the introductory lecture at the beginning of the long-term training.

In addition, English for the lecture language is desirable from the viewpoint of shortening the time, as time required for interpretation can be eliminated. However, in English, it is difficult to flexibly respond to training participants' interests and reactions by changing the contents of explanations and how the explanations are given. There are both advantages and disadvantages. It seems to be necessary to set a language for a lecture after comprehensively taking into account the content, time, language ability, and other factors.

(4) Training participants' reactions and participations

The training participants demonstrated a positive attitude toward the training and were eager to learn. In addition, the training participants had a certain level of experience in the railway industry. In addition, they thoroughly read the Core Staff training materials and IS and BM that were distributed in advance. They acquired a certain amount of knowledge about Japan and Japanese railways in advance through "Workshops" and "Technical Advisory Meetings" that JR East has held together with JICA experts since FY 2020 as well as informal meetings that were held in FY 2021 with the aim of building human relations prior to the start of the training. As a result, they were fully prepared in advance and were able to start the training smoothly. Since the training participants were also actively studying Japanese, there were some cases where they greeted and asked questions to the lecturers in Japanese.

Figure 3.1 Photo of a Common Subject (Online)

3.2 Division-wise Subject [Facility]

3.2.1 Training Overview

With respect to the Facility Division, NHSRCL provided a request at the meeting held between NHSRCL and JICC in April 2019 to the effect that a combined course be prepared as KOMLs require knowledge concerning both the track and civil engineering fields. Therefore, both track and civil engineering fields were included within the contents of the training. Moreover, the civil engineering department in India manages station buildings and other buildings that, in the case of JR East, would fall under the jurisdiction of the architecture division. However, these buildings and other such elements do not require knowledge of HSRs (High Speed Railways), so there was only a lecture given involving a general overview with no observation of Site Office or other such activities being conducted.

(1) To facilitate an ascertainment of the entirety of maintenance and management of JR East's tracks and civil engineering structures, the Facility Division curriculum was prepared in a manner entailing the conducting of observation of organizations at all levels related to the maintenance and management of tracks and civil engineering structures, including those of JR East's partner companies. Inspections and construction work were limited to the main items due to the nature of the training schedule.

(2) The Facility Division curriculum followed the curriculum submitted to and subsequently approved by the NHSRCL in September 2019. However, partial amendments were made to the places to be observed due to the nature of the schedules concerning inspections and construction work.

(3) At the meeting with NHSRCL in September 2019, there was a request provided by NHSRCL to the effect that there be an increase in the number of night work observation provided on Fridays so that as many lectures and observation as possible could be conducted. Therefore, two night work observation and one Operation Control Centre visit were conducted from Friday to Saturday.

(4) In view of the situation concerning the pandemic, the observation of JR East's Controller room (where thorough infection prevention is required) was amended and changed from June 3 and June 4 to May 12 and May 13 (immediately after Golden Week). Accordingly, it was decided that lectures would be held concerning Collaborative lecture among Facilities, Electrical and Signal & Telecommunicationss May 4 and May 5 during Golden Week. However, the termination of speed restrictions occurring in association with the completion of the restoration work undertaken in the wake of the earthquake off the coast of Fukushima Prefecture (March 2022) was set to take place on May 13. Since it was assumed that things would become very busy in terms of operations being undertaken in the Controller room, it was decided on April 27 that there would be a return to the originally scheduled date of June 3-4. Yet, the Collaborative lecture among Facilities, Electrical and Signals & Telecommunication were held on May 4 and May 5 without returning to the original schedule.

(5) In order to have the provided content serve as a reference for training participants when it comes to construct an O&M system for MAHSR in the future, some time was allotted to explain the approaches which led to the stipulation of the respective provisions of the Implementation Standard prepared for MAHSR (which was submitted in 2019). The training contents provided were made to be easily revised in the future in accordance with the culture of India and other such elements.

(6) Since the Basic Manual prepared for MAHSR (submitted in 2020) was submitted without discussions having taken place together with NHSRCL, it is expected that KOMLs will be revising it in accordance

with Indian culture and other such elements. As such, explanations were provided during the JIC lecture on some of the differences between JR East's rules and those contained in the Basic Manual to provide some insight that would be useful as a reference to use in the future.

(7) Lectures were set up concerning environmental elements such as noise. Various noise standards (not just Shinkansen noise standards) were introduced in relation to other means of transportation, such as aircraft and motor vehicles, as well as the noise standards used for overseas railways. These lectures were structured in a way which would have the content serve as a reference for the future consideration of noise standards for the HSR (High Speed Railway) in India.

(8) With respect to the lectures concerning tracks, the curriculum was set up so that participants would first gain an understanding concerning a general outline by being provided with explanations on the theories and concepts involved at JR East's SHINKANSEN Facilities Department, the Facilities Department, and JIC lectures. Then, participants would deepen their understanding by actually observing the facilities, equipment, systems, and work involved at JR East's Site Office and at partner companies.

3.2.2 Objectives and Aims of the Training Sessions

[Objectives and Aims of the Lectures]

Implementation date	Lecture name	Objectives and aims of the lectures
Wednesday, May 4	Collaborative lecture among Facilities, Electrical and Signal & Telecommunications (Outline of In-house Rules and maintenance work procedures) <Tutor-based lecture>	Before going on observations at JR East, participants will gain an understanding regarding an outline of JR East's In-house Rules, guidelines, manuals, and so on. This lecture will also serve as an opportunity to consider the necessity of revisions for the Basic Manual for MAHSR in line with the situation in India.
Thursday, May 5	Collaborative lecture among Facilities, Electrical and Signal & Telecommunications (Work safety, competency certification, response to abnormality, and OCC) <Tutor-based lecture>	Before going on observation at JR East, participants will gain an understanding regarding an outline of JR East's In-house Rules, guidelines, manuals, and so on. This lecture will also serve as an opportunity to consider the necessity of revisions for the Basic Manual for MAHSR in line with the situation in India.
Monday, May 9	Collaborative lecture among Facilities, Electrical and Signal & Telecommunications	The operations of the Facility Division requires knowledge of electrical facilities and signaling & telecommunications facilities, which are all alike in that they constitute ground equipment.

	(Outline of civil engineering, outline of machinery, outline of architecture, outline of track maintenance, outline of electrical, and outline of Signaling & Telecommunications) <Tutor(s)/JR East Facilities Department>	Therefore, participants will gain an understanding of the outlines of each form of ground equipment.
Tuesday, May 10	Observation of the JR East General Education Center (Track /civil facility training facilities)	Training participants will observe facilities at the education center, where they will be able to get hands-on experience with actual inspections of items such as tracks and tunnels. These observation will provide participants with insight to use as a reference for HSR (High Speed Railway) training drills in India. In addition, in order to create an image of facilities by having participants take a look at Shinkansen tracks and viaducts during the day, participants will observe a full-scale mock-up of a Shinkansen viaduct used for the development of construction method to be deployed during large-scale modification work.
Wednesday, May 11	Explanation of the Implementation Standard, etc. (Tracks, civil engineering) <Tutor-based lecture>	An outline of the Implementation Standard, detailed provisions, standard specifications, and other such elements will be confirmed prior to the training to take place at JR East. This lecture will also serve as an opportunity for participants to consider (during the conducting of training) the necessity of revising their manuals in line with the situation in India.
Monday, May 16	Overview of the SHINKANSEN Facilities Department <JR East SHINKANSEN Facilities Department>	Explanations will be provided concerning the organization, human resources development, technical management, maintenance flows, approach to safety management, budgets, repair plans, work contracts, management of materials, initiatives concerning on-site technical support, and other elements involved at Shinkansen track maintenance divisions at JR East. Through these explanations, participants will gain an understanding of the important points and concepts involved in operating HSRs (High Speed Railways).
Monday, May 16	Outline of environment measures taken by the SHINKANSEN Facilities Department	Participants will gain an understanding of the current state and background concerning noise, vibration, and micro pressure wave countermeasures at JR East.

	<SHINKANSEN Facilities Department>	
Tuesday, May 17	Lecture at the Track Maintenance Technology Management Center at the Facilities Department (rail weld management)	Participants will gain an understanding of the outline and features of each weld technique at JR East. In particular, participants will deepen their understanding of enclosed arc welding, which is widely used in the Shinkansen. Participants will also deepen their understanding of the importance of confirmations carried out for finishing quality to ensure weld quality.
Tuesday, May 17	Facilities Department lecture concerning the civil engineering divisions (Outlines of organizations, concept of maintenance, work contracts and construction management, and free discussion) <Facilities Department>	Participants will gain an understanding of the organization of the civil engineering divisions at JR East (head office, branch offices, Civil Technology Centre, etc.), as well as concerning the concepts involved in the maintenance of civil engineering structures (such as maintenance cycles and periodic inspections following cycles involving inspection, diagnosis, countermeasures, and more inspection) and methods involved in work contracts at JR East. They will also gain an understanding of the culture behind JR East's work practices. In addition, free discussion time was also allotted to resolve questions raised during the lecture.
Wednesday, May 18	Observation of the Omiya Civil Technology Center (Outline of the Civil Technology Centre, maintenance cycles, facilities and equipment the Civil Technology Center, and free discussions)	Participants will gain an understanding of elements such as what kind of organization the Civil Technology Centre (which conducts practical work such as the inspection of civil engineering structures) is, what kind of people work there, what kind of facilities are found there, and what kind of equipment is used. The insight gained will serve as reference for future consideration of O&M frameworks. Also, in line with the concept of maintenance as explained by the lecturer from the head office on the previous day, participants will gain an understanding on how inspections and other such operations are carried out at Site Office. Since the operational content involved is almost the same as that found at the head office, a free discussion was set up to speak with employees of the branch offices for which observation were not scheduled.
Thursday, May 19	Facilities Department Lecture (Safety Management)	Participants will gain an understanding of JR East's safety management initiatives undertaken with partner companies. Then, they will gain an understanding on how safety levels can be maintained and improved through outsourcing.
Thursday, May 19	Facilities Department lecture concerning civil engineering divisions	Participants will gain an understanding of safety efforts made by JR East together with construction companies, as well as about disaster prevention (such as train operation restrictions and the

	(approach to safety management, free discussions, and disaster prevention)	enhancement of disaster prevention) They will also gain an understanding of the culture behind JR East's work practices. In addition, free discussion time was also allotted to resolve questions raised during the lecture.
Thursday, May 19	Facilities Department Lecture (Response to the consultation on the work neighbouring to tracks serving for train operation)	Participants will gain an understanding of the measures to be taken when external personnel carry out construction work in the vicinity of tracks serving for train operation at JR East, and the extent to which that affects the line. The insight gained will be used as a reference for O&M in the future.
Thursday, May 20	Visit to the Omiya Shinkansen Track Technology Center (Outline of operations, maintenance flows, procedures for entry within fences, and hands-on experience of train wind pressure)	Participants will gain an understanding about the organization, personnel, and operations of outline of each group at the Shinkansen Track Technology Center. Participants will deepen their understanding of what they have learned in classroom studies by actually checking the facilities, systems, equipment, and so on, and by going to the areas within fences. They will experience and gain an understanding of the necessity of strictly responding to train wind pressures by going into a maintenance passage during train operation time and experiencing the train wind pressure of the Shinkansen.
From Thursday, May 20 to Friday, May 21	Night work observation at the Omiya Shinkansen Track Technology Center	Participants will observe work involving the partial replacement of a turnout used for the Shinkansen and gain an understanding the implementation system deployed for night work, work methods, and the technical levels of personnel. During this night work observation, participants will be able to take a look at the safety systems, the work involved in the partial replacement of turnouts, weld work, work involved in the transportation of materials by maintenance cars, finishing quality confirmations, and so on, which will allow them to deepen their understanding of many of the important elements involved in work related to the Shinkansen.
Monday, May 23	Maintenance car lecture (maintenance car manual) <Tutor-based lecture>	Prior to the training taking place at JR East, the contents of the maintenance car manuals prepared for MAHSR will be reconfirmed to provide an opportunity during training to consider the necessity of revisions for manuals according to the situation in India.
Monday, May 23	Rail inspections and rail defect detection lecture <Tutor-based lecture>	Participants will gain an understanding of the strict management involved in JR East's rail inspections and action (repairs) undertaken after the finding of rail defects, which will be facilitated by explanations provided on inspection methods,

		action/repair deadlines, and the specific work flows involved in action/repair methods.
Tuesday, May 24	Railway Technical Research Institute Lecture (Earthquake Early Warning System) <Railway Technical Research Institute/Tutor-based lecture>	MAHSR will also have an Earthquake Early Warning System, so participants will be gaining an understanding of the algorithms and system maintenance involved in the early detection of earthquakes.
Tuesday, May 24	Observation of the Earthquake Early Warning System (seismological observation huts and spare parts) <Omiya Civil Technology Centre>	Participants will gain an understanding of where seismometers in the Earthquake Early Warning System are located and what kind of pieces of equipment are managed as spare parts by Site Office.
From Tuesday, May 24 to Wednesday, May 25	Night work observation at the Omiya Civil Technology Centre (Tunnel repair work)	Participants will gain an understanding on what kind of repair work is being conducted for the JR East Shinkansen and what kind of safety measures are being undertaken during the construction work being performed.
Thursday, May 26	Observation of the Omiya Shinkansen Track Technology Center (Approach to safety management , education and training, office facilities and equipment, and facility management system)	Explanations will be provided on initiatives concerning safety and education at the Shinkansen Track Technology Center so that participants gain an understanding of the items and methods that employees on site are making efforts in order to improve their awareness of safety and their technical skills. In addition, the facility management system will actually be used when providing explanations on functions such as inspection data registration, analyses, acceptance inspections after work implementation, and facility updates, so that participants gain an understanding of the strict and efficient processes involved in work which deploys the usage of that system.
Monday, May 30	Summary of training <Tutor-based lecture>	Follow-ups for questions provided by training participants in the first half of the training will be conducted to deepen their understanding of the training content.
Monday, May 30	Structural Engineering Center Lecture (Outline of the Structural Engineering Center, examples of past technical support, and free discussions)	Participants will gain an understanding of the role of the Structural Engineering Center when it comes to the maintenance of civil engineering structures at JR East, as well as an understanding of the contributions of the Structural Engineering Center to the maintenance of structures at JR East.

Tuesday, May 31	Observation of the Omiya Shinkansen Track Technology Center (Work plan flows, work adjustment flows, maintenance work management terminals, plans for patrol in the case of disaster)	Participants will gain an understanding of the formulation of annual work plans and work adjustment methods at the Omiya Shinkansen Track Technology Center. In addition, explanations on the work registration method deployed using the Maintenance Work Management System will be provided using terminals to deepen the understanding of participants in relation to work conducted using the system. They will also gain an understanding the importance of preparing for abnormalities and formulating plans for patrol in the case of disaster in advance.
Wednesday, June 1	Observation of the Omiya Shinkansen Track Technology Center (Observation of the Maintenance Depot and training facilities)	Participants will observe various facilities at the Maintenance Depot to deepen their understanding concerning the outline of the facilities. In addition, participants will visit the Track Training Facility and get hands-on experience with measurements using measurement equipment, which will serve to deepen their understanding of the operations being carried out.
From Wednesday, June 1 to Thursday, June 2	Night work observation at the Omiya Shinkansen Track Technology Center	By actually experiencing track patrols, participants will deepen their understanding of the points of interest when it comes to conducting patrols while taking a look at actual facilities.
Friday, June 3	Observation of the SHINKANSEN General Control Center (Facility Controller operations, Facility Controller systems, Facility Controller observation)	Participants will observe the Facility Controller of the SHINKANSEN General Control Center and gain an understanding of the content of operations and positioning of Controller in terms of the work flows deployed there. They will also gain an understanding of the fact that while many of the tasks handled by Controller are performed using a system, some tasks depend on human judgment. Participants will thus gain an understanding of the importance of human error prevention.
From Friday, June 3 to Saturday, June 4	Observation of the SHINKANSEN General Control Center (Work control at night)	Facility Controllers conduct work control for facility work during Maintenance Work Time. During the observation, participants will learn about the implementation system and details of the Controller operations taking place at night. They will also learn about simulations deployed for the handling of maintenance car failures and gain an understanding of the importance of risk management.
Monday, June 6	Observation of the Takasaki Civil Technology Centre (Special general inspection of bridges [Daytime])	Participants will gain an understanding on how JR East conducts special general inspections for bridges. They will also gain an understanding of safety measures deployed for inspections.

From Monday, June 6 to Tuesday, June 7	Observation of the Takasaki Civil Technology Centre (Special general inspection of bridge [Night work])	Participants will gain an understanding on how JR East conducts special general inspections for bridges. They will also gain an understanding of safety measures deployed for inspections.
Wednesday, June 8	East-i on-board travelling (Measurement outlines, on-board travelling, measurement equipment observation) <Japan Railway Track Consultants Co., Ltd.>	East-i is JR East's General Electric and Track Inspection Train for the Shinkansen. It consists of six train cars. Track measurements are carried out in car number 3. Participants will gain an understanding of the outline of East-i inspections, operation methods, measurement systems, and inspection data processing flows. In addition, measurement work will be actually confirmed via on-board travelling so that participants gain an understanding of what kind of frameworks are in place for the operation of an HSR (High Speed Railway).
Thursday, June 9	Observation of disaster-affected areas (Great East Japan Earthquake and Earthquake off the coast of Fukushima Prefecture <Sendai Branch Office>	By observing the areas damaged in the past, participants will gain an understanding of the fact that unexpected disasters can occur, gain an understanding of the strength of nature, and gain an understanding of the efforts undertaken by JR East and partner companies to restore damaged areas.
Friday, June 10	Observation of places where rainfall disaster prevention measures are in place (Within administrative control of the Koriyama Civil Technology Centre) <Sendai Branch Office, Koriyama Civil Technology Centre>	Participants will gain an understanding of the fact that thorough measures are being taken to prevent Shinkansen accidents from arising due to sediment inflows and other factors amid a situation where we are seeing heavy rain increasing more than ever due to global warming.
From Friday, June 10 to Saturday, June 11	Observation of the Koriyama Civil Technology Centre (Special general inspection of tunnels) <Sendai Branch Office, Koriyama Civil Technology Centre>	Participants will gain an understanding on how JR East conducts special general inspections for tunnels. They will also gain an understanding of safety measures deployed for inspections.
Monday, June 13	Observation of Union Construction CO., LTD[Tracks] (Outline of	There is much track work that is outsourced for Shinkansen tracks. Participants will gain an understanding of the company profile of Union Construction, one of JR East's partner companies.

	work, outline of education center, outline of training, approaches to safety, and observation of work equipment)	Participants will also gain an understanding of efforts in terms of education and training along with efforts for safety undertaken at Union Construction. They will also gain an understanding on how an awareness of safety is developed and secured at external contractors.
Tuesday, June 14	Observation of Union Construction CO., LTD [Civil engineering] (Company profile, safety initiatives, and free discussions)	Participants will gain an understanding of the company profile of Union Construction, one of JR East's partner companies. They will also gain an understanding the safety initiatives developed in cooperation with JR East. In addition, time was also allotted for a free discussion to handle questions raised during the lecture.
Tuesday, June 14	Observation of the Tokyo Shinkansen Rolling Stock Center (Observation of civil facilities) <Tokyo Branch Office>	Participants will gain an understanding of the fact that there are various types of facilities that the Civil Engineering Division should maintain and manage, such as water and sewerage facilities at the Rolling Stock Center and crew's boarding platform. They will also gain an understanding the operations involved in maintenance and management carried out for those facilities.
Wednesday, June 15	Observation of TOTETSU KOGYO CO., LTD. (Maintenance cars)	Participants will gain an understanding of the specifications, maintenance and inspection methods deployed for maintenance cars used for the Shinkansen by Totetsu Kogyo, which carries out work using maintenance cars and maintenance/inspection work for maintenance cars.
Wednesday, June 15	Observation of Kensetsu Tosou Kogyo CO., LTD. (Company Profile)	In addition to gaining an understanding on what kind of companies are involved in the repainting of railway facilities , participants will gain an understanding on what is necessary to repaint steel girders safely using scaffolding near the tracks and overhead contact lines .
Thursday, June 16	Summary of training <Tutor-based lecture>	Follow-ups for questions provided by training participants in the second half of the training will be conducted to deepen their understanding of the training content.

3.2.3 Overview of the Training Sessions

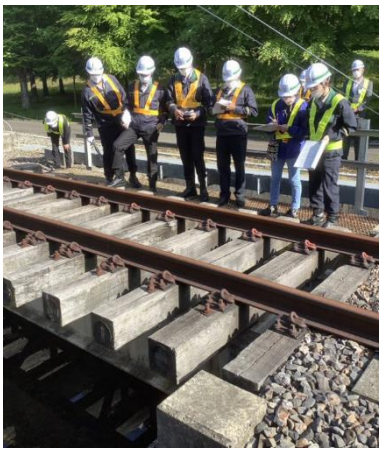
(1) Lectures provided by Tutors on Collaborative lecture among Facilities, Electrical and Signaling & Telecommunications (May 4, May 5, and May 9)

Lectures involving the consolidation of details concerning facilities, electrical and signaling & telecommunications were conducted to provide details on elements commonly shared by Facilities, Electrical, and Signaling & Telecommunications. A wide range of topics were covered, including a general outline of work involved in JR East's track, civil engineering, architecture, machinery, electrical, and signaling & telecommunications, as well as a general outline on systems such as COSMOS, mechanisms for maintaining work safety at JR East, a general outline of In-house Rules, maintenance

work procedures, competency certification, responses to abnormalities and abnormal situations, OCC, and so on. In lectures other than those involving outlines of work, there was much time taken for questions, resulting in a lively question period. There was, however, not enough time for questions concerning the outlines of work.

(2) JR East General Education Center (May 10)

In the morning, a common lecture was held at the General Education Center. In the afternoon, there was a site observation conducted for track and civil engineering facilities of the General Education Center for the division-wise lecture. For track, participants observed rail defect detection conducted using Rail Defect Detecting Devices, equipment used to reproduce track buckling, and the slab tracks and turnouts of the Shinkansen. For civil engineering, they observed equipment used in practical training when it comes to the inspection of bridges, tunnels, earth structures, piers, and platforms, as well as mock-ups of Shinkansen viaducts used for the development of technologies deployed for large-scale repairs. The training participants seemed interested in the inspections and requested to see videos of the inspection conditions.



(3) Facility-related lectures by Tutors (May 11, May 23, and June 8)

Lectures were provided concerning elements such as the Implementation Standards of JR East and MAHSR in relation to tracks and civil engineering, maintenance car manuals, Rail Defect Detection Cars, and East-i. A representative of the JR East SHINKANSEN Facilities Department attended the lecture on maintenance car manuals and answered questions provided by the training participants. Many technical questions were asked about materials, technical standards, work, and so on.

(4) Lecture by the SHINKANSEN Facilities Department, SHINKANSEN General Management Department (May 16)

Lectures from the SHINKANSEN Facilities Department gave a lecture on the organization, human resources development, the certified railway business operator system, technical management, safety, budget formulation, work plan, the management of materials, work contracts, on-site technical support, and environmental measures deployed for the Shinkansen. Explanations were provided on important items for the operation of the Shinkansen. Then, there was a lively exchange of opinions conducted during the question-and-answer session. Some training participants had experience and knowledge of noise and vibration, and many questions were asked, including whether the standards concerning vibration differ between Japan and India.

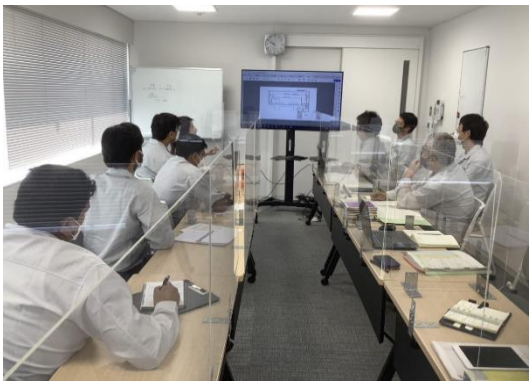
(5) Lectures by the Facilities Department at the JR East Head Office (May 17 and May 19)

Lectures from the Facilities Department of JR East's Head Office gave lectures related to safety, tracks, and civil engineering. A lecture concerning safety was given on the safety management undertaken at JR East. A lecture concerning tracks was given on the management of rail welding. A lecture concerning civil engineering was given on the overview of Civil division in the Facilities Department, concept of maintenance, work contracts and construction management, approach to safety management , train operation restrictions and disaster prevention, and response to the construction on the work neighbouring to tracks serving for train operation. In the lecture on train operation restrictions and disaster prevention, water level regulations for conventional lines for which there was no plan for the application thereof at MAHSR, and which has not been applied to the Shinkansen of JR East also, were introduced in response to a request provided by NHSRCL concerning measures taken against river flooding. It was explained several times that the regulations have not been applied to the Shinkansen of

JR East, but three out of the four training participants present were under the impression that those regulations had been applied to the Shinkansen as well, which was discovered when checks on the degree of understanding of training participants were carried out on May 27. Thus, information on the matter was provided to them once again. In addition, we introduced our response to the earthquake off the coast of Fukushima Prefecture of March during the free discussion, resulting in some meaningful time.

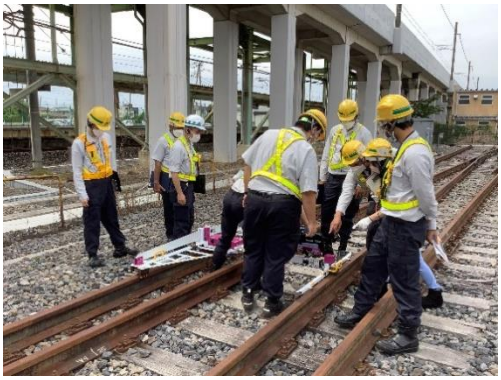
(6) Lecture at and observation of the JR East Omiya Civil Technology Center (May 18 and May 24)

In addition to attending a roll call in the morning at the JR East Omiya Civil Technology Center, participants experienced the physical exercises carried out by the staff, observed facilities such as office rooms, bedrooms, showers, and parking lots at the Civil Technology Center, as well as observation equipment such as platform measurement equipment and riverbed measurement equipment. Lectures from the Civil Technology Center also gave an overview of the Civil Technology Center and explanations on the practical work involved in the maintenance cycle of civil engineering structures. The training participants were interested in reports on incidents taking place at other offices related to the Shinkansen which were given during morning roll calls, as well as the physical exercises conducted by the employees, and the facilities such as the bedrooms.



(7) Lecture and observation: JR East Omiya Shinkansen Track Technology Center (May 20, May 20 night work, May 26, May 31, June 1, and June 1 night work)

Participants attended roll calls in the morning at the JR East Omiya Shinkansen Track Technology Center, and observed facilities such as night watch rooms and bedrooms, as well as the office of the Track Technology Center. While using the actual system terminals and equipment involved, representatives from the Track Technology Center provided explanations on the general outline of the Track Technology Center and various kinds of practical work carried out at the Track Technology Center. The participants were provided with an understanding of the necessity of strictly responding to train wind pressures by going into a maintenance passage during train operation time and experiencing the train wind pressure of the Shinkansen. In addition, a night work observation of the partial replacement of a turnout was planned so that the typical work involved in Shinkansen track maintenance could be learned in an efficient manner. During this observation, the participants actually observed the safety systems of the Shinkansen, the transportation of materials by the maintenance car, turnout replacement work, enclosure arc welding work, finishing quality confirmation, and so on. Explanations were provided on handling while actually using the track measurement device at the Maintenance Depot. During the observation of the track patrols, participants observed the conditions of various track facilities while actually patrolling the top of the tracks. The training participants expressed their gratitude for being able to actually observe many systems and machines and said that the experience was wonderful.



(8) Lecture and observation: Earthquake Early Warning System (May 24)

Regarding the Earthquake Early Warning System that is scheduled to be introduced to MAHSR, an expert from the Railway Technical Research Institute provided explanations on elements such as the detection principles. A lecture was provided on the maintenance of the Earthquake Early Warning System. An observation of the seismological observation hut was also provided along with a chance to

observe the spare parts kept at the Civil Technology Center. The Earthquake Early Warning System was mentioned several times during common lectures. There had been, however, no detailed explanation given regarding elements such as the detection principles, so training participants listened to the lecture with interest and actively asked questions.

(9) As observation of Shinkansen Civil Engineering Structure repair work (Night work on May 24)

As observation of Civil Engineering Structure repair work undertaken for the Shinkansen, participants observed lining repair work of the Nasu tunnel on the Tohoku Shinkansen line, with the supervision of construction being carried out by the JR East Omiya Civil Technology Center. This work involved elements such as filling up the cavity on the back surface of the tunnel lining. On the day of the observation, the work carried out involved the installation of rail cum road-aerial work vehicle within the tracks and the injection of the filling agent via a hole made in the lining. The training participants started their observation with the observation of the pre-work roll call and were also able to observe the procedures carried out by the construction company when entering the railway tracks. During the work, participants were able to observe the injection and injection material tests. During the roll call, the training participants seemed to be interested in the fact that the workers were doing mutual confirmations to ensure an appropriate manner of dress.

(10) JR East Structural Engineering Center Lecture (May 30)

An employee of the JR East Structural Engineering Center gave a lecture concerning an outline of the Structural Engineering Center and cases of technical support carried out in the past. The training participants listened with interest to an introduction on restoration methods deployed to address damage similar to that caused by the Earthquake off the coast of Fukushima Prefecture of March 2022 (which had become a topic of conversation several times during the common lecture). In addition, since a structural engineering center has not been scheduled to be established at MAHSR, the training participants asked the lecturers about the usefulness of the establishment of such a center.

(11) Facility Controller Observation (June 3 and June 3 night work)

Explanations were provided through lectures and Controller room observation with respect to the organization, frameworks, work contents, each individual system, and the handling of train operation restrictions at the Facility Controller of the SHINKANSEN General Control Center. Explanations were provided about fact that while many of the tasks performed by Controller are conducted efficiently using a system, some tasks depend on human judgment. The participants thus learned about the importance of preventing human errors. Explanations were also provided on the approaches deployed for the simulation of maintenance car failures, and participants learned that early recovery can be achieved by considering methods of action/repair in preparation for abnormalities/abnormal situations.

(12) Observation of bridge inspections (June 6 and June 6 night work)

As observation of the inspection of bridges and viaducts, observation were conducted so that participants could see special general inspections of the bridges and viaducts of the Hokuriku Shinkansen maintained by the JR East Takasaki Civil Technology Center. During the inspections, visual inspections using field glasses, etc., were carried out from under the viaduct in the daytime, and visual inspections were carried out within the tracks at night. The internals of the box girder of the bridge were also inspected during the day. The training participants were not allowed to enter the box girder for safety reasons, but an inspector from the Civil Technology Center relayed information to them from inside the box girder using a web camera, allowing participants to observe the internals of the box girder in that manner.

(13) On-board travelling [East-i] (June 8)

Participants observed the actual measurement system, inspection methods, and so on while travelling on board East-i, which carries out Shinkansen track measurements for JR East. Moreover, after the East-i measurement was completed, observation was given to see the underfloor equipment checks conducted after disembarkation, with measurement equipment then being observed thereafter.

(14) Observation of areas affected by the Great East Japan Earthquake, etc. (June 9)

In terms of places where the conditions of the Great East Japan Earthquake could be ascertained, participants took observation of the former Nobiru Station and the Tsunami Disaster Memorial Museum in Ishinomaki. Participants also inspected the areas of the Tohoku Shinkansen which had been damaged by the Earthquake off the coast of Fukushima Prefecture that occurred in March. Training participants were moved by the words of those affected by the tsunami. The experience also seems to have served as a good lesson. During the observation of the disaster-affected areas on the Tohoku Shinkansen line, participants earnestly asked the representatives about the damage situation and the restoration methods.

(15) Observation of disaster prevention facilities (June 10)

Observation was conducted to observe the facilities and equipment serving as measures for prevention against slope disasters currently under construction for the Tohoku Shinkansen. The disaster prevention facilities consisted of slope protection work (slope failure prevention measure) and sediment inflow protection fence (sediment inflow protection measure). The lectures provided explanations on the proper use of the facilities used for countermeasures. The on-site works manager (Civil) talked about the construction methods and the construction periods.

(16) Observation of tunnel inspection (Night work on June 10)

As observation of the inspection of tunnels, observation was conducted so that participants could see special general inspections of the Tohoku Shinkansen tunnels (which are maintained by the JR East Koriyama Civil Technology Center) undertaken during the nighttime. In the inspection, the inspector riding on the bucket of the Tunnel Inspection Car conducted a hammering test for the lining. Training participants could not ride on the bucket because due to passenger capacity rules, but they eagerly observed the work from the formation level. After exiting the tracks, the training participants checked the contents of the inspection memo written by the inspector on the tunnel lining to increase their understanding of the situation.

(17) Observation and lecture: JR East Partner Company related to tracks (June 13)

At the Omiya Shinkansen Field Office of Union Construction CO., LTD., one of JR East's partner companies for track, a representative provided a lecture on the company's business outline, the education of partner companies, and safety initiatives. Observation was conducted of office facilities and equipment used for work at the office of Sugawara Kogyo, a subcontractor of Union Construction CO., LTD..

(18) Lecture at JR East Partner Company related to Civil Engineering (June 14)

At the Urawa Civil Engineering Field Office of Union Construction CO., LTD., one of JR East's partner companies for civil engineering, a lecturer provided a lecture on the company's business outline, the safety initiatives of partner companies. Training participants deepened their understanding of the division of roles between JR East and partner companies in the civil engineering division.

(19) Observation of Rolling Stock Center Facility (June 14)

With the guidance of JR East Tokyo Branch office and the Tokyo Civil Technology Center, observation was conducted of civil engineering facilities installed in the Tokyo SHINKANSEN Rolling Stock Center, such as the water and sewage facilities and the crew's boarding platform. It was conveyed that although not conspicuous, the facility must be subject to the proper maintenance and management of a person in charge of civil engineering.

(20) Lecture by JR East Partner Company related to Maintenance Cars (June 15)

A lecture was given by a representative from Totesu Kogyo CO., LTD., one of JR East's partner companies related to track. The lecture was concerning the specifications, inspection and maintenance of rail grinding cars, safety confirmation cars, weld cars, and maintenance cars used for the Shinkansen.

(21) Lecture by Company related to painting (June 15)

At Kensetsu Tosou Kogyo CO., LTD., which conducts repaints for things such as steel bridges for JR East, a lecturer gave a lecture on the outline of the company's operations and safety measures being undertaken. During the Q&A session, there were also active discussions undertaken not only in relation to safety, but also concerning the differences between Japan and India with respect to paint.

3.2.4 Findings

(1) Curriculum structure and training content

For KOML training, the curriculums were formulated in a manner which would allow students to learn the basic concepts and rules of maintenance work related to tracks and civil engineering and how to proceed with work, the objective of which was to have training participants gain an understanding concerning the overall picture of work related to tracks and civil engineering. Due to the limited time available and due to the fact that there are plans to implement OJT at JR East in the future, the lectures were mainly provided by staff representatives from each office, with site observations and other such

activities only being conducted for major areas. The training participants seemed to understand the content of the lectures, such as when it came to the basic concepts relating to maintenance work. There were, however, requests provided to the effect that training participants wanted to learn, through practical training, more details when it came to the methods used for practical work carried out by JR employees and partner companies. These requests will be considered for OJT.

(2) Training Materials

During this training program, lectures were given using the PowerPoint-based documents prepared as auxiliary teaching materials. The PowerPoint documents used during the lectures helped the training participants review the content of the training after the lectures. It takes time and effort to prepare PowerPoint-based materials and to check the contents of the materials, but I think that they constitute a good way to facilitate training participants' understanding of the content presented.

(3) Training Methods

As there were more questions provided by the training participants than expected during the Common lectures, time was allocated so that more time would be available for questions during the Division-wise lectures. Training participants provided many questions during that time. The training participants were satisfied since they were able to ask their questions directly right then and there. The training participants were also satisfied because there were personnel present who were able to respond to questions which came up when site observations were being undertaken.

Information and guidance were provided to training participants beforehand with respect to precautions to be taken when entering the areas within the fences and within the tracks of the Shinkansen along with the provision of information involving case examples of past accidents. Training participants followed the instructions of JR staff representatives and the Tutors when undertaking site observations, with the result being that no one was involved in any unsafe behaviors.

(4) Training participants' reactions and participations

While taking notes, the training participants put forth serious effort during lectures and during tours. Questions and reports also showed us that as the training progressed, the understanding of training participants had also increased. Some of the training participants had never experienced both day and night work, so that seemed to be difficult for them.

(5) Other findings

The training participants requested that a little bit more time be secured for breaks taking place between the day and night work observations. Since the assumption was that work would be undertaken at JR East Employees who take rest at the site office, their rest period was set to about four hours, but it seems that training participants actually did not have enough time to rest due to the time required to travel from the site office to the hotel where training participants rested and for dinner. I would like to devise ways to secure a little more time for rest during future training programs.

3.3 Division-wise Subject [Signaling & Telecommunications]

3.3.1 Training Overview

For the S&T Division, the objective of the curriculum was to understand overall maintenance and operation work of HSR (High Speed Railway) (Shinkansen).

Specifically, during the first few days, lectures regarding to inhouse rules, maintenance work procedures, work safety, competency certification, etc. which are common for Facilities, Electrical Power, and S&T, were given to the training participants of each division jointly. In addition, JIC Tutors gave lectures on Shinkansen S&T technologies and maintenance systems for the following week to enhance the understanding of basic theories. After that, the sight observation of practical operation was conducted at JR East's SHINKANSEN Electric & Signal Network System Department at the SHINKANSEN General Management Department, SHINKANSEN S&T Technology Center, S&T Maintenance Center, and SHINKANSEN General Control Center to deepen understanding of O&M practice. The site observation of group companies and partner companies, which JR East outsources maintenance work, was conducted mainly at training facilities of those companies jointly with the Electrical Power Division. In addition, in order to learn about the on-board S&T equipment, a joint site observation with the Rolling Stock division was held at the Shinkansen Rolling Stock Center.

Also, for S&T division, learning through site observations in the Operation Control Center is very important in all fields of signal, telecommunications, and systems. However, there were concerns that the site observation in the Operation Control Center might be unable due to the spread of COVID-19. Therefore, as part of risk management, the site observation schedule of the SHINKANSEN General Control Center was moved forward by holding Tutor lectures during Golden Week.

As for training materials, in the theoretical lectures given by JIC Tutors, an explanatory materials based on IS, BM, the core staff teaching material, and including a large number of diagrams and photos was prepared and used. . In addition, materials required for lectures and site observations at other organizations of JR East, group companies and partner companies were prepared by them.

3.3.2 Objectives and Aims of the Training Sessions

[Objectives and Aims of the Lectures]

Implementation date	Lecture name	Objectives and aims of the lectures
Wednesday, May 4	Collaborative lecture among Facilities, Electrical and S&T (Outline of in-house rules and maintenance work procedures) <Tutor lectures>	Before site observation in JR East, gain an understanding regarding an outline of JR East's In-house Rules, guidelines, manuals, and so on. This lecture will also serve as an opportunity to consider the necessity of revising the Basic Manual for MAHSR in line with the situation in India.
Thursday, May 5	Collaborative lecture among Facilities, Electrical	Before site observation in JR East, gain an understanding regarding an outline of JR East's In-house Rules, guidelines,

	and S&T (Work safety, competency certification, response to abnormality, and OCC) <Tutor lectures>	manuals, and so on. This lecture will also serve as an opportunity to consider the necessity of revising the Basic Manual for MAHSR in line with the situation in India.
Monday, May 9	Collaborative lecture among Facilities, Electrical and S&T (Outline of civil engineering, outline of machinery, outline of architecture, outline of track maintenance, outline of electric power, and outline of S&T) <Tutor lectures>	The operations of the Facility Division also requires knowledge of electric power and S&T facilities, which are also ground equipment. Therefore, understand the outline of them.
Tuesday, May 10	Site observation of Training Facility at the JR East General Education Center	- Understand the outline of the Training Facility at the General Education Center. - Understand the mechanisms of DS-ATC and electric point machines through practical training, and develop awareness of safety when working within the track.
From Wednesday, May 11 to Thursday, May 12	Site observation of the SHINKANSEN General Control Center (S&T Controller)	- Understand the outline of the organization and operations of the SHINKANSEN General Control Center (S&T) and the operations of the S&T Controller.
Friday, May 13	Outlines of signal equipment <Tutor lectures>	- Understand the outlines of signal equipment such as SAINT, electric point machines, track circuits, etc.
Monday, May 16	Outlines of S&T equipment <Tutor lectures>	- Understand the outline of other S&T equipment.
Tuesday, May 17	Outline and site observation of the Shinkansen General Inspection Train	- Understand facilities, inspection items, and how to utilize measurement data related to the Shinkansen General Inspection Train (East-i). - Deepen understanding by boarding the East-i and observing actual measurements.
Wednesday, May 18	Organizational Overview of the S&T Division Outline of S&T equipment maintenance	- Understand the outline of the role of the S&T division in managing S&T facilities. - Understand the outline of maintenance work and maintenance work procedures of S&T facilities.

	<Tutor lectures>	
Thursday, May 19	Outline of S&T facility construction <Tutor lectures>	- Understand the outline of the construction of S&T facilities, material management, and three major industrial accidents.
Friday, May 20	Joshinetsu Shinkansen S&T Technology Center Iiyama MC site observation (site observation of non-insulated track circuit)	- Understand the installation status and details of ground equipment of the non-insulated track circuit which will be introduced to the MAHSR. - Improve awareness of safety during work by experiencing high-speed train operation on the Shinkansen wayside.
Monday, May 23	JR East SHINKANSEN Electric & Signal Network System Department and Electrical and Signaling Network Department (common)	- Understand the outline of the organization and common operations of SHINKANSEN Electric & Signal Network System Department. - Understand the outline of the construction system.
Tuesday, May 24	SHINKANSEN Electric & Signal Network System Department (S&T Equipment Management Unit)	- Understand the outline and operations of SHINKANSEN Electric & Signal Network System Department (S&T Equipment Management Unit).
Wednesday, May 25	SHINKANSEN Electric & Signal Network System Department operations (Shinkansen Operation System Management Unit)	- Understand the outline and operations of SHINKANSEN Electric & Signal Network System Department (Shinkansen Operation System Management Unit).
Thursday, May 26	Site observation of Tokyo Metropolitan Area Shinkansen S&T Technology Center	- Understand the outline of the operations of the S&T Technology Center, which is in charge of maintenance of S&T facilities.
Monday, May 30	Site observation of S&T facilities at the Ueno Maintenance Center, Tokyo Metropolitan Area Shinkansen S&T Technology Center	- Understand the outline of Shinkansen S&T facilities. - Understand where and how Shinkansen S&T facilities are installed. - Observe the night work and understand the work system, workflow, safety efforts, etc.
Wednesday, June 1	Site observation of Shinkansen on-board systems at the Morioka	- Understand how ATC on-board systems are installed, inspection methods, and inspection details.

	Shinkansen Rolling Stock Center	
Thursday, June 2	Site observation of JR East Facility Management Co., Ltd. (BT)	- Understand the outline of the operations of a Group company and its education and training system.
Friday, June 3	Site observation of JR East Information Systems Company (JEIS)	- Understand the outline of the operations of a Group company.
Monday, June 6	Site observation of COSMOS-SCADA and Equipment Room at SHINKANSEN General Control Center	- Understand the outline of COSMOS-SCADA facilities and the outline of maintenance. - Understand the outline and the installation status of each facility by observing the Equipment Room.
Tuesday, June 7	Site observation of Tokyo Metropolitan Area Shinkansen S&T Technology Center (2)	- Understand the outline of the operations of the S&T Technology Center. .
Friday, June 10	Site observation of the SHINKANSEN General Control Center (OCC System Controller)	- Understand the outline of the organization and operations of the SHINKANSEN General Control Center (OCC System Controller) and the operations of the OCC System Controller
Monday, June 13	Site observation of Total Electric Management Service Co., Ltd. (TEMS)	- Understand the outline of the operations of a JR East partner company and its education and training system.
Tuesday, June 14	Site observation of Nippon Rietec Co., Ltd. (NR)	- Understand the outline of the operations of a JR East partner company and its education and training system.
Wednesday, June 15	Site observation of Nippon Densetsu Kogyo Co., Ltd. (NDK)	- Understand the outline of the operations of a JR East partner company and its education and training system.
Thursday, June 16	Site observation of Total Electric Management Service Co., Ltd. (TEMS)	- Understand the outline of the operations of a JR East partner company.

3.3.3 Overview of the Training Sessions

(1) Site observation of JR East General Education Center

In the morning, a lecture was held at the General Training Center, and in the afternoon, there was a site observation of the S&T facilities at the General Education Center, held as lectures by division. Observed were the TS-type electric point machines as well as SAINT and its monitors installed at the General

Education Center. As this was the first opportunity for the training participants to see the actual facilities in person, they asked a lot of questions before the explanation.


(2) Tutor lectures

The Tutor lectures gave explanations on the outlines of S&T facilities and organizations of Shinkansen Electrical and S&T division necessary for overall understanding of Shinkansen. The lectures were conducted in English considering the quantity and the comprehension levels of the training participants.

- Outlines of signal equipment

For the outlines of signal equipment, lectures were given on ATC, interlocking devices, electric point machines, and track circuits, which are fundamental to Shinkansen signalling. JR East has introduced a system called SAINT, which integrates ATC and interlocking devices. In the Tutor lectures, items in IS were described again in the lecture materials to promote the understanding of the necessity of the equipment in high-speed railways. In particular, DS-ATC, which is an indispensable signal system for high-speed railways, was explained starting from its basic concept to detail. In addition, an explanation was given on RS-ATC, which uses train radio. According to the training participants, axle detectors are major equipment in India. The interlocking portion of SAINT were quickly understood by training participants from their railway experience in India, and there was a common understanding with the use of multiplex system, etc.

Regarding electric point machines, lectures were given focusing on the outline of the TS-type electric point machines, the Contact Detector (CC), and the movable mechanisms of nose rail, which are specific to Shinkansen.

Regarding track circuits, an explanation was given on an outline of the non-insulated track circuit that is scheduled to be introduced to the MAHSR, and also, the level learning function of a track circuit for which similar facilities are not in India.

- Other signal equipment

Regarding other signal equipment, an explanation was given on overrun detection devices, track circuits for feeding sections, transponders, overrun protection devices with speed checks, Emergency Stop Button, insulation coordination, Shunt Signals, etc. Because of the lack of time due to the large number of equipment unique to the Shinkansen, it was necessary to reconsider the time allocation.

- Outlines of telecommunication equipment

Regarding Shinkansen telecommunication equipment, there was an explanation focused mainly on Train Radio using LCX cable installed on the wayside to enable radio communication with the Shinkansen operating at high speeds. In addition, there was an explanation on Yard Radio, Wayside Mobile Phone, cable gas pressure monitoring equipment, etc.

- Organizational overview of the S&T division

In the organizational overview of the S&T division, there was an explanation of the organizational overview of the S&T equipment on the Shinkansen. Since the training participants has a mission to build O&M organization going forward, the Tutors were asked by the training participants about the personnel composition of the organization and more. The unique signal series qualification was also explained. The training participants asked questions about qualification requirements.

- Outline of S&T maintenance

In the outline of S&T maintenance, there was an explanation about the concept of inspection periodicity based on IS and maintenance inspections using facility management systems.

(3) Site observation of the S&T Controller at SHINKANSEN General Control Center

Entry to the SHINKANSEN General Control Center is essentially prohibited. However, in view of the importance of this training, entry was permitted on the condition that PCR tests were conducted with negative results being subsequently confirmed in advance.

At the S&T Controller, the staff of S&T Controller explained the outline, organization, and business contents of the Controllers, and then a video with English commentary about the outline of the Shinkansen was shown in the observation room. In addition, since the entire Controller Room can be viewed from the observation room, training participants were briefed by the Controller on the overall arrangement of Operation Control Center. After that, the point malfunctioned while an explanation was being given about the terminals and so on while inside the Control Center, so we returned to the observation room and were able to check the status of the meeting and see how information is shared during an abnormality

In order to check the flow of Command work, we also attended the night shift. Before the night shift, we took a break at the hotel and a new JICA Coordinator took the other's place. In addition to receiving an additional explanations of the systems and terminals in the Control Center, there was also an explanation of the duties of the Controller, focusing on the terminal items to be checked.

(4) Site observation of the Shinkansen General Inspection Train (jointly with Rolling Stock division) (May 17)

The outline of the Shinkansen General Inspection Train (East-i) used for inspection of Shinkansen was explained, and a site observation of East-i was carried out. In the morning, an explanation was given in a classroom setting, and in the afternoon, the site observation was held while boarding the East-i. East-i travelled from Tokyo to Sendai. Various inspections on the East-i are outsourced to TEMS, so a TEMS instructor was asked to accompany the group. The rides was conducted jointly with the Rolling Stock division.

The main inspection items for S&T equipment on the East-i are the Train Radio and DS-ATC. For each inspection, the training participants asked a number of technical questions, which continued until the end of the observation.


(5) Site observation of Tokyo Electrical Construction and System Integration Office (jointly with Electric Power division)

The training covered O&M this time around. In order to promote understanding of the overall electrical organization of JR East, an overview of the organization of the Tokyo Electrical Construction and System Integration Office, which is in charge of overall electricity-related construction, was added to the lecture, and training participants asked questions on the composition of the number of people, the number of people in charge of the Shinkansen, and so on. At the Tokyo Electrical Construction and System Integration Office, training participants exchanged opinions with the Director and Deputy Director.

(6) Site observation of the Iiyama Maintenance Center, Joshinetsu Shinkansen S&T Technology Center

As the introduction of a non-insulated track circuit is planned for the track circuit between the station yard of the MAHSR, a site observation was held at the Iiyama Maintenance Center, Joshinetsu Shinkansen S&T Technology Center, where a non-insulated track circuit are installed.

An explanation was given on the organization of the maintenance center. The training participants showed interest in the details of the organization, and they asked about the differences in the operations

with the technology center, the personnel composition, the scope of jurisdiction, and the location of partner companies.

In the S&T equipment room at Iiyama Station, there was an explanation on the SAINT terminals, the system configuration of the non-insulated track circuit, and the connection status of individual equipment.

In the afternoon, there was an observation on site. After confirming the precautions in advance at the office and completing the roll call in front of the gate door of protection fence, they confirmed the procedure for entry within fences and entered within the fence. Within the fence, they waited for the Shinkansen train to pass, then observed the equipment box for the non-insulated track circuit and the installation situation of the LCX cable.

(7) Technical Planning Unit, SHINKANSEN Electric & Signal Network System Department (joint lecture with the Electrical Power Division)

The Technical Planning Unit of the SHINKANSEN Electric & Signal Network System Department explained the outline of the organizational revision and the outline of the education and training. The training participants asked many questions related to issues relevant to themselves, such as the details of

the organization and education and training, and the way of thinking and duration of education for those with and without Shinkansen experience.

(8) Construction Management G, Electrical and Signaling Network Department (joint lecture with the Electrical Power Division)

The Construction Management G of the Electrical and S&T Department explained the importance of railway construction management, including cooperation with partner companies and qualification systems.

(9) S&T Equipment Management Unit, SHINKANSEN Electric & Signal Network System Department

The S&T Equipment Management Unit of the SHINKANSEN Electric & Signal Network System Department explained the organization, operations, the concept for the future, the action targets of the S&T Equipment Management Unit, human resource development and training programs related to the S&T of the Shinkansen. Safety measures were explained using the Swiss cheese model as an example. As for the organization, there were many questions about the detailed number and composition of personnel, etc., but there were few questions about safety measures. Therefore, it is necessary to continue to explain the concept of safety in preparation for on-the-job training.

(10) Shinkansen Operation System Management Unit, SHINKANSEN Electric & Signal Network System Department

The Shinkansen Operation System Management Unit of the SHINKANSEN Electric & Signal Network System Department explained the personnel composition, details on operations, the outline of COSMOS and SAINT, and development and maintenance demarcations within the Shinkansen Operation System Management Unit. Using the replacement work of SAINT as an example, there was an explanation of the outline and flow of the project. The training participants asked to confirm the maintenance categories and the details of the project construction period.

They also exchanged opinions with a unit leader who had previously been in charge of the MAHSR and exchanged opinions on system version control, etc.

In addition, demonstrations were conducted on the input work of the work plan using the maintenance work terminal installed in the SHINKANSEN General Management Department.

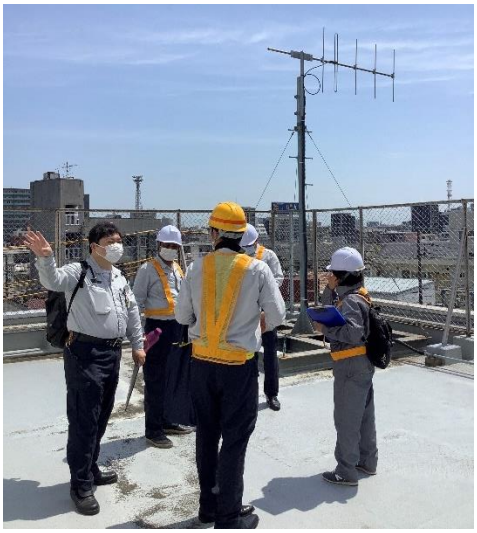
(11) Tokyo Metropolitan Area Shinkansen S&T Technology Center

A site observation of the office at the Tokyo Metropolitan Area Shinkansen S&T Technology Center took place, and an outline of its office and operations were explained. The Head of S&T Technology Center explained an outline of the office and answered questions about the concept of the boundaries of the maintenance center and the education provided at the technology center. Detailed questions were also asked about the quantity of S&T equipment under the control of the technology center. In addition, training participants asked questions about safety guidance to partner companies and manufacturers. Since in India, each company is responsible for providing safety guidance, there seemed to be doubts about Japanese practices such as JR East is in charge of providing guidance. We would like to continue to convey the importance of a safety culture led by railway operators and to further disseminate it.

Finally, a tour was given of the whole office and training participants were present for the exit call. The training participants seemed to be interested in the efforts of the technology center at the time of roll call, where each individual checks the Shinkansen ID card and the designated key, which are lent to individuals and are required to enter the Shinkansen facilities.

(12) Site observation of the Ueno Maintenance Center, Tokyo Metropolitan Area Shinkansen S&T Technology Center

At the Ueno Maintenance Center at the Tokyo Metropolitan Area Shinkansen S&T Technology Center, there was a site observation of the premises of Tokyo Shinkansen Rolling Stock Center, the Shin-Tabata TSS, and the Shinkansen S&T equipment room at Ueno Station, as well as an inspection of the point machines in the Ueno tunnel during a night work site observation. On the premises of Tokyo Shinkansen Rolling Stock Center, detailed questions were asked about the train location display system only found inside the Rolling Stock Depot and the yard radio system installed on the premises. During the site observation of the spare parts warehouse, the training participants carefully confirmed the concept of the installation of spare parts, the transportation methods, and the methods for taking inventory. In addition, the night work was a site observation of point machine inspection in the tunnel by a partner company, which the training participants had asked to do prior to the training. They asked the partner company various questions about the organization system and inspection system, and used them as a reference for building systems at NHSRCL in the future. In the equipment room after the night work, they asked questions about the equipment very actively until the end of the work.




(13) Morioka Shinkansen Rolling Stock Center (joint lecture with the Rolling Stock division)

The Morioka Shinkansen Rolling Stock Center is under the control of the Rolling Stock division, but the maintenance classifications of the on-board DS-ATC and Train Radio System have not been decided by NHSRCL, so a site observation was planned. After undergoing the safety education, the training participants observed inside the Shinkansen On-Board System and Rolling Stock Center, inspected the ATC on-board equipment, and observed the train radio mobile station devices. At the Rolling Stock Center, there was an explanation on the division of roles at the SHINKANSEN General Control Center and Operation Center, as well as on the systems. Detailed questions were asked about the display condition of the terminals. In addition, during the inspection of the ATC on-board system, questions were asked about whether the tests between the on-board system and the ground equipment were necessary and sufficient, and proposals were made about the training participants' own test methods.


(14) JR East Facility Management (jointly with the Electrical Power division)

The company outline was explained and a site observation of training facilities was conducted at JR East Facility Management (BT). After being briefed on the company outline, the training participants confirmed the roles at JR East Facility Management (BT) and the subcontractors. We hope this will be referenced with the outsourcing at NHSRCL. Training facilities related to telecommunication equipment were the main subjects of this site observation. Regarding the PID board where the management classifications of equipment differ between Japan and India, the training participants confirmed classifications of equipment once again. In addition, accident experience training was conducted in the accident information room and via virtual reality (VR). These site observations and experiences should serve as a reference for the construction of training facilities to build a safety culture.


(15) JR East Information System (JEIS) (jointly with the Electrical Power division)

After receiving an explanation of the outline of the company at JR East Information System (JEIS), they observed the COSMOS equipment room, the COSMOS-SCADA equipment room, the COSMOS training room, COSMOS, and COSMOS-SCADA shift operations. JEIS is in charge of five of COSMOS's seven subsystems. Training participants were briefed on system tests before the busy season and checked the system downtime. In order to enter the COSMOS equipment room, fingerprints were registered in the security room. Individuals entered the equipment room through the circle gate and observed the high level of security. In the equipment room, the installation of equipment and the features of the air conditioning were explained.

(16) COSMOS-SCADA Facility (jointly with Electrical Power division)

There was an explanation about the details of COSMOS-SCADA, conducted jointly with the Electrical Power division. Since COSMOS-SCADA includes equipment for which the reason for installation cannot be understood unless the background of the system construction is known, understanding of COSMOS-SCADA was enhanced through lectures by experts.

(17) Site observation of the Equipment Room at SHINKANSEN General Control Center

A site observation of the equipment room was held at SHINKANSEN General Control Center. In the equipment room, training participants were briefed on various telecommunication equipment such as central Train Radio devices, various monitoring equipment, wayside cameras, and Call Recording System with extended recording times. There was strong interest in checking not only the telecommunication equipment but also the power supply system for the entire command equipment and lightning damage countermeasures.

(18) Tokyo Metropolitan Area Shinkansen S&T Technology Center (Shin-Shirakawa)

As part of a site observation of the Tokyo Metropolitan Area Shinkansen S&T Technology Center, troubleshooting training for accidents and failures was conducted using the facilities at the General Education Center. SAINT transmission/reception unit failure recovery training and track circuit failure recovery training were conducted. In the transmission/reception failure recovery training, training participants carried out training in accordance with actual conditions, such as how to check with the monitor terminal and actually replace the units. In the track circuit failure recovery training, the training of communucating with S&T Controllers for procedures of entering within the fence and within the track were also conducted, and the current on the track circuit was measured using an actual current measuring instrument to identify the failure point.

(19) SHINKANSEN General Control Center (OCC System Controller)

An outline of the OCC System Controller was given, and site observations of the OCC System Controller and OCC System Controller night work were conducted. During the lecture about the outline of OCC System Controller, questions were asked about pros and cons of the autonomous decentralised system and the division-wise personnel composition for the OCC System Controller. Training

participants worked on ascertaining the characteristics of OCC System Controller of the Shinkansen. In addition, the work performed by the Controller at the OCC System Controller was observed during night work. The training participants then ascertained the details of checkpoints carried out at the OCC System Controller along with the division of roles with JEIS.

(20) Total Electric Management Service (TEMS) (jointly with the Electrical Power Division)

At Total Electric Management Service (TEMS), the training participants were given an explanation of the company outline, then observed the training facilities of the TEMS Technical Academy. TEMS is JR East's only maintenance company for S&T division. Training participants listened to the lecture with interest. Training participants asked questions about the ratio of work in terms of the Shinkansen and conventional lines, as well as about the distribution of maintenance work between JR and other construction companies. This served to increase their understanding with respect to the outsourcing of maintenance work. After that, they listened to a lecture on the TEMS education policy and safety initiatives. During that lecture, they checked the details of the roadmap outlining the education that is necessary before one becomes a fully-contributing team member. As for the training facilities, the training participants undertook observations mainly of the TS-type point machine, the LCX of the Train Radio, and the repeater equipment installed as Shinkansen facilities.

(21) Nippon Rietec (jointly with the Electrical Power Division)

At Nippon Rietec, training participants were given an outline of the company and observed the training facilities at the training center. During the portion concerning the company outline, there were questions asked about the ratio of work involving S&T and about the construction periods of Shinkansen extension work ordered by Nippon Rietec. This meant that training participants were checking on the state of the construction company. Training participants also confirmed the safety measures and employee hiring policy in relation to human resource development in order to use the information provided as a reference for forming their own mindsets for hiring at NHSRCL. During the site observation, training participants also experienced adjustments for the TS-type point machine by themselves while using actual tools and measurement equipment.

(22) Nippon Densetsu Kogyo (jointly with the Electrical Power Division)

At Nippon Densetsu Kogyo, training participants were given an outline of the company and observed the training facilities at the training center. At Nippon Densetsu Kogyo, after the senior managing director of the company greeted training participants, an outline of the company was provided. At Nippon Densetsu Kogyo's Chuo Gakuen (accredited vocational education & training school), there is a facility called the Safety Culture Creation Museum where training participants learned about the misery of accidents which had occurred in the past. In the facility used for hands-on experience with electricity and the dangers it poses, training participants observed equipment which simulated electrical hazards in a way which made it easy to understand the dangers involved. They were also impressed by the ingenious construction of the equipment. In the training conducted for outdoor equipment, the training participants observed the adjustment of the point machine and the

confirmation of the structure of the LCX. They also experienced the heights at which work is undertaken using the rail cum road vehicles, and so on. This experience served as a reference for them when it came to their own plans for training facilities.

(23) Total Electric Management Service (jointly with the Electrical Power Division)

At Total Electric Management Service (TEMS), training participants took part in an observation of the TEMS Tokyo Branch. At the Tokyo Branch of TEMS, training participants were provided with explanations concerning the outline of the entire branch, the configurations and personnel composition of the service center, and so on. They confirmed the division of roles between the branch and the service center, the management of the warehouse, and so on. This served to deepen their understanding of the content covered during the training. During the observation of the branch office, training participants also visited rest areas, office rooms, warehouses, and so on to observe the actual conditions of work being undertaken, and used what they observed as a reference for their own work.

3.2.4 Findings

(1) Curriculum structure and training content

For the first half of the Division-wise Subjects, the lecture concerning Shinkansen S&T equipment was provided by the Tutor. The contents of the lecture were mostly devoted to the S&T equipment of the Shinkansen, and some of them were based on the basics of S&T. Since the KOMLs had a high level of knowledge about railway signals used for conventional lines, some part of the lecture regarding to the basic parts were omitted. Those omitted lecture materials shall be utilized during core staff training, etc.

The observation of the Morioka Shinkansen Rolling Stock Center was given priority from the stage in which the lecture curriculum was prepared and was to be conducted jointly with East-i and Rolling Stock division (the schedules for which had already been decided upon). This meant that there was little flexibility available in terms of other observations. One reason for this was that the previous two postponements (due to COVID-19) limited the time available to make adjustments to the training schedule. Due to these circumstances, some observations could not be optimally scheduled. In terms of the major overall flow of the program, things were set up so that lectures would be conducted during the first half of the program, with training participants also participating in site observations after having acquired foundational knowledge. The second half of the program was set up to consist of Division-wise Subjects where there would also be site observations (including for night work), visits to the training facilities of group companies and partner companies, and so on. It cannot be denied that this made for a very busy schedule. We were also unable to secure sufficient preparation time for reports and final presentations during the training conducted on this occasion. While the various curriculums had to be established in response to requests provided by the NHSRCL, the process probably should have been more flexible.

There were also requests provided by KOMLs in advance to the effect that observations of the areas between tunnel sections be provided along with training for the handling of abnormalities and abnormal situations, among other things. These items were implemented as scheduled and are

considered to have served as useful training elements for the KOMLs. According to the questionnaires issued to the KOMLs, the Division-wise lectures related to S&T were found to generally have been satisfactory. There were requests provided for details on some interlocking drawing & tables and parameter table for each stations. Such details, however, were not provided as part of this training because knowledge of such details constituted skills required at the construction stage, as opposed to the maintenance stage.

(2) Training Materials

When it came to preparing teaching materials, we coordinated in advance with the places where lectures were to be conducted. By communicating in advance with them with respect to the work histories of training participants, their basic knowledge, and the content of their work to be conducted in the future, we were able to ensure that the content which the training participants wanted to know about would be included within the materials. For example, in the case of the maintenance center, the scope of its administrative jurisdiction and its personnel composition were elements added to the explanatory materials so that the information could be used as a reference for the training participants when it came to establishing their own frameworks. Similarly, we had partner companies make mention not only about themselves, but also to make mention of their subcontractors in order to have training participants get a complete picture when it comes to maintenance.

During this training, lecture materials were essentially prepared in Japanese and then translated thereafter. We confirmed that there were some terms which had not been fully translated using fully-unified English terms during the translation and check stages. As such, some time was required before training participants were able to understand the content being provided. More careful confirmation is required at the documentation and translation stages in order to prevent terminology from losing consistency.

(3) Training participants' reactions and participations

The training participants were always positive and eager to acquire knowledge. They were always concentrating as they took part in the lectures and asked questions for as long as time allowed, thereby working toward gaining an understanding of what was being covered. During observations, training participants also made an effort to ascertain and understand everything they observed with the intention of not overlooking any small element.

3.4 Division-wise Subject [Electrical]

3.4.1 Training Overview

For the Electrical Divisions, the objective of the curriculum structure was to understand the maintenance and operation of High-Speed Railways (Shinkansen) in general.

Specifically, in the first few days, the Facilities, Electrical, Signaling & Telecommunications (S&T) Divisions jointly attended lectures on common in-house rules for facilities and electrical, maintenance work procedures, work safety, competency certification, and other topics. Subsequently, JIC Tutors provided lectures on electric power technology and maintenance systems for Shinkansen to learn basic theories. After that, a site observation of practical operation was conducted in lectures at major offices involved in the Shinkansen of JR East (SHINKANSEN Electric & Signal Network System Department of the SHINKANSEN General Management Department, Tokyo Metropolitan Area Shinkansen Electric Power Technology Center, Electric Power Controller at SHINKANSEN General Control Center, etc.) to deepen the training participants' understanding of O&M practice. The site observation of group companies and partner companies entrusted with maintenance work by JR East was conducted jointly with S&T, mainly at training facilities of those companies.

At a meeting with NHSRCL in June 2021, there was a request for site observations of a station's distribution substation. In coordination with Tokyo Metropolitan Area Shinkansen Electric Power Technology Center, therefore, we structured the program reflecting as many requests of training participants as possible by incorporating a site observation of Utsunomiya Station distribution substation on Wednesday, May 25, 2022, among others.

As for Training Materials, in the theoretical lectures given by JIC Tutors, explanatory materials files were prepared and utilized, based on Implementation Standards (IS), Basic Manuals (BM), and the "Core Staff Training" textbooks and using many diagrams and photographs. In addition, materials required for lectures and site observations at JR East and its group companies and partner companies were prepared by those companies.

(1) Tutor lectures

Tutor lectures were classified into the Collaborative lecture for the training participants to learn matters common to Facilities, Electrical, and S&T Divisions, and the lectures by division. In the Collaborative lectures for the divisions, the lectures were structured for the training participants to learn an outline of work in track, civil, architecture, machinery, electric power and signaling & telecommunications. The aim is for them to comprehend the big picture of and promote the understanding of facilities, power supply, and signaling & telecommunications. In addition, lectures on in-house rules system, maintenance work procedures, work safety, competency certification, and response to abnormality were included in the curriculum as contents common to all the divisions.

The lectures by division were organized in consideration of the training participants' proficiency level, flexibly adjusting the amount of contents and time allocation for each session, with elaboration to deepen training participants' understanding.


(2) Structure of lectures for each electrical facility

The contents related to the outline of overhead contact lines, power supply and power distribution, which are the basics of the Shinkansen's electrical facilities, were given in the lecture on an outline of a electric power. As training participants already have knowledge of general electrical facilities installed all around India, the contents of lectures focused on facilities such as heavy compound catenary system and change-over switches, which are electrical facilities of the Shinkansen unique to Japan and not similar to the ones in India. In addition to the features of the facilities, the historical background of their introduction and a comparison of their functions with those of other facilities were incorporated into the lectures.

The lectures on overhead contact lines focused on the heavy compound catenary system, which is a typical contact system for the Shinkansen's overhead contact lines, and included contents on improving the tension and wave propagation velocity of contact wires, which are important for high-speed operation of the Shinkansen.

The lectures on power supply focused on the facility configuration of traction substations and protective relays, which are necessary for understanding the Shinkansen's alternating current feeding. The lectures also focused on change-over switches, which are important equipment for high-speed operation of the Shinkansen, to promote accurate understanding among training participants.

The lectures on power distribution covered power distribution facilities in general, including not only outdoor equipment such as high-voltage cables, branch boxes, and high-voltage cable failure-detection devices but also indoor equipment such as switchboards, transformers, and power supply switching board.

The concept of inspection periodicity based on IS and the contents of maintenance inspection using facility management systems were given in the lecture on electrical facility maintenance work. In addition, examples of the implementation standards for the Shinkansen's electrical facilities were shown, and lectures on the positioning of the implementation standards within JR East were incorporated so that the training participants were able to understand their importance.

The lectures on the inspection plan and inspection items mainly explained inspection items based on BM, and also incorporated the contents of a judgement on facility conditions based on a collection of facility condition cases shown in the Maintenance standards for Shinkansen electrical facilities of JR East. Since some lecture contents are included in the lecture contents of the Tokyo Metropolitan Area Shinkansen Electric Power Technology Center, an entity that is subcontracted to do a part of the training, the lectures were made to facilitate intensive and efficient understanding of the key points of maintenance.

The lectures on an outline of the General Inspection Trains gave insight into the historical background and purpose of introducing the General Inspection Trains and their measurement items. Regarding measurement devices related to electric power, the lectures were organized to deepen the training participants' understanding by incorporating specific contents regarding roles and functions of each device into the lectures, such as devices installed in car numbers 1, 4, 5, and 6.

The lectures on an outline of maintenance cars gave insights into the performance and features of maintenance cars used by JR East. The lectures also included an outline of various inspections defined by the standards on the structure of maintenance cars of JR East. Since their details are included in the lectures and site observations of the Tokyo Metropolitan Area Shinkansen Electric Power Technology Center of the, which was subcontracted with an observation visit, this lecture is designed to ensure that training participants do not receive similar lectures.

(3) Safety

Regarding safety and accident cases, the peculiarity of the Shinkansen was mentioned from the viewpoint of the three major industrial accidents, i.e., man-vehicle collisions, fall accidents and electric shocks, and lectures were given on preventive measures necessary for each industrial accident. In addition, regarding past accident cases that occurred at JR East, an opportunity was given for the training participants to discuss the causes of the accidents and countermeasures so that the training participants themselves were able to have a sense of ownership of the accidents. With regard to safety, efforts were made to raise safety awareness through this program, since it leads to having the training participants "Understanding of the safety philosophy," which is stipulated in the fundamental policy of this training.

3.4.2 Objectives and Aims of the Training Sessions

[Objectives and aims of the lectures]

Implementation date	Lecture title	Objectives and aims of the lecture
Wednesday, May 4	Collaborative lecture among Facilities, Electrical and S&T (Outline of in-house rules and maintenance work procedures) <Tutor lectures>	To gain an understanding on the outline of JR East's In-house Rules, procedures, manuals, etc. prior to the training undertaken at JR East. This lecture will also serve as an opportunity to consider the necessity of revising the Basic Manual for MAHSR in line with the situation in India.
Thursday, May 5	Collaborative lecture among Facilities, Electrical and S&T (Work safety, competency certification, response	To gain an understanding on the outline of JR East's In-house Rules, procedures, manuals, etc. prior to the training undertaken at JR East. This lecture will also serve as an opportunity to consider the necessity of revising the Basic Manual for MAHSR in line with the situation in India.

	to abnormality, and OCC) <Tutor lectures>	
Monday, May 9	Collaborative lecture among Facilities, Electrical and S&T (Work (Outline of civil engineering, outline of machinery, outline of architecture, outline of track maintenance, outline of electric power, and outline of S&T) <Tutor lectures>	The operations of the Electrical Division require knowledge of track maintenance facilities and signaling & telecommunications facilities, which are also ground equipment. Therefore, understand an outline of the facilities owned by each division.
Tuesday, May 10	Site observation of JR East General Education Center (Power supply training facility)	Observe the power supply training room at the General Education Center as a reference for training facilities of the MAHSR. In addition, understand an outline of the training facilities related to power supply at the General Education Center. Understand individual operations and operation interlocking of circuit breaker and disconnector based on the handling of voltage detector and discharge rod.
Wednesday, May 11	Site observation of JR East General Education Center (overhead contact line training facility)	Observe the overhead contact line training room and outdoor training lines at the General Education Center as a reference for training facilities of the MAHSR. In addition, practice overhead line measurement of voltage detectors, discharge rods and non-crossing type overhead crossings, and understand how to handle equipment used in the Electrical Division. Observe indoor overhead line models to understand the facility configuration of the compound catenary system.
Thursday, May 12	Site observation of the Shinkansen General Control Center (Electric Power Controller)	Understand an outline of the organization and operations of the Shinkansen General Control Center (Electric Power Controller) and the operations of the Electric Power Controller. Also deepen understanding of operation of the Shinkansen during a power block.
From Friday, May 13 to Saturday, May 14	Site observation of the Shinkansen General Control Center (Electric Power Controller), confirmation of	Confirm the shift of maintenance work time and start/end of power block at regular time through 1-shift or 2-shift work of the Electric Power Controller to understand the contents of the work. Also deepen understanding of the relationship with other controllers, such as the Traffic Controller, the Facility Controller, and the S&T Controller. In particular, deepen understanding of how information on the

	start/end of a power block at regular time, and confirmation of shift of maintenance work time	maintenance work management system is displayed in the Controller. Training participants will also gain an understanding of the fact that the Controller's approval is required in the process up to execution (although the start/end of Power Block at regular time is automated using the system).
Tuesday, May 17	Outline of electrical facilities (overhead contact lines, power supply, and power distribution) <Tutor lectures>	Understand an outline of the Shinkansen overhead contact line facilities, power supply facilities, and power distribution facilities. In particular, deepen understanding of an outline of facilities adopted in the MAHSR project, such as the compound catenary system and change-over switches.
Wednesday, May 18	Outline of electrical facility maintenance work <Tutor lectures>	Understand an outline of maintenance work and inspection items of electrical facilities.
Wednesday, May 18	Outline of the Tokyo Electrical Construction and System Integration Office	Understand the organizational outline of the Tokyo Electrical Construction and System Integration Office This organization specializes in construction, and will serve as a reference for building an organizational structure in the future by deepening understanding of its relationship with the maintenance departments and its organizational structure.
Thursday, May 19	Outline of the General Inspection Trains and maintenance cars <Tutor lectures>	Understand an outline of operation of the General Inspection Trains and maintenance cars Deepen understanding of what kind of measuring instruments are used and what kind of data are measured in advance for actually boarding on East-i on the following day.
Friday, May 20	Riding on the General Inspection Train (East-i)	By riding on East-i, learn the details of measurement work and how to reflect measurement results in maintenance. Also learn that it is very important to measure actual objects for safe and stable transportation on the Shinkansen.
Monday, May 23	Outline of the JR East Shinkansen Electric & Signal Network System Department (Technical Planing U)	Understand an outline of the organization and operations of the Shinkansen Electric & Signal Network System Department (Technical Planing U).
Monday, May 23	Outline of the JR East Electrical and Signal Network System Department	Understand an outline of the operations and construction system of the Electrical and Signal Network System Department (Construction Management G).

	(Construction Management G)	
Tuesday, May 24	Outline of the Shinkansen Electric & Signal Network System Department (Electric Management U)	Understand an outline of the organization and operations of the Shinkansen Electric & Signal Network System Department (Electric Management U).
Wednesday, May 25	Site observation of the Utsunomiya Station No. 1 Distribution Substation and the Shin-Utsunomiya TSS	The Utsunomiya Station No. 1 Distribution Substation is a facility for supplying power to the Shinkansen's wayside distribution lines. Understand the facility configuration of the station distribution substation through the on-site observation. The Shin-Utsunomiya TSS is an important facility that supplies power to the Tohoku Shinkansen's overhead contact lines. Understand the power supply system of the Shinkansen through the on-site observation.
Thursday, May 26	Outline of the Electrical and Signal Network System Department (Electric Power Technology Management Center)	Understand an outline of the operations of the Electrical and Signal Network System Department (Electric Power Technology Management Center).
Wednesday, June 1	Outline of safety and accident cases <Tutor lectures>	Understand an outline of the three major industrial accidents and electric power accidents. The objectives of this lecture are to understand what kind of accidents occurred in the Electrical Division of the Shinkansen, and to improve awareness and knowledge of safety at NHSRCL, which will operate the first Shinkansen in India.
Thursday, June 2	Site observation of JR East Facility Management Co., Ltd. (BT)	Understand an outline of the operations of the Group company and its educational and training site observation.
Friday, June 3	Site observation of JR East Information Systems Company (JEIS)	Understand an outline of the operations of the Group company.
Monday, June 6	Outline of COSMOS-SCADA facilities at the Shinkansen General Control Center	Understand an outline of facilities and maintenance of COSMOS-SCADA.

Monday, June 6	Outline of the Tokyo Metropolitan Area Shinkansen Electric Power Technology Center	Understand an outline of the operations of the Tokyo Metropolitan Area Shinkansen Electric Power Technology Center, which is in charge of maintaining electrical facilities.
Tuesday, June 7	Outline of the the Tokyo Metropolitan Area Shinkansen Electric Power Technology Center	Understand an outline of the operations of the Tokyo Metropolitan Area Shinkansen Electric Power Technology Center, which is in charge of maintaining electrical facilities. Also observe the Onari Training Center and the Mock-up equipment of the overhead lineto understand the training facilities owned by the Technology Center.
Wednesday, June 8	Overall inspection the Tokyo Metropolitan Area Shinkansen Electric Power Technology Center	Understand how the overall inspection of overhead contact line facilities is carried out. In addition, improve awareness of safety during work by experiencing high-speed running on the Shinkansen wayside.
From Wednesday, June 8 to Thursday, June 9	Night work at a Shin-Omiya TSS the Tokyo Metropolitan Area Shinkansen Electric Power Technology Center	Understand inspection methods and details of inspection by experiencing individual inspections of feeding circuit breakers. Also deepen understanding of procedures to separate and connect equipment using on-site procedure documents and command procedure documents, and deepen understanding toward the construction of a safe work environment.
Friday, June 10	Site observation of the Washinomiya Maintenance Depot	Understand the types of maintenance cars and the roles of the Maintenance Depot as a reference in preparing for the commencement of operation. In addition, confirm how to handle the Mechanical Traversing Device of Washinomiya Maintenance depot and improve knowledge for the optimum arrangement of maintenance cars.
From Friday, June 10 to Saturday, June 11	Inspection from Close Range the Tokyo Metropolitan Area Shinkansen Electric Power Technology Center	Experience the Inspection from Close Range to understand work systems, work flows, safety measures, etc. Deepen understanding of specific inspection work by performing actual wear measurement and other operations at places requiring attention where wear is progressing.
Monday, June 13	Site observation of Total Electric Management Service Co., Ltd. (TEMS)	Understand an outline of the operations of the partner company and its educational and training site observation.

Tuesday, June 14	Site observation of Nippon Rietec Co., Ltd. (NR)	Understand an outline of the operations of the partner company and its educational and training site observation.
Wednesday, June 15	Site observation of Nippon Densetsu Kogyo Co., Ltd. (NDK)	Understand an outline of the operations of the partner company and its educational and training site observation.
Thursday, June 16	Site observation of Total Electric Management Service Co., Ltd. (TEMS)	Understand an outline of the operations of the partner company. Training participants will also gain an understanding of the office environment and the Warehouse at branch offices and service centers.

3.4.3 Overview of the Training Sessions

(1) Site observation of the General Education Center (May 10 and 11)

The curriculum in the morning was common to all the divisions, and the lectures by division and site observations were conducted in the afternoon. At the General Education Center, site observation and training were carried out regarding overhead contact line facilities and power transformation facilities. Training was conducted using the overhead contact line training room, the power supply training room, and the outdoor training lines installed in the General Education Center. Since it was the first opportunity to touch the facilities after the start of lectures by division, lively discussions took place. The training participants were also enthusiastically participating in the training. The training participants were provided with actual hands-on experience with the height of the non-crossing type Overhead Crossing Line Device in the overhead contact line equipment, the deviation measurements, voltage detection and earthing work, and the installation of the full harness.

(2) Site observation of the Shinkansen General Control Center (Electric Power Controller) (May 12, 13, and 14)

Taking the importance of this training into account, people were allowed to enter into the Shinkansen General Control Center on the condition that it was confirmed in advance that their PCR result was negative.

In the Electric Power Controller, an outline of and the organization and operations of the command were explained. Prior to training at the Operation & Control Centre, the training participants were made aware of the command operations by watching images with English commentary about an outline of the Shinkansen in the site observation room at the General Control Center. Accompanying a night shift from 17:30 to 9:50 the next day was also scheduled. The training participants deepened their understanding of specific command operations until the start of power block by receiving an explanation on the Maintenance Work management terminal within the Controller. In particular, they deepened their understanding of cooperation with other Controllers (approval of maintenance work time from the Facility Controller, communication from the Traffic Controller about lowering of pantograph of trains stabled in the station yard, etc.) when accompanying the 2nd shift work.

(3) Site observation of the Tokyo Electrical Construction and System Integration Office (jointly with the S&T Division) (May 18)

Although the target of this training was O&M, it was also necessary to explain about the Tokyo Electrical Construction and System Integration Office in order to explain the whole picture of the electrical organization in JR East. An outline of the organization was explained, and the training participants asked questions about the composition of the number of staff and the number of staff in charge of the Shinkansen. At the Tokyo Electrical Construction and System Integration Office, the training participants exchanged opinions with the Director and Deputy Director.

(4) Site observation of the General Inspection Train (East-i) (May 20)

An outline of the General Inspection Train (East-i) used for inspection of the Shinkansen was explained, and a site observation of East-i was carried out. On the day before the East-i on-board travelling was conducted, an outline was given during a Tutor-based lecture. The program was structured in a manner serving to deepen the understanding of East-i on-board travelling. The training participants boarded on East-i from Oyama Station to Sendai Station. Since measurement operations were outsourced to Total Electric Management Service Co., Ltd. (TEMS), an instructor from TEMS also boarded on it with them.

Major investigation items of electrical facilities for East-i include wear, deviation, height, and hard spots of contact wires, and the switching time of change-over switches is also measured. The training participants asked many technical questions for each inspection.

(5) The Technical Planning Unit, the Shinkansen Electric & Signal Network System Department (jointly with the S&T Division) (May 23)

The Technical Planning Unit of the Shinkansen Electric & Signal Network System Department explained an outline of the organizational revision and an outline of the education and training. The training participants asked many questions about the details of the organization and education and training related to the issues of MAHSR, such as the order of recruitment and the duration of education.

(6) The Construction Management G, the Electrical and Signal Network System Department (jointly with the S&T Division) (May 23)

The Construction Management G of the Electrical and Signal Network System Department explained the importance of railway construction management, including cooperation with partner companies and qualification systems.

(7) The Electric Management Unit, the Shinkansen Electric & Signal Network System Department (May 24)

The Electric Management Unit of the Shinkansen Electric & Signal Network System Department explained the organization, operations, human resource development and training programs related to the electric power

of the Shinkansen. The training participants asked many questions about the organization, such as the detailed composition of the number of staff.

(8) Site observation of the Utsunomiya Station No. 1 Distribution Substation and the Shin-Utsunomiya TSS (May 25)

The Utsunomiya Station No. 1 Distribution Substation and the Shin-Utsunomiya TSS provided the training participants with their first opportunity to see the facilities in operation. Each facility was explained to the training participants from the power receiving side to the load side of both the distribution substation and the traction substation, and a Tutor provided an explanation based on the single-line diagram and the equipment arrangement diagram. The training participants asked about the details described on the single-line diagram. In particular, the training participants asked many questions about protection interlocking in the event of an accident. In addition, thanks to the cooperation of the employees of the Tokyo Metropolitan Area Shinkansen Electric Power Technology Center who accompanied us on site, the training program was smoothly carried out.

(9) The Electrical and Signal Network System Department (the Electric Power Technology Management Center) (May 26)

The Electric Power Technology Management Center of the Electrical and Signal Network System Department explained the organization and operations related to the electric power of conventional lines. The training participants actively asked about the phrases used in work (e.g., E-Smile, ET Campaign, My Hiyatto,

and 4M4E) used in the organization. One measure for introducing energy-saving technology is to introduce Energy storage system, and the training participants asked many specific questions such as about the selection of the installation site, the configuration of equipment in the traction substation, and the control method of the regenerative power.

(10) JR East Facility Management (jointly with the S&T Division) (June 2)

At JR East Facility Management (BT), a site observation of FMTEC in Nakaurawa took place. The company outline was explained, and a site observation of training facilities was conducted. During the training, the training participants observed the accident safety experience area and experienced an accident using virtual reality (VR) to deepen their understanding of safety management implemented by the group company. These should serve as a reference for training facilities to build a safety culture. In addition, the training participants observed various practice rooms, such as facilities installed on station platforms, firefighting equipment, and electrical facilities, and actively asked many questions.

(11) JR East Information Systems Company (jointly with the S&T Division) (June 3)

At JR East Information Systems Company (JEIS), the training participants observed the JEIS Operation & Control Centre in the Shinkansen general office. After receiving an explanation about an outline of the company, they observed the COSMOS equipment room, the COSMOS-SCADA equipment room, the

COSMOS training room, COSMOS, and COSMOS-SCADA shift operations. The training participants asked many questions mainly about COSMOS-SCADA, and discussed the layout of the equipment rooms and the roles of various servers. Since some of the contents of COSMOS-SCADA were also included in the lectures on the Electric Power Controller, efforts were made to prevent the training participants from attending similar lectures in duplicate.

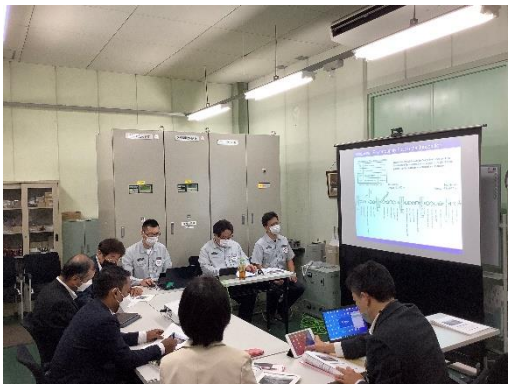
(12) The Tokyo Metropolitan Area Shinkansen Electric Power Technology Center (June 6, 7, 8, 9, 10, 11)

A site observation of the office at the Tokyo Metropolitan Area Shinkansen Electric Power Technology Center took place, and an outline of its operations was explained. Regarding an outline of the office, the training participants asked questions about the boundaries of the maintenance center and education provided at the Technology Center. Subsequently, the specific contents of operations at each department were explained.

During the site observation of the Tokyo Metropolitan Area Shinkansen Electric Power Technology Center , the following were carried out: Overall inspection of overhead equipment, individual inspection of feeding circuit breakers at the Shin-Omiya Traction Substation, Inspection from Close Range, etc. In the overall inspection, the training participants went through the procedure of entering within fences and experienced high-speed running of the Shinkansen up close. After confirming the precautions for entering within fences in advance at the office and completing the roll call in front of the protection fence, they confirmed the procedure for entering within fences and entered within the fence. Within the fence, they carried out refuge from a passing Shinkansen train set, and visually checked the presence or absence of obstacles and the soundness of facilities according to the items to be checked in the overall inspection.

In the individual inspection of feeding circuit breakers, after voltage detection/earthing and separation/connection of circuit breakers, they performed a visual inspection of the main body and the operation part, measurement of the minimum breaking voltage, insulation resistance measurement, etc. They also confirmed how inspection results were registered with facility management system (NEWSS), and understood the sequence of individual inspections.

In the Inspection from Close Range, they rode on a maintenance car called the Maintenance Wagon (MW) to inspect overhead contact lines. The training participants were also invited to participate in the B roll call, and held a careful meeting about KYM (Kiken Yochi Meeting), work systems, and roles.

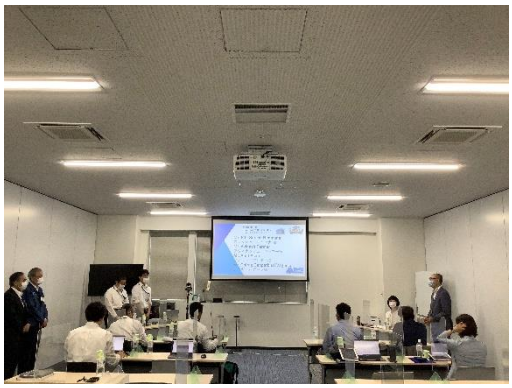




(13) Total Electric Management Service (jointly with the S&T Division) (June 13 and 16)

At Total Electric Management Service (TEMS), the training participants observed the training facilities of the TEMS Technical Academy in Oyama. An outline of the company, the training program of the Technical Academy, and safety initiatives were introduced. The Electrical Division and the S&T Division separately conducted a site observation of the training facilities, and facilities for conventional lines were mainly introduced. Those present were able to observe the fabrication and handling of the isolated rolling tower, with the training participants also seriously checking on the work being undertaken.

On June 16, they observed the Service Center (SC) of the TEMS Tokyo Branch to confirm the workplace environment and Warehouse. There were many questions asked by training participants about the depot assigned for SC and Dispatch Office, and about the number of employees.

(14)　Nippon Rietec (jointly with the S&T Division) (June 14)

At Nippon Rietec (NR), the training participants observed the training facilities in Yumemino. An outline of the company and the training programs provided at the training facilities were introduced. The Electrical Division and the S&T Division separately conducted a site observation of the training facilities, and site observations were carried out on overhead contact lines, power supply, power distribution, and all the Electrical fields.

When it came to the overhead contact line, training participants observed the outdoor overhead contact line equipment and warehouses used for training. Regarding power distribution, the switchover operation of high voltage receiving boards No.1 and No. 2, and the interlocking leading up to generator operation were confirmed. When it came to power supply, training participants observed how the setting values were amended using a Protection Interlocking Device. They observed elements such as the entry of input position information using a simulated parent on the locator panel. This made for a program that participants could only experience at an NR training facility.

(15) Nippon Densetsu Kogyo (jointly with the S&T Division) (June 15)

At Nippon Densetsu Kogyo (NDK), the training participants observed the training facilities of the Chuo Gakuen in Kashiwa. This training was carried out jointly with the S&T division throughout the day. In the morning, based on the brochures distributed in advance, training participants observed the Safety Culture Creation Museum and took part in VR experience related to safety. They were also provided with hands-on experience concerning electricity, and so on. Observation of training facilities was carried out starting in the afternoon. In terms of signaling, training participants confirmed the mechanisms and manual adjustment of point machines. In terms of telecommunication, the training participants checked the installation of the LCX and connector structures. In terms of the overhead contact line, training participants received hands-on experience with respect to the procedure involved in returning vehicles onto the track (for rail cum road vehicles), with the lifting and lowering of rail cum road vehicles, with revolving the rail cum road vehicles in high places, and so on.

3.2.4 Findings

(1) Curriculum structure and training content

During the period leading up to the start of this training, an online exchange of opinions between the Tutors and the training participants allowed us to gain an understanding in advance of any requests or other opinions related to the training program. We were then able to reflect that feedback upon the content of the training.

The site observations were essential when it came to facilitating a deepening of the understanding of training participants. For example, while training participants were quick to gain understanding of the roles and functions of electrical facilities, which are a familiar sight on Indian railways, there were some instances where gaining an understanding of unfamiliar maintenance tasks was difficult. However, through lectures and observations of JR East's Technology Center, there were many opportunities to witness the progress of training participants when it came to their understanding of maintenance work. There were also many technical questions and answers provided during the observation of the General Inspection Train (East-i). I believe that this was an ideal opportunity for participants to actively deepen their understanding of the technical content based on the sense of responsibility that comes with becoming persons responsible for practical work for O&M at NHSRCL.

At the General Education Center, observation and training were carried out for overhead contact line equipment and for power supply equipment. Since this was the first opportunity for the training participants to get experience with electrical facilities during this training program, it was observed that training participants actively participated in the training and also undertook active discussions.

At the SHINKANSEN General Control Center, the training participants were actually present for the shift work (mainly the Electric Power Controller). This was very useful in facilitating a deepening of their understanding of the specific command operations taking place up until the commencement of power block.

Regarding the work of traction substations, distribution substations, and maintenance cars, it seems that training participants were satisfied with having conducted observations of actual transportation facilities. Meanwhile, there were opinions provided by training participants to the effect that the training period was too short to acquire specialized knowledge. There were also requests provided to the effect that participants wanted to deepen their understanding of responses to abnormality, something that could not be experienced in practice during this training program.

(2) Training Materials

Some of the lecture materials included a mixture of content concerning conventional lines and Shinkansen lines, so it took some time to organize the contents related to the Shinkansen. We had the impression that it took some time for training participants to gain an understanding of the organizational structure and role of the SHINKANSEN General Management Department. As such, the Tutor provided a detailed explanation to the training participants at a later date.

There were opinions provided by training participants to the effect that the teaching materials (lecture materials) were sufficient when it came to ascertaining the outline of the Shinkansen. However, it was also found that the training participants wanted a more detailed explanation of each individual item, such as with respect to the overhead contact line, the protective relay for the power supply, and the role of the switchboard. As for the details of such facilities, another program to visit Japan is planned to take place after this training program. Training on such is planned for that time.

Lecture materials were distributed to the training participants in the form of computer files on the Friday of the preceding week. However, there was an opinion provided to the effect that depending on the program content in question that they wanted to have the lecture materials sent out as soon as possible. This also serves as evidence that the training participants are taking their training seriously, and shows that they have learned about, even if only a little, the power supply technology of the Shinkansen.

(3) Training Methods

By allocating sufficient time for questions and answers during the lecture, training participants were able to ask and have answered many questions right then and there, thereby facilitating the understanding among training participants. This element was also highly praised by the training participants. Meanwhile, sufficient question periods could not be secured for some lectures. Questions were accepted after the lectures and answers provided at a later date. During the Tutor-based lectures, discussions were held using whiteboards to promote the understanding of the training participants.

The program was praised for its gradual introduction of aspects such as Common Subjects, Division-wise Subjects, practical training at the Shin-Shirakawa General Education Center, the Control Center and Technology Center, and training sessions conducted at group companies and partner companies.

(4) Training participants' reactions and participations

The schedule was very tight and the training participants became tired during the training. However, their insatiable thirst for knowledge and experience had them using their idle time to conduct self study. Even after the training, they presented questions to the Tutors.

3.5 Division-wise Subject [Rolling Stock]

3.5.1 Training Overview

Rolling Stock Division Training was composed of three layers, that is, Rolling Stock, Rolling Stock Management, and Gemba (Site) as shown in Fig. 1 below. It was intended that training participants will be able to not only understand the outline of rolling stock operations and maintenance in Japanese Shinkansen but also obtain necessary knowledge comprehensively before starting O&M preparation and management by learning rolling stock itself which will be the basis of every operations as well as its management and actual maintenance work conducted in Gemba (Sites).

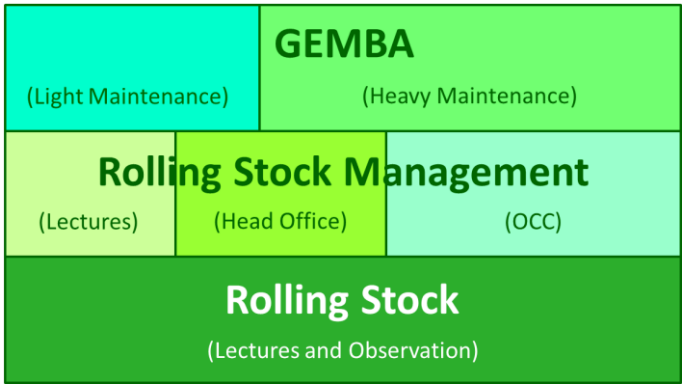
In the first half of the training, lectures were given focusing on the basis of Series E5 Shinkansen EMU on which the Rolling Stock launched in India will be designed. And, the basic structures of rolling stock such as their car body and bogie, the outline of various equipment including traction circuit equipment, brake system, safety equipment as well as service equipment were covered in the lectures so that training participants can grasp the overall picture of the rolling stock. Moreover, some terminology related to rolling stock was introduced in Japanese to urge training participants to learn some of them for the future training and major schematic diagrams were also explained to deeply understand the mechanism and function of each equipment in addition to the general knowledge. From different perspective, training participants also touched upon the past development history of Shinkansen starting from the commencement of Tokaido Shinkansen learning some differences from the conventional lines as well as the latest technology to be aware of what is significant in dealing with Shinkansen in the future. Finally, opportunities to observe train simulators and actual rolling stock were also provided to ensure the basic knowledge acquired in the lectures by visiting the JR East General Education Centre and the Tokyo Shinkansen Rolling Stock Centre respectively. And the observation of East-i (Shinkansen General Electric and Track Inspection Train) was also carried out to observe the dedicated trainset and actual measurements considering that the General Inspection Train (GIT) will be launched in India.

After learning basic knowledge of rolling stock, lectures with regard to rolling stock management as well as train operations were given in the middle of the training to deepen understanding of the concepts necessary for safe operation of rolling stock. Training participants visited the Shinkansen Transport & Rolling Stock Department to learn organizations and management resources related to rolling stock and they also attended lectures on both Traffic Controller and Train & Crew Controller in the Shinkansen General Control Centre where they learned the roles and management of rolling stock in operation control as well as agile response in case of emergency. When it comes to rolling stock management, a few case studies on safety and quality were also conducted in addition to ordinary lectures. Discussions through the comparison between India and Japan and some past incidents gave them clear vision on the importance of rolling stock management.

In the last three weeks, training participants visited Gemba (Site Offices) equivalent to Tane, Surat, and Sabarmati Rolling Stock Depot, that is, the Morioka Shinkansen Rolling Stock Centre and the Shinkansen General Rolling Stock Centre in Sendai, to attain a complete image of rolling stock maintenance work ranging from light maintenance such as Daily Inspection and Regular Inspection to heavy maintenance such as Bogie Inspection and General Inspection. Training participants also observed rolling stock management in each centre, maintenance of depot machines and some maintenance work outsourced to group companies from JR East and were given opportunities to share information as well as exchange opinions on rolling stock maintenance with those who are engaged in actual maintenance work at each site, which was helpful for their better understanding.

Through this three-layer program, it is expected that training participants will be able to start working on O&M preparation much more smoothly after completing this training program.

Figure. 3.2　Structure of training（Rolling Stock Division）



3.5.2　Objectives and Aims of the Training Sessions

[Objectives and aims of the lectures]

Date	Lecture name	Objectives and aims
Monday, May 9	Orientation <Tutor Lecture>	Clarify the objectives of the entire curriculum and important points of lectures and observations in each day to raise training participants' awareness upon starting the training.
Monday, May 9	Rolling Stock Management （Importance of Safety） <Tutor Lecture>	Learn the importance of safety referring to past incidents, case studies as well as safety initiatives in JR East.
Tuesday, May 10	JR East General Education Centre Train Simulator	Experience assembling an emergency ladder and understand train operation and securing safety by ATC through the observation of Shinkansen Train Simulators.
Wednesday, May 11	Outline of Rolling Stock <Tutor Lecture>	Understand the background leading to the development of Series E5 through the lecture on the past development history of Shinkansen starting from Tokaido Shinkansen and learn major characteristics of Series E5 such as environmental performance as well as greater comfort.
Wednesday, May 11	Car body, Outfitting, Bogie <Tutor Lecture>	Learn equipment distinctive to Shinkansen through lectures on Car body, Outfitting, and bogie of Series E5.
Thursday, May 12	Traction Circuit <Tutor Lecture>	Learn traction circuit structure of Series E5 such as traction converter, VCB, traction motor, etc. and understand the operation of equipment in energizing cars with a schematic diagram.

Friday, May 13	Control Circuit, S-TIMS <Tutor Lecture>	Learn major equipment installed in the driving cab and the passenger cabin, type of switches and their operation, and the function of S-TIMS.
Friday, May 13	Auxiliary Circuit <Tutor Lecture>	Understand the structure and operation of equipment such as APU and air conditioner while learning the circuit constitution of each service equipment called tertiary circuit.
Monday, May 16	Brake System <Tutor Lecture>	Learn types of brake system adopted in Series E5 such as service brake, emergency brake, and urgent brake while understanding the operating condition and mechanism with actual schematic diagrams.
Tuesday, May 17	Observation of General Inspection Train (East-i) <Tutor Lecture/TEMS>	Understand the outline of measurement work and feedback of results to maintenance boarding East-i (Shinkansen General Electric and Track Inspection Train).
Wednesday, May 18	Tokyo Shinkansen Rolling Stock Centre Observation of Series E5	Deepen the understanding of rolling stock structure obtained in the lecture observing an actual Series E5 as well as observe basic maintenance facilities such as disconnector and movement prohibition indicator.
Thursday, May 19	Safety Equipment <Tutor Lecture>	Learn the role of each part of on-board equipment and operation mechanism with regard to DS-ATC, safety equipment installed on Series E5.
Friday, May 20 Monday, May 23	Shinkansen General Management Department Rolling Stock Unit Lectures	Understand the outline of Shinkansen Rolling Stock Management in the Head Office through lectures on various operations which are carried out in the Rolling Stock Unit.
Tuesday, May 24 Wednesday, May 25	Shinkansen General Control Centre Lectures	Understand the operation control work and its importance through lectures on traffic controller and train & crew controller.
Thursday, May 26	Rolling Stock Management <Tutor Lecture>	Learn COSMOS used in depots and how to read slips as well as various initiatives related to work safety, accident restoration and failure prevention with some case studies to understand the importance of safety and quality.
Monday, May 30	Auxiliary Circuit <Tutor Lecture>	Understand the mechanism of primary circuits such as VCB control circuit, door closing circuit, and so on using schematic diagrams.
Tuesday, May 31	Morioka Shinkansen Rolling Stock Centre Outline	Understand the outline through lectures and observations in the centre where light maintenance is conducted.
Wednesday, June 1	Morioka Shinkansen Rolling Stock Centre Station Dispatch Office, ATC Characteristic Inspection	Learn coupling/uncoupling work at a station and response in case of emergency through the observation of the station dispatch office. Understand the actual work and related equipment in the observation of ATC characteristic inspection.

Thursday, June 2	Morioka Shinkansen Rolling Stock Centre Regular Inspection	Learn important points in regular inspection while deepening the understanding of rolling stock structure through the observation of regular inspection.
Friday, June 3 Saturday, June 4	Morioka Shinkansen Rolling Stock Centre Daily Inspection	Learn work contents of daily inspection, shunting, and car cleaning (night shift work) in the observation while understanding the night shift work.
Monday, June 6	Shinkansen General Rolling Stock Centre Outline, General Affairs Section	Visit the centre to understand the outline through lectures and observations. Learn the importance of work safety and training through observation of training facility related to safety while grasping roles in each group of the General Affairs Section.
Tuesday, June 7	Shinkansen General Rolling Stock Centre Bogie Maintenance Section	Learn the outline of bogie maintenance as well as work contents through the outline lecture on the section and the observation of bogie maintenance line.
Wednesday, June 8	Shinkansen General Rolling Stock Centre Car Body Maintenance Section	Learn the outline of car maintenance as well as maintenance work of removed equipment and parts through the outline lecture on the section and the observation of car body maintenance line.
Thursday, June 9	Group Companies	Visit JR East Rail Car Technology & Maintenance and JR East Techno Service Co., Ltd. to understand maintenance work, relevant work, as well as depot machine maintenance through the outline lectures and observations.
Friday, June 10	Shinkansen General Rolling Stock Centre Transport Control Section	Grasp the work planning in the centre through the outline lecture and observation while learning ancillary work observing shunting work and wheel turning.
Monday, June 13	Shinkansen General Rolling Stock Centre Technical Section	Learn various procedures with regard to rolling stock retrofit work as well as maintenance technical training through the outline lecture and the observation of technical training centre.
Monday, June 13	Shinkansen General Rolling Stock Centre Facility Section	Learn the outline of facility management necessary for maintenance through the outline lecture and the observation of infrastructure in the premises such as industrial water and power supply facilities, etc.
Tuesday, June 14	Shinkansen General Rolling Stock Centre Inspection Section	Learn the role of completion inspection and work contents through the outline lecture and the observation of pre-departure check and running test on the mainline pertaining to the completion inspection.
Wednesday, June 15	Shinkansen General Rolling Stock Centre Production Control Section	Learn bogie and general inspection planning, work schedule management, material management, and contract management through the outline lecture and the observation of warehouse.
Wednesday, June 15	Shinkansen General Rolling Stock Centre Quality Control Section	Learn quality control of inspected trainsets and how to investigate rolling stock failure while deepening the understanding of network management through the outline lecture.

Thursday, June 16	Wrap Up Session <Tutor Lecture>	Review the contents covered in the lectures and observations as well as sort out future tasks to be carried out to start the O&M preparation smoothly after the training.

3.5.3 Overview of Lectures and Site Observations

(1) Tutor lectures (First half: May 9, 11, 12, 13, and 16)

The objectives of the entire curriculum and important points of lectures and observations in each day was clarified to raise awareness upon starting the training in the orientation on May 9, where it was also emphasized that this training was the origin of not only Key O&M Leader (KOML)'s activities but also every O&M preparation and it was crucial to build a bridge for mutual understanding through the training.

On May 11, the development history of Shinkansen, Outline of JR East Shinkansen, Research and Development using test trainsets as well as the outline of Series E5 were covered with the rolling stock outline training material. In the Shinknasen history lecture where the development railway system was explained referring to Japanese history, training participants especially became aware of differences between conventional lines and Shinkansen.

On May 12, lectures on car body and bogie were followed by a lecture related to traction circuit where training participants were able to understand the mechanism of the circuit using the actual schematic diagram with regard to the method to energize a car which training participants had confirmed in the train simulator observation on May 10.

On May 13, other auxiliary circuits, electric circuits as well as S-TIMS were explained. Training participants asked many questions based on their experiences and fruitful discussion was made as some of the equipment were used in rolling stock in India.

On May 16, an explanation was made on the brake system using the training material as well as the schematic diagram of the system. In the discussion about the interim presentation, training participants decided to summarize the development history of Shinkansen as well as the outline of Series E5 comparing with rolling stock which they had experienced in India before.

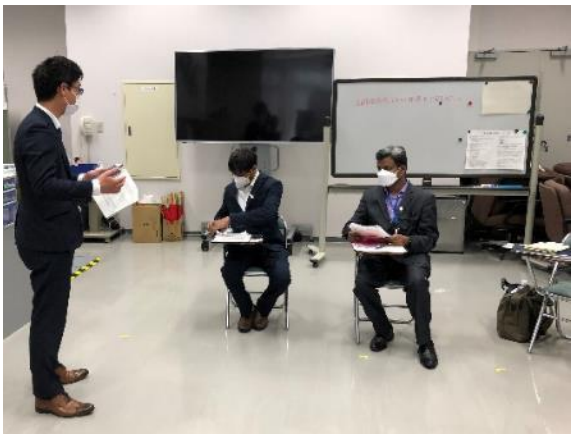
(2) JR East General Education Centre (May 10)

Training participants experienced assembling an emergency ladder first, and after that, they not only experienced the procedure to energize a trainset but also confirmed train operation between stations and ATC operation in the train

simulator. Moreover, training participants experienced shunting operation where they tried some scenarios such as a person crossing just in front of the train and safety equipment operation.

(3) Shinkansen General Electric and Track Inspection Train (May 17)

Training participants were given a lecture on the outline of East-i (Shinkansen General Electric and Track Inspection Train) in the morning. They also observed actual measurement work related to LCX wave and ATC signal conducted by the S&T division boarding a train running from Tokyo to Sendai in the afternoon.



(4) Tokyo Shinkansen Rolling Stock Centre (May 18)

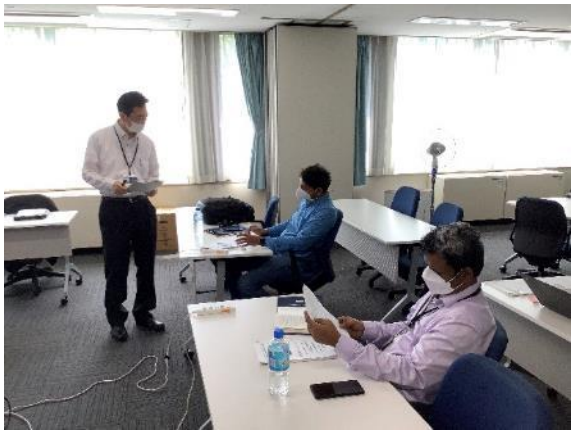
Training participants visited the Tokyo Shinkansen Rolling Stock Centre where they observed not only basic maintenance facilities but also an actual Series E5 trainset after safety instruction. They could also deepen the understanding of rolling stock structure learned in the lecture such as rooftop and underfloor equipment, driving cab, and various facilities. Moreover, they had an opportunity to exchange opinions with employees who attended the site visit.

(5) Tutor Lectures (Latter half: May 19, 26, and 30)

On May 19, safety equipment was explained. Training participants could understand the details with careful explanation although it contained difficult contents which required a wide range of knowledge from on-board and ground equipment to train operation. A lecture on work procedures in depots including COSMOS outline was also given in the afternoon.

On May 26, after the tutor answered questions asked in the General Control Centre lecture, the lecture on work procedures in depots including COSMOS outline was continued in addition to the preparation of the interim presentation to be held on May 27.

On May 30, a case study on work safety was covered based on the past incident to discuss the importance of safety management. Some safety initiatives conducted in JR East were also introduced as a related topic. Moreover, some initiatives on quality improvement in JR East were also covered as an important topic.



(6) Shinkansen General Management Department (May 20 and 23)

On May 20, training participants visited the Shinkansen General Management Department where they could understand the entire picture of Shinkansen rolling stock management in the Head Office through lectures on the Rolling Stock Unit, relevant laws and regulations, procurement and retrofit as well as maintenance facilities.

On May 23, training participants attended lectures on planning to execute each work, budget control, and material management to understand interdepartmental cooperation with regard to rolling stock management as well as the importance of material management including cash flow.

(7) Shinkansen General Control Centre (May 24 and 25)

On May 24, training participants learned the organization outline and roles of the Shinkansen General Control Centre as well as various tasks conducted in the traffic controller such as time management of commercial operation and maintenance and the cooperation in case of failure among a train operator, a conductor, and each controller.

On May 25, training participants learned the organization outline and roles of the train & crew controller as well as various tasks conducted in the controller such as the procedures on controller's report, cooperation with related sections, and response to emergency cases including rolling stock failure and an outage case in a tunnel.

(8) Morioka Shinkansen Rolling Stock Centre (May 31 through June 4)

On May 31, training participants visited the Morioka Shinkansen Rolling Stock Centre where they observed disconnectors, movement prohibition indicators, various testing equipment, warehouse, re-railing equipment as well as training facilities inside the premises after the outline lecture and safety instruction were given.

On June 1, Training participants visited the Morioka Station Dispatch Office where they observed coupling/uncoupling work as well as learned how staff members in the office respond to rolling stock failure or the like. In the afternoon, they observed the depot control centre work and ATC Characteristic Inspection after returning to the centre.

On June 2, training participants observed regular inspection of Series E5 all day. They had a chance to observe not only replacement work of consumables but also function test using the monitor. In addition, they also learned some measurement work using jigs and dedicated equipment, tool and material management as well as procedures related to work order or completion.

From June 3 to 4, training participants observed daily inspection and cleaning work conducted in the night shift. In the daily inspection, they observed every work conducted by each staff member to grasp the entire image. Moreover, they observed car cleaning and washing work as well as shunting work to understand works carried out in parallel with daily inspection.

(9) Shinkansen General Rolling Stock Centre (June 6 through 15)

On June 6, training participants visited the Shinkansen General Rolling Stock Centre where they deepened the understanding of the importance of work safety in the observation of safety training facility while learning various tasks carried out in each group of the General Affairs Section after the outline lecture and observation in the premises.

On June 7, training participants visited the Bogie Maintenance Section where they observed the bogie maintenance line after the outline lecture. In this observation, they learned various maintenance work such as bogie frame, wheelset, and brake parts while observing bogie exchange work in the Bogie Inspection.

On June 8, training participants visited the Car body Maintenance Section where they observed the car body maintenance line after the outline lecture. In this observation, they learned various maintenance work such as car body dismantling and assembling work while observing equipment maintenance such as traction converter, safety equipment, and the like in the afternoon.

On June 9, training participants visited JR East Rail Car Technology & Maintenance where they observed depot machine maintenance work as well as equipment maintenance work. They also visited JR East Techno Service Co., Ltd. in the afternoon to observe facilities for environmental conservation, cleaning work, and the like after the outline lecture.

On June 10, training participants visited the Transport Control Section where they observed work in the Depot Control Centre, wheel turning work, and the yard office after the outline lecture while boarding shunted trainsets to understand the operation work inside the premises.

On June 13, training participants visited the Technical Section in the morning where they observed various training facilities such as train simulator for troubleshooting, door equipment, pantograph, coupling device, and the like after the outline lecture. In the afternoon, they visited the Facility Section where they observed various equipment rooms and infrastructure facilities such as discharged water treatment facilities after the outline lecture.

On June 14, training participants visited the Inspection Section where they observed the completion inspection of Series E7 (tertiary energization test) after the outline lecture in the morning while they observed inspection items carried out in the running test after the General Inspection boarding round trip train between Sendai and Kitakami in the afternoon.

On June 15, training participants visited the Production Control Section in the morning where they observed the spare parts warehouse and general warehouse after the outline lecture. In the afternoon, they visited the Quality Control Section where they had an opportunity to discuss quality improvement with persons in charge after the outline lecture.

(10) Wrap up (June 16)

Training participants made a preparation for the final presentation reviewing what they had learned throughout the training from May 9 to June 15.

3.5.4 Findings

(1) Curriculum structure and training content

As described in 3.5.1, the training was designed so that training participants could grasp the overall image of Shinkansen rolling stock and its maintenance through lectures focusing on Series E5 which were implemented in the first half of the training as well as observations of various organizations conducting rolling stock management and actual rolling stock maintenance work which were implemented in the latter half of the training. Among these contents, tutors spent sufficient time in teaching rolling stock knowledge which is the core in this division. As a result of detailed explanation of schematic diagrams and opportunities to observe actual rolling stock in addition to the contents covered in the textbook which was handed before the training, training participants could have established solid basis on the topic upon starting various consideration after this training. As for rolling stock maintenance, training participants thought that they didn't have enough time to cover the contents, however, tutors have found that the time and allocation in the curriculum were plausible to understand the entire image within the range of 2 months period considering that it takes a great amount of time and effort to understand all the details of each content.

(2) Training Materials

For lectures, new training materials were prepared which added some supplementary contents based on the original textbook and schematic diagrams of rolling stock and case studies were also provided to help training participants understand the outline of rolling stock and its maintenance. In addition, some basic Japanese terminology were added in each training material and introduced in lectures. For observations, outline materials were basically prepared in each site so that training participants could understand the contents much better. Among these contents, schematic diagrams were found helpful for training participants in understanding the function of rolling stock whereas case studies were also beneficial in that training participants had opportunities

to discuss safety and quality which are the most important topics in rolling stock management based on their past work experiences and tutors, on the other hand, could urge training participants to understand the importance of initiatives on safety and quality while grasping their understanding toward these topics. When it comes to Japanese terminology, it was found that training participants felt difficulties with them, but it can be used a dictionary with images afterwards as these terminology are not covered in the ordinary dictionaries.

(3) Training Methods

Tutor's lectures were provided in English and included many QA sessions and discussion opportunities to ensure training participants understanding. Moreover, the program was intended to deepen mutual understanding as railway operators by not only providing as much observation as possible in each limited time slot but also holding discussion sessions with persons in charge. As a result, training participants gave feedback in the questionnaire that they were very satisfied with the training whereas instructors in each site also commented that they were greatly stimulated. It is considered that this training was beneficial to both parties.

(4) Training participants' reactions and participations

As training participants who attended the training had rolling stock development and maintenance experiences and sufficient time to study the textbook and material before starting the training, they could fully understand the contents through lectures and observations. However, sufficient time for digesting what they had learned should be included during the training for appropriate output since they learned new contents every day and needed to submit many reports and interim and final presentation by the deadline. Moreover, as frequent long-distance travels were planned during the training, itinerary with a certain margin was desired. Especially, in the longer-period training like this training, the training party should travel to the next location early in the evening to adjust the pace for the next day instead of traveling to the next location after conducting the training up until the last time in the evening.

(5) Other findings

According to the questionnaire result, training participants were almost satisfied with the training program although they had some dissatisfaction on the limited amount of time. Especially, schematic diagrams were found helpful for them to understand the rolling stock outline and they also were satisfied with answers to each question as a result of fully confirming the intention of questions and consciously compensating for the deviation and loss due to the sequential interpretation. Furthermore, it was significant in this training that training participants could fully understand not only rolling stock outline and actual maintenance work but also various Japanese ways including soft aspects such as safety culture and improvement activities in Gemba (Site).

3.6 Division-wise Subject [Train Operation]

3.6.1 Training Overview

It is not an exaggeration to say that the O in O&M, meaning Operation, refers to the Transportation Division itself.

The Transportation Division shoulders almost everything in terms of any and all kinds of operations. Operation is built on complex simultaneous equations. In operations, we must understand things, understand how to use them, understand the circumstances, cooperate with each other, optimize management, and continue to challenge customer service improvement and ultimate safety. That's what an operation is. This is the responsibility shouldered by the Transportation Division.

In order to come up with an operation method that is best suited to the present situation based on the composition of railways, it is necessary to learn all sorts of things. The scope of the learning involved can be said to be limitless. Japan's railways and JR East's railway business are operated by making full use of all management resources, including people, goods, money, information and rules. In other words, there are mechanisms which exist that do not form overnight. From on-site operations to various corporate management-related decisions, the Transportation Division (experienced individuals) is responsible for the core tasks of a railway company. Therefore, it is necessary to acquire knowledge in the following broad-ranging areas.

- Practical work on the frontlines... Station transportation, Train Conductor operations, Train Operator operations, vehicle cleaning (train car inspection), etc.
- Management on the frontlines... Train Conductor guidance operations (including new trainee training)
  Train Operator guidance operations (including new trainee training)
  Arrangements for the creation of Train Crew work assignments and the allocation of work attendance amendments
  Instantaneous Train Crew arrangements during train operation disruptions,
  Plan for work inside yard premise
  (Rolling stock inspection plans, vehicle cleaning plans, stabling track plans, shunting train operation plans, etc.)
  Instantaneous amendment to work plan for work inside yard premise during train operation disruption
  Planning operations, human resource development, and office management undertaken at Site Office
  (Creating work, creating human resources and creating offices)
- Management of the entirety of the frontlines...Traffic Controller operations (regular work, train traffic operation arrangements, etc.)
  Train & Crew Controller operations
  (Change in schedule of rolling stock, Train Operator and Train Conductor, and vehicle failure handling, etc.)
  Passenger & Information Management Controller operations,
  Information Controller operations
  Controller guidance operations

Chief Controller operations (including the duties of the Deputy Chief Controller and those of individuals in charge of coordination and management)
General Chief Controller operations

・Direct practical operations for planning...Transport planning (formulation of trainset timetables)
Rolling stock scheduling (formulation of rolling stock route schedule)
Train Operators scheduling (formulation of Train Operator route schedule, etc.),
Train Conductor scheduling (formulation of Train Conductor route schedule, etc.)
Train Crew guidance (management of In-house Rules and other such items, formulation and revision of handling and manuals, consideration and implementation of accident prevention and items for which guidance has been provided, training plans, coordination with various departments, and so on)

・Indirect practical operations related to planning...Personnel supply and demand plans
Review of personnel appointments
Training programs for new Train Crew
Education, training and HR development planning
Transportation facility planning (balance between hard and soft elements, such as maintenance of safety equipment and railway signals, setting of various indicators, and Train Crew depot and facilities)

・Management of corporate management...Safety planning
Customer service quality reforms
Facility investment planning
Labor and human resources planning (rules of employment, related rules, Train Crew work attendance systems, etc.)
*The specific gravity of the Transportation Division is large when it also comes to corporate management as well (cross-functional departments, etc.).

It was decided that during this training, a bird's-eye view-based approach would be taken within a limited period of time, wherein participants would proceed with learning using the Three Principles of Actualities for as long as time permits.

In terms of the above classifications, it was decided that everything from practical work on the front lines to indirect practical work for planning would be covered. In addition, the content of corporate management (cross-functional departments, etc.) related to the Transportation Division is larger than that of other divisions. Therefore, it was decided not that not only would the study of Common Subjects take place, but also that mindsets (when it comes to safety, customer preferences, cost efficiency, etc.) would be consciously conveyed during the training for each division.

Details of division-wise training plans are as follows.

(9) During the theoretical training, the contents planned mainly consisted of that which should be understood at the minimum in the limited period of time allotted.

To be specific, it was decided that each of the above fields would be introduced individually to give an outline of transportation departments and that the introduction would be provided with mutual cooperation being undertaken.

It was also decided that basic subjects among those involved in Off-JT training for railway business personnel, especially power car operators and other such individuals who need licenses issued by the relevant ministries and agencies, would also be covered (laws and regulations of train operation and theory for efficient train operation).

Furthermore, a training program was established in which the work-related know-how that is usually acquired through on-the-job training is incorporated within Off-JT (transport planning, rolling stock scheduling, crew scheduling, Rolling Stock Center yard work overview, transportation facility, practical work of the Transportation Service Unit and Transportation Planning Unit of SHINKANSEN Transport & Rolling Stock Department,).

In addition to that, in order to ensure that the practical training at the site being inspected is productive, lectures were set up in advance to provide supplemental knowledge. Those lectures were concerning Shinkansen-specific train cars and facilities/equipment, an outline of Train Crew depot and the charge of the SHINKANSEN General Control Center (theoretical training frame).

(10) The content of the practical training was planned as a content to understand the practical work by accumuleting.

The curriculum was set up in a manner that allowed participants to understand that railways are built on a foundation of practical works. Specifically, the training course has been set up to teach participants about work on the frontlines at stations and Train Crew Depot about management on the frontlines at the Train Crew Depot and the Rolling Stock Center, and about overall management of the frontlines at the Operation & Control Centre.

The number of training days has been configured in consideration of the quantitative and qualitative weight of the items being learned.

In addition, it was an opportunity to learn the objectives of safety, service, and efficiency by thoroughly implementing the Three Principles of Actualities. Without confusing objectives with methods, things were planned so that one can become an executive who can think on their own to achieve an objective.

(11) This reflects the request received from NHSRCL in FY 2019.

A two-shift system was set up in order to facilitate the study disaster prevention at an underground passenger station: one for a tour and training taking place at Ueno Station, and another consisting overnight work training at an Operation & Control Centre to learn about night work. Especially, with respect to the latter, it was decided that both time frames (one involving sleep early and going to wake up early, and one involving going to sleep later and waking up later) could be learned about by setting

up two working shifts. As a result of this, the work of 24-hour system can be learned about in a comprehensive manner.

Moreover, based on the opinion of NHSRCL, the plan devised was entailed making Friday an overnight work shift day to ensure that learning opportunities were not missed, even though Saturday is also an off-duty day (meaning training taking place after taking a nap and waking up). This is in order to increase the number of learning opportunities (learning time) during the period in question.

(12) A site suitable for MAHSR was selected as the site to be observed during practical training.

For example, Karuizawa Station was selected for the practical training related to train operation duty at stations, not major stations such as Tokyo Station, Ueno Station, and Omiya Station.

The reasons for the selection of Karuizawa Station are as follows:

- It is not starting station or end station, but a station on the way.
- It is a station operated only by the Shinkansen, with no JR East convention lines. Thus, the basics can be learned through specialization.
- It is a simple interlocking station with two platforms and four tracks, with turnback operation also being possible.
- There are both types of b passengers; tourist passengers and commuting passengers.
- There are both stopping trains and passing trains
- Platform screen doors are installed
- There are some platforms of the Loop Line without screen doors.
- The training base is located in an area which makes day-trips from the Tokyo metropolitan area possible (convenience of transportation)

Moreover, during the practice training for Train Crew Depot, the Sendai Shinkansen Crew Depot was selected for the following reasons. The selection was not only based on the number of employees of the office, the range of boarding, and the type(s) of vehicles for which crew board.

- In charge of the Tohoku Shinkansen line running the E5 series to be introduced in India
- It is easy to set up an on-board travelling route with only crew operations of the Tohoku Shinkansen.
- It is easy to learn thanks to the single line that provides guidance to the Train Crew.
- It is closer to the Tokyo Metropolitan Area than other districts (Morioka) with the same requirements ;convenience of transportation.

Due to the limited amount time available, there was no particular emphasis placed on coupling and uncoupling (KOMACHI and/or TSUBASA) for which the implementation thereof is not scheduled to take place at the MAHSR and no any emphasis placed on the details of direct train operation between JR and other companies (Hokkaido Shinkansen and Hokuriku Shinkansen).

On the other hand, the Tokyo Shinkansen Rolling Stock Center was selected for the Rolling Stock Center yard training with an emphasis having been placed on “knowing plan formulation” as opposed to being place on “knowing train cars.”

・Daily inspections and vehicle cleanings are carried out 24 hours a day, especially late at night and early in the morning. All type(s) of vehicles for all lines are amassed together for this, so it is required the most technical technique for yard work planning.
・There are a considerable number of intermediate roll calls conducted for Train Operators. There are also lots of Train Crew management operations undertaken during shifts.
・Exists in the Tokyo Metropolitan Area (convenience of movement)

Shunting operation, a part of call-on operations and vehicle cleaning, at the Rolling Stock Center, are outsourced. JR EAST TECHNO HEART TESSEI was selected from the viewpoint of its expertise and the technology it has when it comes to those areas. The specific reasons are as follows:

・Work is being carried out at the Tokyo Shinkansen Rolling Stock Center, which conducts training for work performed in the yard.
・Cleaning of train interiors is being conducted quickly and carefully within the time set aside for turnback (Tokyo Station).
・The corporate culture is based on the spirit of hospitality.

(13) A conscious effort was made to ensure that theoretical training and practical training were connected.

For example, the laws and regulations of train operation covered in the theoretical training were incorporated into the training so that participants could learn in a comprehensive manner (all at once). Because they are elements such as the General Principles of Safety and the General Provisions, which constitute a foundation for frontline employees (Train Crew) working on site.

Moreover, with respect to 'the transportation facility' of the theoretical training, it was decided that participants would deepen their understanding of training concerning train operation duty at stations and training at Train Crew depot by providing them with explanations beforehand on the roles and positioning of transportation facilities.

In the theoretical training for 'the outline of Rolling Stock center work inside yard premise', 'rolling stock scheduling', 'crew scheduling', and 'transport planning', the practical work involved in the formulation of plans was explained using a viewpoint based on train timetable revision. Meanwhile, things were also planned so that knowledge and work could become connected together by having participants learn, during practical work training at the Rolling Stock Center, the Train Crew depot and the Operation & Control Centre (Traffic Controller and Train & Crew Controller), daily planning and arrangements taking place for transport disruptions.

(14) There is much interest in COSMOS, which controls a wide range of Shinkansen operations.

Learning a system does not mean learning how to configure it or enter data. Understanding people, things and rules is the only approach to take when it comes to contemplating optimal specifications.

Therefore, it was decided that we would forgo learning technical details about system development with specialized study time. In addition it was decided that we provide interrelated explanations on what can be done using COSMOS along with what COSMOS is not used for.

The system has functions, such as indications of various kinds of information, supporting the consideration of things, the management of track records and plans, and so on. It is not, however, a system which 'automatically thinks up ideas for of train traffic operation arrangements and route control'. Thus, the training contents have been set up so that participants are informed why people-based systems (human thinking) are necessary.

3.6.2 Objectives and Aims of the Training Sessions

[Objectives and Aims of the Lectures]

Implementation date	Lecture name	Objectives and aims of the lectures
Friday, May 6	Orientation (Verbal communication) <Tutor-based lecture>	[Objective] To ensure the permeance of future training policies and the stances on learning ・Don't confuse objectives with techniques. Create by thinking. ・Learn about people, things, and rules, rather than systems. ・Safety (fail-safe) and the customer's perspective (Customer Service First) constitute the basis of judgement.
Monday, May 9	Overview of Transportation Division duty <JR East SHINKANSEN Transport & Rolling Stock Department, Transportation Service Unit>	[Objective] To learn from a bird's-eye view about the diverse operations of the transportation department ・In terms of the introductory part, an understanding will first be gained on how each item to be learned within the theoretical training and practical training works together. ・There are also many practical tasks (such as frontline management and planning) that can be performed only when working at a specific department or when entrusted with specific responsibilities (planning division, work as a manager, and so on). As such, we will promote an understanding of practical work that is not limited to the frontlines at work sites.
Monday, May 9	Train operation duty at station <SHINKANSEN Transport & Rolling Stock Department, Transportation Service Unit>	[Objective] To learn about platform transport duties, train operation handling, and related facilities amid a situation where systematization and central control are progressing. Normal operations ・Caution regarding conditions ・Boarding/Alighting Completion Signs ・Door reopening signs

		・Movable fence handling ・Emergency stop arrangements, etc. Responses to abnormalities/abnormal situations ・Operation methods (RS-ATC, Substitute Safety Method) ・Correct stopping position ・Entry Within Tracks or Access Path for Workers (Act on Special Provisions Concerning the Punishment for Conduct Impeding the Safety of the Train Operation on the Shinkansen Railway) ・Handling in the event of non-conversion of points, etc. Station control terminals ・Basic operation ・Operation when abnormalities/abnormal situations are faced Station facilities ・Inside the platform operation room ・Inside the station office rooms ・Platform facilities, equipment, etc.
Tuesday, May 10	Training experience with series E5 simulator for Train Operators <JR East General Training Center>	[Objective] To gain an understanding the advantageous effects delivered to instruction and education by simulators which are closer to reality through hands-on experience with the simulators that Train Crew actually handle. Also, to have participants exchange opinions with lecturers and listen to what lecturers have to say with respect to the training of new people and other such matters, and to have the insight gained be leveraged for future training. ・Hands-on experience with the simulator ・Exchange of opinions on training new Train Crew members
Wednesday, May 11	Transport planning <SHINKANSEN Transport & Rolling Stock Department, Transportation Planning Unit>	[Objective] Learn how Shinkansen timetables are planned and created. About demand forecasts and investigations on transportation track records ・Factors which facilitate an understanding of transport demand (by fiscal year, by region, by regular timing and non-regular timing, etc.)

		・Usage track record investigation methods and their utilization (ridership report, etc.) ・Demand assumption methods Timetable and train diagram ・Foundational knowledge for timetable and train diagram (described items, how to read, etc.) ・Timetable formulation procedures ・Timetable configurations (conditions required for configuration)
Thursday, May 12	Rolling stock scheduling <SHINKANSEN Transport & Rolling Stock Department, Transportation Planning Unit>	[Objective] To acquire the foundational knowledge necessary for rolling stock scheduling, such as train car inspection systems and basic operational concepts. Foundational knowledge for the preparation of rolling stock scheduling ・Conditions considered for rolling stock scheduling (Transportation conditions, overnight stay of trainset at the Rolling Stock Depot, inspection capability, etc.) ・Mindsets in terms of the number of train cars held ・Train car inspection types Presentation of rolling stock schedules ・Scheduling diagram for rolling stock ・Rolling stock roster ・Rolling stock route schedule ・Stabling capacity Inspection plan ・Various kilometrages as indicators of operational management ・Inspection period and periodicity thereof ・Inspection period and periodicity, number of required instances of implementation thereof
Thursday, May 12	Crew scheduling <SHINKANSEN Transport & Rolling Stock Department,	[Objective] To learn the foundational knowledge necessary for crew scheduling, such as that pertaining to Train Crew work attendance systems and work shift plans for Train Crew. Foundational knowledge for the creation of crew routes

	Transportation Planning Unit>	・About the Train Crew work attendance system ・Crew route creation ・Precautions and conditions for crew route creation (Accommodation locations, lines under one's charge, type(s) of vehicles, personnel, restrictions, etc.) ・Presentation of crew schedules Roster chart for crew route order ・Crew scheduling chart ・Crew operation route chart ・Crew route chart
Friday, May 13	Overview of yard works at Rolling Stock Center <SHINKANSEN Transport & Rolling Stock Department, Transportation Service Unit>	[Objective] To provide an overview of work inside yard premise plans so that the operations of the Rolling Stock Depot can be undertaken smoothly. Rolling Stock Depot operations ・Rolling stock maintenance ・Train interior cleaning ・Yard shunting Plan for work inside yard premise ・Yard shunting plan ・Daily work report
Friday, May 13	Outline of works at Train Crew depot <SHINKANSEN Transport & Rolling Stock Department, Transportation Service Unit>	[Objective] To gain an understanding of the outline of the Train Crew Depot business of JR East. To gain an understanding of the organization, the chain of order, the framework for cooperation with the planning division, Train Crew training structures, etc. Legal systems such as the Railway Business Act Roles and responsibilities ・Assignment of Train Crew to trainsets ・Train Crew competence management ・Training of Train Crew ・Career support for employees Guidance and promotion in cooperation with the planning department ・Human resource development

		・Management of attendance to work ・Train Crew Competence management ・Implementation of measures Role of Train Crew Training Manager (nearly equal to the head of the crew depot) Driver licenses, theoretical training, practical training, and Certification Checks at individual places
Monday, May 16	Vehicle equipment, and transportation facilities particular to the Shinkansen <SHINKANSEN Transport & Rolling Stock Department, Transportation Service Unit>	[Objective] To deepen one's understanding of signal methods and safety methods which are different from that seen on conventional lines from the viewpoints of ground equipment, on-board equipment, and train operation. Characteristics of vehicles ・Gauge ・Vehicle shape ・Structure of rolling stock ・Power system ・Control system Signaling System Features (ATC) ・DS-ATC configuration ・DS-ATC functions ・Transponder ・Cab monitor screen display ・Track circuit, signal aspect, and speed check pattern
Tuesday, May 17	Laws and regulations of train operation <SHINKANSEN Transport & Rolling Stock Department, Transportation Service Unit>	[Objective] To learn the basics and concepts of the rules, from those constituting the legal systems serving as the foundation of railways to those used in the handling of daily train operation. Legal systems, In-house Rules, etc., and Standards (General Guidelines) for Management of SHINKANSEN Train Operation Safety Implementation Standards for SHINKANSEN Train Operation ・Definitions of terms ・Operation of trainsets ・Protection of trainsets ・Shunting of vehicles

		・ATC Method ・Operation using Railway Signalling ・Cab Signal ・Special Signal ・Action taken with respect to accidents
Wednesday, May 18	Theory for efficient train operation <SHINKANSEN Transport & Rolling Stock Department, Transportation Service Unit>	[Objective] To develop the ability to lead and plan logically by learning theory which serves to move trainsets reasonably and economically based on the laws of physics when it comes to elements such as train car performance and track structure, as well as based on operational techniques, conditions and so on. ・Tractive force acting in the traffic direction of the trainset, running resistance and braking force ・Calculation of elements such as train position and speed (velocity) using the equation of motion ・Running conditions (power running, coasting, etc.) of the trainset and the running time between stations are shown as the train performance curve, according to the theory for efficient train operation
Wednesday, May 18	Transportation facility <SHINKANSEN Transport & Rolling Stock Department, Transportation Planning Unit>	[Objective] In a broad sense, this refers to all the equipment necessary to move trainsets and train cars. Participants will deepen their understanding of the transportation facilities (excluding train cars, fuel, and so on) which form the foundation of the railway business. Learn about relationships with people and rules, and learn about backgrounds. ・Shinkansen train operation system ・Track chart for train operation ・Facilities and equipment found between stations, within station yards, and within Rolling Stock Center yards Completion of Train Crew and Rolling Stock Depot and equipment and facilities
Thursday, May 19 Friday, May 20	Operations of the SHINKANSEN General Control Center	[Objective] To understand the organization and operations of the Operation & Control Centre, which supports daily Shinkansen operations.

	<SHINKANSEN General Control Center, Traffic Controller Office>	Outline of Operation & Control Centre and Controller operations Outline of the Traffic Controller office ・Traffic Controller operations ・Passenger & Information Management Controller operations ・Train & Crew Controller operations ・Organizational chart, framework, number of employees, and roles by responsibility ・Education and training
Monday, May 23	Practical training for operations at an underground passenger station <Ueno Station>	[Objective] Participants will visit an underground station and learn about its facilities and management, fire prevention and disaster prevention, evacuation guidance, and so on. Facilities, equipment and rules specific to underground passenger stations ・Facility tour ・Handling of evacuation-related guidance, etc. ・Hands-on experience with the evacuation staircase (from the 4th basement level to the ground outside of the station) ・Visit to bases, etc. at inside station related to disaster prevention
Tuesday, May 24	Practical training for train operation duty at station <Karuizawa Station>	[Objective] To gain an understanding primarily of handling of transport duties, the systems and facilities/equipment for Shinkansen stations. Overview and operational aspects ・Dimensions [Outline of station, details of work, number of employees (By position and responsibility), etc.] ・Office initiatives ・Office work and ticket gate operations (introduction) ・Methods for providing guidance and information to customers (especially during train operation disruptions) ・Response to disasters, earthquakes, etc. (manuals, evacuation methods, and stockpiles) ・Coordination with the SHINKANSEN General Management Department, the SHINKANSEN General Control Center, and other divisions

		Train operation duty at station ・Initiatives serving to prevent accidents and ensure safety during daily work ・Caution regarding conditions, Boarding/Alighting Completion Sign ・Train protection (related facilities and equipment) ・Handling of movable fences (including failure) [on-site explanation] ・Responses to abnormalities/abnormal situations ・Wrong stopping position (on-site explanation of stopping position) ・Lost and found (explanation provided with the local site also being involved) ・At the time of enforcement of RS-ATC and the Substitute Safety Method (Station System, Pilot Station System) ・Ledgers (introduction) Station facilities, etc. ・Departure route setting lamp ・CCTV ・Indications providing information on boarding locations ・PID board ・Emergency Stop Button ・COSMOS (station terminal) Ledgers related to station transportation Other facilities in the platform operation room and in station buildings (Example: Operation information terminals, etc.)
Wednesday, May 25 Thursday, May 26	Practical training for the Rolling Stock Depot yard <Tokyo Shinkansen Rolling Stock Center>	[Objective] To gain an understanding of the operations thereof that are carried out in the yard of the Shinkansen Rolling Stock Center, and its organization. Outline, etc. ・Dimensions (Type(s) of vehicles, scale of depot entry/exit, type of operations, type of maintenance, employees, by office organization, by duties and so on) ・Action targets and initiatives of the office

		・Characteristics in terms of a Shinkansen Rolling Stock Center in the Metropolitan Area ・Precautions concerning work and management in Shinkansen vehicles ・Work commissioned to group company JR East Techno Heart TESSEI (vehicle cleaning, etc.) ・Coordination with the SHINKANSEN General Management Department, the SHINKANSEN General Control Center, and other divisions Daily Inspection ・Simulated inspection tours ・On top of the roof, undersides, driving cabs ・Tour to view the handling of disconnectors and Movement Prohibition Signs Plan for work inside yard premise ・Formulation of plans for yard shunting on the following day and two days after ・Responding to requests for in-vehicle training from other sites and requests for maintenance work ・A plan that takes into account the pace of the Train Operators and the motion of the cleaning team in the yard ・Transmission to each department in the office (including group companies) of formulated plans ・Amendment of the shunting plan on the day of due to transport disruptions or vehicle failures (A series of work tasks starting from a preliminary meeting with OCC) ・The following work-related meetings conducted via radio with arriving Train Operators (Example: Stabling tracks) ・Prior meetings for the arrangement of requested maintenance work along with the setting of prohibition and subsequent releasing of the tracks used in the work ・Work performed at the time of coupling/uncoupling of vehicles [Uncoupling/coupling configuration, trigger terminal operation, and guidance work]

		・Handling in the event of the non-conversion of switches ・Inspection result management, inspection plans, and arrangements ・Arrangements for repairs in cases of vehicle failure ・Cooperation with OCC when the timetable is disrupted Crew management operations ・Intermediate roll call for Train Crew and information card on the trainset boarded at the depot Understanding of yard track layout ・Tour of local sites ・Understanding in terms of wiring diagrams Other ・Office management (roll calls, morning assemblies, work attendance management, and equipment handling) ・Handling of vehicle failure reports ・COSMOS usage examples ・Safety initiatives
Monday, May 30	SHINKANSEN Transport & Rolling Stock Department Transportation Service Unit Operation Training	[Objective] To gain an understanding of planning, Train Crew guidance and management, station employee education, and contract work related to transportation for the Shinkansen. Planning operations ・Personnel management ・Management of measures concerning the Shinkansen Train Crew guidance operations ・Train Crew Competence management reports ・Responses and measures with respect to irregular events attributable to the Train Crew ・On-board travelling assistance ・Guidance and management of yard shunting operations Station education and training operations ・Planning and implementation of training programs for new Station Managers on duty of train operation management and regular training for Station Managers on duty of train operation management Contracted operations

		・Conclusion of service contracts (Shinkansen vehicle cleaning contracts) ・Cleaning by JR East Group companies in each region
From Tuesday, May 31 to Saturday, June 4	Practical training for controller operations <SHINKANSEN General Control Center, Traffic Controller Office>	[Objective] To understand the organization and operations of the Operation & Control Centre, which supports daily Shinkansen operations. Explanations of overall outlines ・Organizational goals ・Organization, number of employees, job organization, responsibilities, and chain of orders ・Crisis management ・Major career history before becoming a Traffic Controller or a Train & Crew Controller ・JR East Shinkansen network ・Explanation involving an outline of COSMOS (functions related to the Transportation Division) Explanation and introduction of each Controller ・Traffic Controller, Train & Crew Controller, Passenger & Information Management Controller and Information Controller Facility Controller, S&T Controller, Electric Power Controller and OCC System Controller (Facility Controller and others; Brief explanations) Public relations ・External responses ・Provision of information in the event of an abnormality/abnormal situation Organization of the emergency headquarters ・Installation standard ・Scope when it comes to the calling of meetings ・How to contact and collaborate with the head office, the SHINKANSEN General Management Department, branch offices, and site offices ・Information collection and transmission tools (TV conference systems, etc.) Efforts to ensure safety and improve the quality of transportation

		・Various drills taking place on a joint basis (earthquake drills, etc.) ・Various training programs (including training for newly assigned Controllers) ・Visits by Controllers to Site Office ・Training for abnormalities and abnormal situations with actual train cars and turnback operation training (introduction) Collaboration with planning departments and Site Office ・SFD (Shinkansen Free Discussion) ・Information collection, transmittals, and contact methods Traffic Controller operations ・Framework ・Details of operations under one's charge (Chief Controller, coordinators, and individual controllers) ・Equipment and facility functions and operations (terminals for train traffic operation arrangements, train operation information terminals, radios/telephones, etc.) ・Handling of transport disruption (flow of arrangements based on events) ・Methods for train traffic operation arrangements ・Operation Time and Maintenance Work Time Train & Crew Controller operations ・Framework ・Details of operations under one's charge (Chief Controllers, operational coordinators, vehicle manager nad individuals) ・Equipment and facility functions and operations (Train Crew terminal on the day of, rolling stock assignment, rolling stock management system, train car technical support system, etc.) ・Responses to abnormalities/abnormal situations ・Methods for change in schedule (Train and Crew) Passenger & Information Management Controller operations ・Framework ・Details of operations under one's charge (Chief Controller, Deputy Chief Controller and individuals)

		・Equipment and facility functions and operation (MARS terminals, public addresses taking place all at once, ridership report systems, etc.) Guidance to passengers in cases of abnormalities/abnormal situations ・Disseminating information to site offices and passengers ・Arrangements for connections between the Shinkansen and conventional lines ・Transfer to substitute transportation and temporary parking of trainsets ・Passenger transfers Information Controller ・Description of operations handled ・Function and operation of equipment and facilities (information boards, etc.) Controller guidance operations (Traffic Controller, Train & Crew Controller,) ・Training and education for Controllers ・In-house Rules and manual management ・Training plans ・Support system for abnormalities/abnormal situations Other ・Introduction of past events ・Introduction and trial operation of training machines (terminals for train traffic operation arrangements)
Monday, June 6 to Thursday, June 9	District training for Train Crew depot <Sendai Shinkansen Train Crew depot >	[Objective] ・To gain an understanding of the duties of Train Conductors and Train Operators who support Shinkansen operations on the frontlines ・To gain an understanding of the management organization of the Train Crew Depot and how to instruct the Train Crew Outline, etc. ・Dimensions such as range of operation, type(s) of vehicles being operated by crew, number of employees (by job type and responsibility)

		・Implementation targets, voluntary improvement activities (committee activities) and initiatives ・The pride of shouldering the responsibility of handling the Shinkansen and points to pay special attention to (Front-line transportation service roles) ・Irregular (shift) work systems (Use tablets to facilitate employee awareness, allow childcare/nursing care work, etc.) ・Coordination with the SHINKANSEN General Management Department, the SHINKANSEN General Control Center, and other divisions Train Crew guidance operations ・Training of trainees (Guidance provided by instructors and teachers) (Certification Checks for independent driving by Head of Site Office, etc.) (Especially for Train Operators, practical training, practical examinations, and education involving tours of the train lines they will be operating after obtaining a license for Shinkansen type(s) of vehicles) ・Training and guidance (Formulation of annual plans and planning and implementation of regular training) ・Guidance for on-board travelling (on-board travelling record book and ascertaining of individuals to be utilized for instruction) ・Promotion of safety, prevention of accidents and prevention of recurrence (Object lessons from events, follow up on events when they occur, and promote safety activities) ・Raising awareness of safety, etc. based on past cases (Events related to doors, signals, and work) ・Customer Service (Importance and awareness of customer perspectives) (Customer service, customer reception, personal appearance, in-car patrols, provision of information during abnormalities/abnormal situations)

		・Fare adjustment work taking place on trains ・Management of qualifications held and deadlines for Psycho-technical Aptitude Tests (Train Operation aptitude, medical aptitude), ・Management of sleep (SAS inspections, etc.) ・Other (Collaboration with the Training Center, collaboration with the SHINKANSEN General Management Department and the SHINKANSEN General Control Center, as well as the chain of order) Plan-making operations ・COSMOS input ・Train timetable revision work ・Preparation and collation of portable timetables used daily by Train Crew ・Planned work based on instructions (including OCC Controller arrangements) Crew management operations ・Managing people, goods, and money as an acting head of site ・Time management, operation management, and train operation status management ・Importance of roll calls ・Alcohol detector, intermediate calls, checks for eyeglasses, etc. ・Train Crew arrangements and cooperation with Command when the timetable is disrupted ・Daily work attendance arrangements, work attendance amendments, management of work hours, monthly work attendance preparation ・Comprehensive transportation system, work attendance/leaving office systems, etc. ・Wake-up device management for one's depot, management of places of accommodation at outside destinations, management of baggage loaned to Train Crew, and management of sales proceeds

		Administrative planning operations ・Organization of working hours, management of salaries ・General affairs, clothing, and welfare ・Role as a position which overlooks and supports the entirety Human resource development ・Involvement with employees ・Fostering of human resources for the next generation Main line on-board (Train Conductor and Train Operator) ・The series of steps from arrival at office to start of on-board ・The series of steps from the end of on-board to the point of leaving office ・Train Operator's duties, such as train driving (four principles of train operation, etc.) ・Passenger guidance. Train Conductor duties such as handling doors and train protection staff. ・Basic actions, pointing and calling, and equipment/facility handling ・On-board travelling reports On-board travelling, site tours, and desk-based explanations ・Understanding rules, handling, facilities/equipment, etc. ・Series E5, each stop type and type of pass-through, Train stop Marker , special work, places of accommodation at destinations and transit offices ・Train Conductor: Door handling, in-car patrols, passenger guidance, etc. ・Train Operator: Train running time, signs, equipment preparing at the time of turnback, and the series of actions taking place from arrival to departure
Friday, June 10	SHINKANSEN Transport & Rolling Stock Department, Transport planning unit Operational training	[Objective] To gain an understanding the work involved in transport planning, Train & Crew scheduling, and transportation facility planning related to Shinkansen transportation. The following content, which was also explained during the theoretical training, was supplemented in line with practical operations Transport planning

		・Flow of formulation of Shinkansen transportation planning ・Conditions for the formulation of Shinkansen transport planning ・Introduction of COSMOS transportation planning functions and opportunities for trial operation Scheduling work (Train cars, Train Operators, Train Conductors) ・Flow of Train & Crew scheduling ・Introduction of COSMOS rolling stock scheduling functions and opportunities for trial operation ・COSMOS crew scheduling function introduction and opportunity for trial operation Transportation facility plan ・Introduction of case examples of consideration based on the present plan ・Coordination with other departments (horizontal cooperation), coordination with site offices (vertical cooperation)
Monday, June 13 Tuesday, June 14	Practical training for vehicle cleaning and yard shunting work <JR East Techno Heart TESSI; Tabata and Tokyo Service Centers>	[Objective] To gain an understanding vehicle cleaning work, which is important for maintaining and improving the quality of Shinkansen transportation, as well as shunting work taking place in the yard (which serves to support the aforementioned). Overall matters concerning items such as company overviews ・Dimensions of elements such as management targets, missions, details of operations, number of employees (by position and by responsibility), and management issues, etc. ・Initiatives for safety and hospitality, etc. ・Precautions when it comes to work and management taking place in the train cars of Shinkansen trains (special devices and management, etc.) ・Daily order flows, consignment schemes, and horizontal division of labor with JR East Commissioned operations and management ・Cleaning work (Daily cleaning and in-vehicle cleaning during turnback to the station) ・Yard operations (shunting operation, etc.)

		・Employee work schedule creation and work attendance management Education, skill improvement and nurturing ・Implementation status of regular training and planned education, and training and education involving the utilization train car mock-ups ・Responses to cleaning performance qualifications and various competitions ・Human resource development and training for new employees Work tour ・On-board travelling during shunting operation ・Vehicle cleaning inside the Rolling Stock Center yard ・Cleaning of the front of the train car (Bonnet cleaning) ・Draining sewage and water supply work ・Handling of Movement Prohibition Signs ・In-vehicle cleaning during turnback at Tokyo Station ・Office work offices (Tokyo SC, Tabata SC) and crew management operations ・Examples of system utilization (COSMOS, etc.)
Wednesday, June 15	Practical training for SHINKANSEN Transport & Rolling Stock Department	[Objective] To ensure that finishing takes place by reviewing all the contents of what was studied. Supplement with additional teaching content. ・One-year flow regarding the work of timetable revision ・Work related to train performance curve chart (including system trial operations
Thursday, June 16	Summary of training <Tutor-based lecture>	Looking back on the entirety of the training

3.6.3 Findings

(1) Curriculum structure and training content

・The transportation division is characterized by a very wide scope and is also deep because it covers the entirety of the railway. We were, however, able to plan and implement a substantial content menu.

・Before an individual can become a fully-contributing team member, time is required on a monthly or annual basis for them to learn each task pertaining to the transportation division.

Although there was a limited time of 8 weeks (including 6 weeks for Division-wise training), we were able to ensure that the program provided the best content possible.

・Japan (JR East) also conducts a division of labor in the transportation division, but only three training participants must know all the details in relation thereto. Therefore, the minimum necessary items were prioritized as a base to built upon.

-> As a result of these three points, the training participants were able to gain an understanding of the points which should be ascertained by candidates for executive positions.

・Training at stations was specialized in some aspects. The background behind that consists of the following two reasons.

The first reason, is that the functions of transport duties (train operation) at stations have been reduced (meaning that things have been moving toward a centralized system).

Second, this training program does not cover business fields (ticket issuing, ticket examination, and fare/charge rules), inside station business (commerce), or income management.

-> As a result, we were able to complete the menu to be implemented, also prevented the disputed issues from spreading.

・At the beginning of the training, the basic concepts (three points to be described later) were taught and repeated during the training period.

“Do not confuse the objective with the methods. Create by thinking. ”

“Learn about the correlation between people, things and rules. It’s not a system premise”

“We base our decisions on safety (fail-safe) and customer perspectives (customer service first).”

・The program was prepared in a manner which served to systematically facilitate the gaining of an understanding on the content of theory training and the work involved in practical training.

・It was decided that during the practical training, an understanding would be gained concerning the importance of the Three Principles of Actualities (actual sites, actual objects, and actual people).

・The content of practical training is diverse; it includes frontline work, guidance work, management work, and planning work.

Therefore, we planned things so that training participants could gain an understanding of them in order.

-> These four points enabled the training participants to learn using viewpoints based on both a vertical axis and a horizontal axis

・The content of the requests from NHSRCL was reflected upon the content.
One of the contents is the incorporation of night work. Another is to increase learning opportunities by off-duty Saturdays rather than holidays.
・Among the many Site Offices of JR East, the places suitable for the plans of the Indian HSR (High Speed Railway) were selected as places for training (observation).
・The plan was formulated in a manner so that COSMOS could be learned at every training place.
・ We also provided an opportunity to learn necessary systems other than COSMOS.
-> These four points made the training participants think again about their mission.

(2) Training Materials

The teaching materials were made to be easy to understand for employees who were learning about railways for the first time. As a result, the training participants were able to understand that the mechanisms of Japanese railways are built on the historical transitions of conventional lines, not the Shinkansen lines. About 80% to 90% of rules, facilities and educational mindsets are the same as those for the conventional lines. It was possible to further promote the understanding of the mindsets involved through the teaching materials used.

(3) Training Methods

・Continued instruction was provided to the effect that objectives not be confused with the methods when getting caught up in detailed explanations and methods.
・When questions were focused on the functions and specifications of the system, it was reiterated that the correlation between people, things, and rules (not the system itself) was what is important.
・Training participants were reminded that the foundation upon which railways are built, is safety, and that train cars are a “lump of iron” that may end up taking someone’s life if the ground is walked on.
At the observations taking place of the roofs of the vehicle, the training participants took their own unique actions, but by giving attention no accidents (bud of accident) happened and safety was ensured.
・There were actions that could have served to cause a misunderstanding among the general public (passengers) at some of the observation sites, but we were able to improve upon the

service-focused mindset of the training participants by continuously communicating to them customer-driven and customer perspective-focused approaches.

・At the beginning of the training program, there was a strong tendency for Q&A sessions to start before the lecture had reached completion. However, by separating the Q&A portions from the explanations (division by time) and communicating that information before the lecture started, we were able to proceed smoothly and make effective use of the time.

・We were able to bring the management of training to completion by cooperating with JICA Coordinators on various issues.

There were some issues that need to be solved. One is that when three training participants were present, one of them would asked a question and the other two would start talking about something different. Another issue is that questions would continue on and the discussions ended up exceeding the allotted amount of time. Another issue was that training participants wanted responses to be provided for even minute matters that should be dealt with flexibly.

・The working stances taken by the participants during the training were also well reflected within the results (scores) of their comprehension level tests.

・Instead of focusing only on copying and pasting the Japanese version, how things were set up encouraged people to gain an understanding the essence of the text, which was effective.

・Some of the same questions were repeated for the third or fourth time at different training locations.

The effective utilization of question sessions was attempted by having follow-ups conducted in a sequential manner.

・By continuing to encouraging learning based on a broad perspective, looking at things from a bird's-eye view, and based on an accumulation of experience with practical tasks (meaning from both upper and lower perspectives), we were able to successfully complete training that was general, comprehensive, and systematic (which was the objective of this training).

(4) Training participants' reactions and participations

・Although the specialties of each of the three individuals were different areas of the transportation division (Train Crew guidance, OCC , train operation at station), the participants were also able to study the content with an interest in the fields of the other two individuals.

・They seemed to have been highly satisfied with what they could learn in a limited period of time.

・The training participants seemed to be satisfied with the contents of the instruction provided.

(5) Other findings

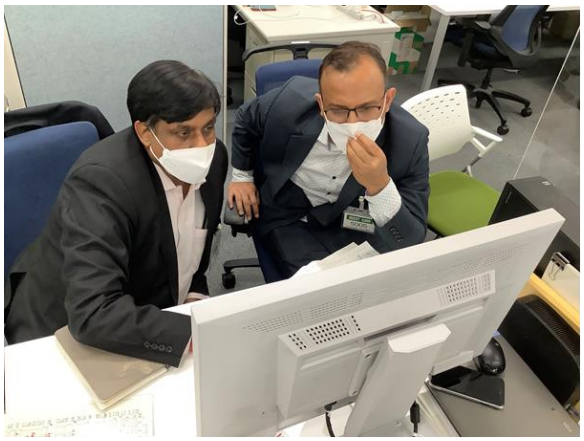
Within the training plan, time frame configuration, learning scope configuration, and the configuration of goals to be achieved, are all respectively linked. Our mutual recognition is that through the exchanges of opinions conducted on site, we were able to confirm that if the opinions of those doing the teaching (instructors and Tutors actually conduct the training on site) and the training participants actually attending the training, could be reflected upon the content of the training plans (scheme) in advance, which means that better training programs can be planned. The formulation of training schemes themselves should be based on the knowledge of the Three Principles of Actualities.

Photo 1: Observation of the Karuizawa Station platform facilities

Photo 2: Observation of facilities at the Tokyo Shinkansen Rolling Stock Center yard

Photo 3: Observation of roll call space in the Sendai Shinkansen Train Crew Depot

Photo 4: System terminal test operation taking place at the SHINKANSEN Transport & Rolling Stock Department



Chapter 4 Issues, Measures, and Lessons Learned in Implementing and Operating the Project (Project Implementation Method, Operation System, etc.)

4.1 Issues and Measures in Implementing and Operating the Project

Major issues in implementing this project included the following:

・Since it was necessary to correctly convey highly specialized technical knowledge including knowledge about railway technology and the O&M system for the Shinkansen, it was necessary to ensure that railway technical terms were translated correctly during the preparation of teaching materials and interpreted correctly during lectures and site observations.

・As there were a wide variety of essential topics to be learned, it needed to establish a system for constantly promoting and checking the level of understanding of the training participants, in addition to unilaterally providing lectures and site observation instructions.

・It was necessary to systematically inform the meeting time and other information to training staff and training participants because the curriculum structure was complicated, and the training start times at observation sites and travel times differed from day to day. Another issue was time management of the tight schedule.

・Since most of the training participants were vegetarians, consideration was required for meals at the observation sites.

・As the training participants visited Japan for training with the COVID-19 pandemic still not completely under control, there were many issues related to infection control. First, it was extremely difficult to design training schedules and arrange lecturers because the quarantine period after entering Japan was constantly changing according to the status of infections. In order to prevent a cluster among people related to the training and to prevent infection risks at observation sites that play an important role in social infrastructure, it was necessary to take all possible measures to prevent COVID-19 infections in conducting the training.

The following describes the measures that were taken with respect to these issues in the implementation and operation of this training.

(1) Quality control of the translation and interpretation level of railway English

The translation of the training material was outsourced to a translation agency that had experience in translating railway English. In addition, since the training material for this training used many highly specialized railway technical terms, such as those defined in the MAHSR Project, we loaned the translation agency training textbooks and terminology lists that were prepared in the past for the MAHSR Project as references. When the first draft of the

English translation was submitted, a full check was conducted from the perspective of whether the correct railway technical terms (English) were used, in addition to checking the presence or absence of mistranslations, to prepare the final version. As a result, the training material was highly evaluated by more than 85% of the training participants.

JICA Coordinators served as interpreters during the training. While the JICA Coordinators had high-level language skills, it was difficult for them to respond spontaneously to highly technical topics. Therefore, we requested them to make thorough preparations before interpreting during the training. For example, we provided them with English and Japanese versions of almost all the training material sufficiently in advance. English-Japanese railway terminology lists for MAHSR and Japanese and English versions of the Core Staff Training textbooks were also provided. For advanced technical lectures, JICA kindly arranged another JICA Coordinator with sufficient technical backgrounds. In the theoretical lectures given by Tutors, the Tutors gave lectures in English to the extent possible. When using an interpreter, the Tutors provided supplementary explanation of the meaning of advanced technical terms to the JICA Coordinators in Japanese, and provided support by showing the corresponding railway technology terms in English. Thanks to these efforts made by all concerned parties, the training participant questionnaires showed that most of the training participants were highly satisfied with the interpreting, which we believe indicates that the quality of the interpreting during this training was maintained at a consistent level.

(2) Promoting and ensuring understanding and checking the level of understanding

In the Division-wise Subjects, two Tutors were assigned to each division in order to promote understanding of a wide variety of learning items. At least one Tutor always accompanied the training and acted as a mediator between the lecturer/site observation instructor and the interpreter. The Tutors also responded to questions from the training participants and followed up on unclear points in order to promote understanding of the learning items.

Based on our experience to have Indian trainees at a training in Japan, we recognized that they tended to prefer a learning style involving sufficient Q&As to deepen their understanding. Therefore, particularly in the Division-wise Subjects, the Tutors spent sufficient time for Q&A sessions, and responded to various questions from individual training participants to the extent possible. Specifically, for questions that a lecturer was not able to answer immediately at a training site, the lecturer or the Tutor prepared answers by making inquiries with the relevant parties and made sure to provide feedback to the training participants at a later date. As a result, the training participant questionnaires showed that all training participants were highly satisfied with their active participation in the training, including Q&As.

Q&A sessions not only resulted in clearing up uncertain points, but also served as a barometer of the level of understanding of the training participants for each lecture and site observation. The methods for checking the level of understanding of lectures and site observations also included Site Observation Reports and Weekly Reports. In Site Observation Reports, the assigned training participants record detailed information about the observation sites. The Tutor checks whether there are any discrepancies in the training participant's understanding, and if there are any matters to be corrected, points them out and requests resubmission. In Weekly Reports, the training participants summarize the especially essential points in the training they undertake each week, and the Tutors review them immediately after submission to check the level of understanding of the training participants.

The Interim Presentation Session was held in the morning of May 27 in the style where the training participants themselves played the role of lecturer and explained the basic theory and outline of their own division to the other division's training participants. By looking for ways to explain using easy-to-understand expressions for other training participants with no knowledge of their division, and by answering various questions from the training participants by themselves, it appeared that the training participants were able to enhance their understanding of the theory behind each division's technology and the O&M outline.

In addition, a written test for checking comprehension was conducted immediately after the completion of the theoretical training in each division (May 27). While most of the training participants scored more than 80%, there was a large difference in scores among training participants in some divisions (the Train Operation and Rolling Stock divisions). Therefore, six training participants who scored less than 80% were re-tested on June 16, and they scored more than 95%.

As a result of these measures, we understand that the goal of this training, "Systematically and comprehensively understand the overall picture of O&M of the Shinkansen in Japan," has been achieved to a reasonable extent.

(3) Measures for schedule management

In this training, the training start time varied day by day and division by division. For example, one day, Division A left the hotel at 8:30 a.m. to attend a lecture at JICA Tokyo, while Division B left the hotel at 6:30 a.m. to go to a distant observation site. The next day, Division A left the hotel at 17:00 in the evening for night work, while Division B returned to the hotel at 8:00 a.m. after night work and took the day off that day. Furthermore, due to several changes in the training schedule because of work at observation sites or the PCR test results, it was necessary to share the latest training schedule with a wide range of parties relevant to the training, including the JIC/JEPS administration team in charge of the operation of the training,

JICA Tokyo, JICA Coordinators, and the observation sites (subcontractors), as well as the training participants.

Among the relevant parties, the JIC secretariat played a central role and always updated and shared detailed schedule tables using GIGAPOD, etc. In addition, a mailing list was set up with the JICA Coordinators, the accompanying Tutors, and the secretariats of each company as a means of emergency communication and reporting on the progress of the training schedules.

On the first day of the training, the training participants received detailed schedule tables in English that also described items they had to bring with them on each day of the training. Subsequently, the detailed schedule tables in English were updated twice in response to changes in the training schedule. Last-minute schedule changes were communicated to the training participants via Gmail. In this training, the training participants were given a dedicated Google Workspace account to receive information via Gmail. In addition, Google Drive was used by the training participants to submit various reports and share training material in advance. The training participants were instructed to access the account at least once or twice a day. This means, we believe, that Gmail was used more than adequately to communicate with the training participants.

Moreover, at the end of a lecture or site observation, the Tutors informed the training participants of items they had to bring with them and the meeting time for the next day's training, and JICA Coordinators also confirmed again when they returned to the hotel. Therefore, there were no delays due to omission in communication or misunderstanding of the schedule.

However, proper management of training schedules cannot be achieved only through efforts of the operation side, and the understanding and cooperation of the training participants is essential. In addition to the necessity of keeping the training curriculum on time, important learning items in this training also included mastering and practicing the concept of punctuality as a person responsible for O&M of the Shinkansen. Therefore, the training emphasized punctuality especially in the Common Subject at the early stages of the training. By treating a delay of only one minute from the time of the online training as tardiness, the awareness of the training participants that even a delay of one minute was a delay in railway operation was increased. As a result, there were almost no events such as tardiness in the subsequent Division-wise training.

In this way, we recognized that the uniform sharing of information among the staff involved in the operation of the training, the thorough dissemination of information and guidance, and the understanding and reliable implementation of the concept of punctuality by the training participants made appropriate schedule management and smooth operation possible for this complex and frequently changed training.

(4) Consideration for meals

Since most of the training participants in this training were vegetarians for religious reasons, a certain amount of consideration was required for lunches and other meals during the training. However, most of the training sites were offices of railway operators or Shinkansen-related facilities located a little away from city centers, and there were no facilities nearby that served vegetarian meals, such as Indian restaurants. Even if there was one within walking distance, there was insufficient time to eat out at a restaurant during the lunch break of busy site observation training.

For these reasons, we decided that the training operation side was not able to arrange meals during the training, and that the training participants needed to bring a meal they could eat.

This policy was communicated to all the training participants during the online preliminary orientation held three weeks prior to their visit to Japan, encouraging them to bring portable food containers (microwave-safe Tupperware, etc.) and familiar food from their home country to the extent possible. In addition, the training participants were provided with a list of Indian food stores in Tokyo and regional cities where they would stay, and also provided with support for procurement of food in Japan. Furthermore, arrangements were made in advance with the training and observation sites so that the training participants were able to borrow microwave ovens, hot water, and meal spaces. The availability of such meal-related equipment was shared with the training participants in advance, and all possible measures were taken to ensure that they would not feel uncomfortable about meals. When visiting the JR East General Education Center, the employee canteen prepared Indian curry menus for vegetarians. When there was some time to spare in the training schedule, the training participants were taken to an Indian restaurant in the neighborhood of the observation site. Measures were taken flexibly in this way. Some training participants enjoyed Japanese noodles and salads at the employee canteen of an observation site. In addition, we believe that the inconvenience of lunch was offset by the fact that the breakfast at each accommodation facility arranged by JICA was rich in variety and well-balanced in nutrition.

In Japan, where the dietary environment for vegetarians is not yet adequate, it is difficult to eliminate the inconvenience of meals for Indian training participants. We would like to express our gratitude for the efforts of the observation sites and the parties concerned that gave the utmost consideration to this situation. We would also like to express our heartfelt gratitude to the training participants for understanding the situation in Japan and making their own efforts to adapt to this situation for two months.

(5) COVID-19 prevention measures and response

In response to the issue of a fluid quarantine/waiting period after the training participants entered Japan, classroom learning (lectures) of the Common Subjects that could be provided through online training was concentrated in the two weeks from entry into Japan, so that no major changes had to be made to the curriculum even if the waiting period changed from the original schedule. In fact, although the online training was originally scheduled to last seven days (from April 19 to 25), the online training period was extended and face-to-face training was scheduled to begin on May 6 due to two new COVID-19 cases after entry into Japan. However, the curriculum changes were minimal.

Upon the start of face-to-face training, it was also a vital issue to ensure that training participants who did not have the habit of always wearing a mask wore a mask at all times in the proper manner. In addition to distributing non-woven fabric masks to all the training participants, they were repeatedly notified in several briefings, beginning with the preliminary orientation before visiting Japan, that everyone was required to wear a mask all times especially at the Shinkansen-related facilities they would observe and that the precautions to prevent infections were very vital in this training because site observation training would become impossible if any person was found to be infected with COVID-19. In the daily face-to-face training, as a result of the efforts of the JICA Coordinators and Tutors to point out when training participants were not wearing a mask properly, all the training participants finally learned to wear a mask in the appropriate manner at all times during training and in public places without being urged by the relevant parties, which was a great achievement.

In addition, due to a request from the observation sites visited in this training, health condition management through body temperature monitoring was carried out throughout the training period. Specifically, the training participants, the JICA Coordinators, and the Tutors who participated in site observations, as well as JICA and other staff accompanying the site observations, were asked to measure their body temperature every morning and report their body temperature and physical condition via an online report format (Forms). The JIC/JEPS admin team urged those who did not submit the report by the designated submission time to fill in the form. In addition, the JIC/JEPS admin team announced that training participants who had not filled in the form would not be allowed to participate in the training. As a result, all relevant parties made reports every day, and 2,545 reports were submitted in total throughout the training period. Considering the fact that it was possible to smoothly understand the health status of the training participants by utilizing this reporting system when any person was found to be positive in a PCR test, it can be said that these measures had a certain level of significance in the operation of the training amid the COVID-19 pandemic.

Furthermore, as mentioned earlier, all the training participants, JICA Coordinators, and Tutors who participated in site observations at important Shinkansen facilities such as the Operation

Control Center were required to undergo a PCR test within 72 hours prior to a site observation. In order to reduce the burden on them, saliva tests were mainly used instead of pharyngeal tests. In addition, tests were conducted at medical institutions that were able to provide test results on the day of the test or in the morning of the following day, so that it was possible to quickly respond in the event that someone was found to be positive. However, it was not easy to incorporate the tests into the tight schedule, and as a result, the tests had to be carried out at night time after the completion of training, on the morning of a day off after an overnight shift, and during time off on Saturdays or Sundays. Since the necessity of taking PCR tests had been widely communicated to the training participants and other concerned parties, they responded very cooperatively even with such a tight schedule. From the start of the training, a total of 73 people including training participants, Tutors, and JICA Coordinators underwent testing without a positive result (there was one false positive case). It can be said that this was a result of daily efforts of all the parties relevant to the training to undertake COVID-19 infection prevention measures.

4.2 Lessons Learned

This training was conducted with various issues, but as a result of the measures and efforts described in 4.1, the intended objective of "Systematically and comprehensively understand the overall picture of O&M of the Shinkansen in Japan" was successfully achieved, as indicated in the questionnaire results of the training participants. The lessons learned from this training are as follows.

- Railway technical terms were translated or interpreted using the terms already defined in IS and BM as well as in the Core Staff Training textbooks. However, the training participants often did not understand these terms and needed to check the definition of them. We learned a lesson that it is necessary to provide an opportunity to explain the definition of terms at an early stage of the training or confirming the meaning every time a new term appears, instead of proceeding on the premise that they should have already known the terms.
- The curriculum of the Division-wise training in this training was set according to the request of NHSRCL. Specifically, if there was a request to visit any site, it was incorporated into the curriculum. In addition, almost all requests such as "Please provide opportunities to study on weekends by assigning overnight work from Friday night to Saturday morning" and "Please take measures to check the level of understanding" were reflected in the curriculum. The resulting training schedule became very hard, partly due to the subsequent addition of PCR tests. Consequently, while all the training participants were able to make it through the entire training schedule, it is undeniable that there were differences among individual training

participants regarding whether they were able to fully ruminate and digest all the items they learned. For similar training opportunities in the future, we will design a training curriculum with a little more leeway by reducing the number of site observations and allocating time for reflection in the training curriculum.

- According to the results of the training participant questionnaires, one division requested more theoretical lectures, whereas another division requested more site observations. Since needs are quite different from division to division, we believe that it is necessary to construct curriculums with the number of days according to the needs of each division, instead of the same ratio between theoretical training and site observations for all divisions.
- With the COVID-19 pandemic not fully under control yet, the amount of work required for training in Japan is enormous, including the use of both online and face-to-face training, guidance for training participants regarding measures, health management and PCR tests, crisis management in the event of an unexpected event, and changes in training schedules. If the amount of work is calculated based on the same standards as those for face-to-face training before the COVID-19 pandemic, it may not match the actual situation. We recommend that the amount of work for training in Japan during the COVID-19 pandemic be calculated with such labor incorporated in the calculation.

Chapter 5　Recommendations on Issues and Solutions Going Forward

This training is not the last training in Japan for NHSRCL staff involved in the MAHSR Project. An On-the-Job Training Program for KOMLs (hereinafter referred to as “OJT Program”)　who are the participants in this training, is planned separately for this fiscal year. In addition, training for the head office staff, who will be the right hand of the KOMLs, and training for on-site managers will be conducted taking the schedule of the commencement of operation into account. With such training in mind, recommendations on issues and solutions going forward is presented below.

- Clarification of the objective of training

  The objective of this training was to "Systematically and comprehensively understand the overall picture of the O&M of the Shinkansen in Japan", but it was not sufficiently conveyed to some training participants in advance, and there were a small number of training participants who was focusing on collecting specific know-how on technical issues that were becoming problems in their home country. As a result of repeatedly explaining that the objective of this training was to understand the full picture, they understood the objective of this training. However, when conducting training in Japan for the MAHSR Project in the future, it is important to have training participants fully understand the objective or goal of the training before they come to Japan and work on the training. Therefore, it is essential for the Japan side to clarify and clearly state the objective of training and provide opportunities to carefully explain it in advance to NHSRCL and individual participants.

- Designing the training curriculums to take the roles of training participants in O&M into account

  At the beginning of this training, the Senior Executive Officer of JR East in charge of the MAHSR gave a lecture on the roles of KOMLs, and several training participants commented that they gained deeper understanding of the specific roles KOMLs should play in preparation for and after the commencement of operation. Although they had grasped the outline of the roles they should play in O&M before this training, they had not understood specific details of their work in each phase.

  Since the main objective of this training was to "understand the full picture of the Shinkansen system in Japan," it was possible to conduct sufficiently effective training without taking specific details of their work into account. However, we would recommend that when designing the OJT Program in the future, the curriculum be developed after sufficient prior hearing from NHSRCL and KOMLs so that they can learn the specific issues solving and knowledge required for fulfilling those roles to establish their O&M system.

  Regarding future Core Staff Training, various comments, such as "Core staff have different roles from KOMLs and their curriculum should be structured according to their roles," "The weight

of the Division-wise Subject should be increased," and "Please increase time for on-site practical training", were made in the questionnaire responses of the training participants. JIC has already formulated a broad framework for Core Staff Training in FY2019. However, there are some points that need to be reconsidered or improved based on this KOML training, and points that need to be amended due to changes in the situation from the time of formulation. Therefore, it may be necessary to revise the goals and curriculum structure of the training.

In particular, on opinion in the questionnaire responses from the training participants was that "The curriculum should reflect the opinions of KOMLs, who understand both the full picture of the Shinkansen system in Japan and the actual situation in India." We strongly recommend that when revising the Core Staff Training plan in the future, the opinions of the KOMLs (training participants), who were cultivated in this training as a bridge between India and Japan, also be reflected in any form, while maintaining the essential curriculums to teach safety philosophy and operational knowledge indispensable to the construction of the Shinkansen O&M system.

- Translation and interpretation of railway technical terms

We outsourced the translation of the training textbooks for this training to translators with experience in railway English translations. Even so, wording fluctuated considerably for the railway terminology (English) unique to the MAHSR, and considerable labor was required for the review. Future the OJT Program and Core Staff Training will be more practical, so more detailed railway technical terms are expected to be used. As there may be no English name corresponding to an object to be taught, it is expected that there will be considerable work on the Japan side to invent or define a corresponding English name. Therefore, it is necessary to accumulate more know-how in railway technical terms (English) related to the MAHSR than ever and to promote the development of human resources who are skilled in railway terminology (English) in each field.

For practical training in the future, another important issue is to maintain and improve the level of the railway knowledge of training interpreters. There were some JICA Coordinators in this training who had little technical knowledge in each field at first but acquired know-how in railway English by studying together in the training. We strongly hope that interpreters with such valuable knowledge and skills will be networked and assigned as a priority in the next and subsequent JICA training.

Furthermore, it is expected that there will be more and more opportunities for NHSRCL staff to learn railway technology in Japanese in order to establish the O&M system for the Shinkansen in India. The training participants of this training were studying Japanese while working in their home country, but we feel that there is a limit to learning Japanese in a short time. We strongly recommend establishing a system for systematically and intensively learning the Japanese language in India so that their Japanese language skills can reach a sufficient level for practical

training at railway sites in Japan.

Appendix

1. List of Training Participants
2. Training Schedules
3. Questionnaire Analysis & Results

Appendix 1

List of Training Participants

Attendance number		Dvison	Name
1		Facilities(Civil engineering)	Sahzad Ali
2		Facilities(Civil engineering)	Vipin Kumar
3		Facilities(track)	Mithilesh Kumar Singh
4		Facilities(track)	Ravinder Singh
5		S&T	Amit Asati
6		S&T	Chirag Ganpatbhai Vaghela
7		Electrical	R. L. Suresh Nimmana
8		Electrical	Avinash Parmar
9		Rolling Stock	Yerra Ramesh
10		Rolling Stock	Sethupathy Rajalingam
11		Train Operation	Vijay Khatwa
12		Train Operation	Bhupendra Singh Negi
13		Train Operation	Sharad Kumar Srivastava

Train Operation

Appendix 2

Training Schedule of JICA "Key O&M Leaders Training in Japan"

Legends
- **:Common program**
- **:Division-wise program(Lectures)**
- **:Division-wise program(Observations)**

1 Common Program（ Training will be conducted online until 25-Apr.）

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	18-Apr	**19-Apr**	**20-Apr**	**21-Apr**	**22-Apr**	**23-Apr**	**24-Apr**
AM	**AM: Trainees arrive in Japan (Quarantine period ends on 25-Apr.).**	・Briefing/Orientation	・JR East's safety initiatives	・Rail officials' spirits ・Management philosophy ・Workplace management	・Concept and endeavors of quality improvement of transportation and customer service at JR East		
PM		・Special Lecture by Director General of SHINKANSEN General Management Department ・Roles of Key O&M Leaders	・Safety management of SHINKANSEN	・Basics of SHINKANSEN operation	・Overview of JR East General Education Center ・Material procurement of SHINKANSEN		
	25-Apr	**26-Apr**	**27-Apr**	**28-Apr**	**29-Apr**	**30-Apr**	**1-May**
AM	・Special lecture by General Manager of SHINKANSEN Electrical & Signal Network System Department	(Transfer from hotel in Narita to hotel in Shinjyuku) ・JICA Tokyo Orientation ・Face-to-face orientation ・Lending of equipment (uniforms, etc.)	・Service quality improvement in SHINKANSEN operations	・Case of the opening operation of the TOHOKU SHINKANSEN	Day off (japanese national holiday)		
PM	・Special lecture by General Manager of SHINKANSEN Facilities Department ・Special lecture by General Manager of SHINKANSEN Transport & Rolling Stock Department		・Safety initiatives in SHINKANSEN operations ・Overview of SHINKANSEN General Control Center ・Special lecture by Director General of SHINKANSEN General Control Center	・Importance of Inter-departmental cooperation Part1 (Special lecture) ・Importance of Inter-departmental cooperation Part 2 (Special lecture)			
	2-May	**3-May**	**4-May**	**5-May**	**6-May**	**7-May**	**8-May**
AM	・Importance of Inter-departmental cooperation Part 3	Day off (Japanese national holiday)	Day off (Japanese national holiday)	Day off (Japanese national holiday)	・(Column)TESSEI's SHINKANSEN Cleaning ・Inter-divisional discussions among Trainees ・Evaluation of trainee progress and understanding		
PM	・Special lecture by Experts ・Concrete actions for untiringly pursuing safety						

2 Division-wise Program (Lectures and Observations)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	9-May	**10-May**	**11-May**	**12-May**	**13-May**	**14-May**	**15-May**
AM	**Overview of the duties of Transport Division** ・Overview of the Transport Division ・Promotion of various measures ・System of laws and In-house Rules and etc.	JR East General Education Center ・Site tour of the center ・Site tour of the Accident History Exhibition Hall	**Transport planning** ・Demand forecast and traffic record survey ・Train timetable	**Rolling Stock scheduling** ・Basic knowledge ・Chart ・Inspection planning	**Overview of Rolling Stock Center** ・Overview ・Duties ・Duties in the premise of the Rolling Stock Center ・Basic knowledge of vehicle cleaning and etc.		
PM	**Train Operation duty at station** ・Train Operation duty at station ・Measures in case of abnormality	**JR East General Education Center** ・Observation of Series E5 simulator		**Crew scheduling** ・Basic knowledge ・Example and simulation	**Overview of Train Crew Depot** ・Systems of Train Crew Depot ・Management ・Office work ・Instruction/training and etc.		
	16-May	**17-May**	**18-May**	**19-May**	**20-May**	**21-May**	**22-May**
AM	**Rolling Stock and facilities specific to SHINKANSEN** ・Overview of Rolling Stock ・Overview of the ATC system ・Ground equipment and etc.	**Laws and regulations of Train Operation** ・Implementation Standards for Train Operation ・Method of Train Operation ・Railway signaling ・Accident prevention and countermeasures and etc.	**Theory for efficient Train Operation/transportation facility** ・Overview of theory for efficient Train Operation ・Train performance curve chart ・Minimum running time ・Transportation facility planning ・Headway and transportation facilities	**OCC I** ・Overview ・Role ・Overview of COSMOS ・Traffic control ・Traffic operation arrangements in case of abnormalities	**OCC II** ・Basic knowledge of rolling stock ・Rolling stock schedule management ・Crew scheduling in an abnormality ・Maintenance Work management ・Response to abnormalities and etc.		
PM							
	23-May	**24-May**	**25-May**	**26-May**	**27-May**	**28-May**	**29-May**
AM	・Inter-divisional discussions among Trainees(Explanation of OJT training）	**Train Operation (Station)** ・Overview and station management ・Train Operation (Station) ・Facilities (Study tour and introduction)	**Rolling Stock Center I** ・Overview ・Daily Inspection	**Rolling Stock Center II** ・Daily management ・Yard work and etc.	・Evaluation of trainee progress and understanding		
PM	**Underground Passenger Station** -Site visit to Underground Passenger Station				・Inter-divisional discussions among Trainees（Mid-term Report)		
	30-May	**31-May**	**1-Jun**	**2-Jun**	**3-Jun**	**4-Jun**	**5-Jun**
AM	SHINKANSEN General Management Department (Transport Service Unit) ・Planning ・Train Crew management ・Education and training for Train Operation (Station) ・Contract works and etc.	**OCC III** ・Introduction of Controller Division ・Public relations ・Establishment of emergency response headquarters ・Introduction of initiatives for safety and improvement of transportation quality through education ・Cooperation between OCC and other sections (planning departments and site offices)	**OCC IV** ・Traffic Controller (Overview and Actual work) ・Passenger and Information Management Controller (Overview and Actual work) ***Overnight work**	（Off duty）	**OCC V** Train and Crew Controller (Overview and Actual work) ***Overnight work**	（Off duty）	
PM							
	6-Jun	**7-Jun**	**8-Jun**	**9-Jun**	**10-Jun**	**11-Jun**	**12-Jun**
AM	**Train Crew Depot I** ・Overview ・Train crew management ・Site observation (Transportation facility etc.)	**Train Crew Depot II** ・Overview of the actual work of Conductor at crew room ・Conductor Instruction	**Train Crew Depot III** ・Overview of the actual work of Train Operator at crew room ・Train Operator Instruction ・Site observation (Depot entry and exit)	**Train Crew Depot IV** ・Train crew management ・Duties of General Affairs ・HRD	**SHINKANSEN General Management Department (Transport Planning Unit)** ・Transport planning ・Scheduling (Rolling Stock, Train Operator, Train Conductor) ・Transportation facility planning and etc.		
PM							
	13-Jun	**14-Jun**	**15-Jun**	**16-Jun**	**17-Jun**	**18-Jun**	**19-Jun**
AM	**Vehicle cleaning/Yard shunting I** ・Overview ・Consignment work and management ・Study tour of actual works (yard) and etc.	**Vehicle cleaning/Yard shunting II** ・HRD ・Study tour of actual works (station) and etc.	**SHINKANSEN General Management Department (Transport Service and Planning Unit)** ・Q&A and etc.	Wrap-up session (SHINKANSEN General Management Department)	Working towards "OJT program"（Final Report）		
PM				Summary of JICA "KOMLs Training"	・Closing ceremony		

Rolling Stock

Appendix 2

Training Schedule of JICA "Key O&M Leaders Training in Japan"

Legends
- ：Common program
- ：Division-wise program(Lectures)
- ：Division-wise program(Observations)

1 Common Program（ Training will be conducted online until 25-Apr.）

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	18-Apr	**19-Apr**	**20-Apr**	**21-Apr**	**22-Apr**	**23-Apr**	**24-Apr**
AM	AM: Trainees arrive in Japan (Quarantine period ends on 25-Apr.).	・Briefing/Orientation	・JR East's safety initiatives	・Rail officials' spirits ・Management philosophy ・Workplace management	・Concept and endeavors of quality improvement of transportation and customer service at JR East		
PM		・Special Lecture by Director General of SHINKANSEN General Management Department ・Roles of Key O&M Leaders	・Safety management of SHINKANSEN	・Basics of SHINKANSEN operation	・ Overview of JR East General Education Center ・ Material procurement of SHINKANSEN		
	25-Apr	**26-Apr**	**27-Apr**	**28-Apr**	**29-Apr**	**30-Apr**	**1-May**
AM	・Special lecture by General Manager of SHINKANSEN Electrical & Signal Network System Department	(Transfer from hotel in Narita to hotel in Shinjyuku) ・JICA Tokyo Orientation ・Face-to-face orientation ・Lending of equipment (uniforms, etc.)	・ Service quality improvement in SHINKANSEN operations	・Case of the opening operation of the TOHOKU SHINKANSEN	Day off (japanese national holiday)		
PM	・ Special lecture by General Manager of SHINKANSEN Facilities Department ・ Special lecture by General Manager of SHINKANSEN Transport & Rolling Stock Department		・Safety initiatives in SHINKANSEN operations ・Overview of SHINKANSEN General Control Center ・Special lecture by Director General of SHINKANSEN General Control Center	・ Importance of Inter-departmental cooperation Part1 (Special lecture) ・ Importance of Inter-departmental cooperation Part 2 (Special lecture)			
	2-May	**3-May**	**4-May**	**5-May**	**6-May**	**7-May**	**8-May**
AM	・ Importance of Inter-departmental cooperation Part 3	Day off (Japanese national holiday)	Day off (Japanese national holiday)	Day off (Japanese national holiday)	・(Column)TESSEI's SHINKANSEN Cleaning ・Inter-divisional discussions among Trainees ・Evaluation of trainee progress and understanding		
PM	・Special lecture by Experts ・Concrete actions for untiringly pursuing safety						

2 Division-wise Program (Lectures and Observations)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	9-May	**10-May**	**11-May**	**12-May**	**13-May**	**14-May**	**15-May**
AM	**Orientation** ・Objective of training ・Training program	**JR East General Education Center** ・Site tour of the centre ・Site tour of the Accident History Exhibition Hall	**Outline of Rolling Stock** ・History of Shinkansen ・Outline of Series E5	**Traction Circuit** ・Pantograph ・VCB, High voltage equipment box ・VCB control circuit	**Control Circuit & S-TIMS** ・Driving cab equipment ・Switches ・Outline of S-TIMS		
PM	**Rolling Stock Management** ・Importance of Safety	**JR East General Education Center** ・Observation of Train simulator	**Car Body & Bogie** ・Car body ・Outfitting ・Bogie	**Traction Circuit** ・Traction transformer ・Traction converter (CI) ・ Traction motor	**Auxiliary Circuit** ・Auxiliary power unit (APU) ・Air conditioner ・Ventilation equipment		
	16-May	**17-May**	**18-May**	**19-May**	**20-May**	**21-May**	**22-May**
AM	**Brake System** ・Brake control ・Brake control unit ・Air compressor	**General Inspection Train (East-i)** ・Observation of GIT (Tokyo - Sendai)	**Observation of Actual Trainset (SHINKANSEN Rolling Stock Centre)** ・Observation of Series E5 ・Rolling stock structure	**Safety Equipment** ・Outline of DS-ATC ・System configuration ・Speed control function	**SHINKANSEN General Management Department (Rolling Stock Unit)** ・Outline of the Unit ・ Laws, regulations and In-house rules ・ Procurement and retrofit ・ Maintenance facilities		
PM							
	23-May	**24-May**	**25-May**	**26-May**	**27-May**	**28-May**	**29-May**
AM	・Inter-divisional discussions among Trainees(Explanation of OJT training）	**OCC I** ・Outline and role of the centre ・Traffic control	**OCC II** ・Train & Crew Controller ・Rolling stock schedule management ・Emergency response	**Rolling Stock Management** ・Basic knowledge in depot (COSMOS) ・Work safety ・Accident restoration ・Failure prevention	・Evaluation of trainee progress and understanding		
PM	**SHINKANSEN General Management Department (Rolling Stock Unit)** ・Budget control ・ Material management				・Inter-divisional discussions among Trainees（Mid-term Report）		
	30-May	**31-May**	**1-Jun**	**2-Jun**	**3-Jun**	**4-Jun**	**5-Jun**
AM	**Auxiliary Circuit** ・Circuit to energise car ・VCB control circuit ・Door control circuit	**SHINKANSEN Rolling Stock Centre** ・Safety instruction ・ Outline of the centre ・Depot control ・Technical management ・Site tour	**SHINKANSEN Rolling Stock Centre** ・Station dispatch office	**SHINKANSEN Rolling Stock Centre** ・Regular Inspection		（Off duty）	
PM			**SHINKANSEN Rolling Stock Centre** ・Depot control and PRC ・ATC Characteristic Inspection		**SHINKANSEN Rolling Stock Centre** ・Daily Inpsection		
	6-Jun	**7-Jun**	**8-Jun**	**9-Jun**	**10-Jun**	**11-Jun**	**12-Jun**
AM	**SHINKANSEN General Rolling Stock Centre** ・Orientation ・ Site tour	**SHINKANSEN General Rolling Stock Centre (Bogie Maintenance Section)** ・Outline ・Bogie Inspection ・Bogie/Wheelset inspection	**Train Crew Depot III** ・Overview of the actual work of Train Operator at crew room ・Train Operator Instruction ・Site observation (Depot entry and exit)	**Group Company I** ・Outline ・ Maintenance work ・ Facility maintenance	**SHINKANSEN General Rolling Stock Centre（Transport Control Section）** ・Outline ・Wheel turning ・Rolling Stock scheduling ・Yard management/planning ・Depot control		
PM	**SHINKANSEN General Rolling Stock Centre (General Affairs Section)** ・Outline ・ Safety instruction			**Group company II** ・Oultine ・Rolling stock maintenance work ・Car cleaning ・ Yard shunting			
	13-Jun	**14-Jun**	**15-Jun**	**16-Jun**	**17-Jun**	**18-Jun**	**19-Jun**
AM	**SHINKANSEN General Rolling Stock Centre（Technical Section ）** ・Outline ・Retrofitting work ・ Technical management and planning	**SHINKANSEN General Rolling Stock Centre (Inspection section)** ・Outline ・Completion inspection ・Observation of test run	**SHINKANSEN General Rolling Stock Centre（Production Sontrol Section）** ・Outline ・Shop-in planning & Work schedule ・Budget control ・Outsourcing ・System ・Material	**Wrap up session (Rolling Stock)**	Working towards "OJT program"（Final Report） ・Closing ceremony		
PM	**SHINKANSEN General Rolling Stock Centre（Facility Section）** ・Outline ・Facility management ・Facility maintenance		**SHINKANSEN General Rolling Stock Centre（Quality Control Section）** ・Outline ・Failure prevention ・Network	Summary of JICA "KOMLs Training"			

Facilities

Appendix 2

Training Schedule of JICA "Key O&M Leaders Training in Japan"

Legends
- : Common program
- : Division-wise program(Lectures)
- : Division-wise program(Observations)

1 Common Program（ Training will be conducted online until 25-Apr.）

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	18-Apr	**19-Apr**	**20-Apr**	**21-Apr**	**22-Apr**	**23-Apr**	**24-Apr**
AM	**AM: Trainees arrive in Japan (Quarantine period ends on 25-Apr.).**	・Briefing/Orientation	・JR East's safety initiatives	・Rail officials' spirits ・Management philosophy ・Workplace management	・Concept and endeavors of quality improvement of transportation and customer service at JR East		
PM		・Special Lecture by Director General of SHINKANSEN General Management Department ・Roles of Key O&M Leaders	・Safety management of SHINKANSEN	・Basics of SHINKANSEN operation	・ Overview of JR East General Education Center ・ Material procurement of SHINKANSEN		
	25-Apr	**26-Apr**	**27-Apr**	**28-Apr**	**29-Apr**	**30-Apr**	**1-May**
AM	・Special lecture by General Manager of SHINKANSEN Electrical & Signal Network System Department	(Transfer from hotel in Narita to hotel in Shinjyuku) ・JICA Tokyo Orientation ・Face-to-face orientation ・Lending of equipment (uniforms, etc.)	・ Service quality improvement in SHINKANSEN operations	・Case of the opening operation of the TOHOKU SHINKANSEN	Day off (Japanese national holiday)		
PM	・ Special lecture by General Manager of SHINKANSEN Facilities Department ・ Special lecture by General Manager of SHINKANSEN Transport & Rolling Stock Department		・ Safety initiatives in SHINKANSEN operations ・ Overview of SHINKANSEN General Control Center ・ Special lecture by Director General of SHINKANSEN General Control Center	・ Importance of Inter-departmental cooperation Part1 (Special lecture) ・ Importance of Inter-departmental cooperation Part 2 (Special lecture)			
	2-May	**3-May**	**4-May**	**5-May**	**6-May**	**7-May**	**8-May**
AM	・ Importance of Inter-departmental cooperation Part 3	Day off (Japanese national holiday)	**Lectures about Facilities, Electric and S&T** ・Overview of common rules of Facilities, Electrics and S&T ・Overview of System		・(Column)TESSEI's SHINKANSEN Cleaning ・Inter-divisional discussions among Trainees ・Evaluation of trainee progress and understanding		
PM	・Special lecture by Experts ・Concrete actions for untiringly pursuing safety						

2 Division-wise Program (Lectures and Observations)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	9-May	**10-May**	**11-May**	**12-May**	**13-May**	**14-May**	**15-May**
AM	**Lectures about Facilities, Electric and S&T** ・Overview of each division	JR East General Education Center ・Site tour of the center ・Site tour of the Accident History Exhibition Hall	**Implementation Standard of Track** ・Overview of Implementation Standard and Standard specification for track work and etc.	**OCC** ・Overview of tasks of facility controller ・Observation of Controller room ・Train operation restriction ・Observation of Accident History Exhibition Hall ・Observation of work control during night and etc. ***Overnight work**	（Off duty）		
PM		**JR East General Education Center** ・Observation of training facilities(Civil&Track)	**Implementation Standard of Civil Facilities** ・Implementation Standard and Basic Manual and etc.				
	16-May	**17-May**	**18-May**	**19-May**	**20-May**	**21-May**	**22-May**
AM	**SHINKANSEN General Management Department (SHINKANSEN Facilities Department)** ・Overview of SHINKANSEN Facilities Department ・Overview of Track maintenance division in SHINKANSEN Facilities Department ・Overview of environmental measures	**Facilities Department（HQ)** ・Management of rail welding	**Civil Technology Center** ・Overview ・Maintenance Cycle of Civil Engineering Structure ・Facilities and equipment of Civil Technology Center and etc.	**Facilities Department（HQ)** ・Safety Management ・Train operation restriction and disaster prevention measures ・Effect of construction work which is conducted outside of railway site on train operation and etc.	**SHINKANSEN Track Technology Center(i)** ・Overview ・Track Maintenance flow ・Procedure of Entry within Fences ・Experience of Wind Pressure induced by high speed train ・Observation of night work ***Overnight work**	（Off duty）	
PM		**Facilities Department（HQ)** ・Overview of Civil division in the Facilities Department ・Concept of maintenance					
	23-May	**24-May**	**25-May**	**26-May**	**27-May**	**28-May**	**29-May**
AM	・Inter-divisional discussions among Trainees(Explanation of OJT training）	**Railway Technical Research Institute** Lecture and observation of Earthquake Early Warning System (EEW）	（Off duty）	**SHINKANSEN Track Technology center(ii)** ・Equipment of Shinkansen Track Technology Center ・Education, Training ・Efforts for Safety ・Track Facility Management System	・Evaluation of trainee progress and understanding		
PM	・Overview of maintenance car manual ・Overview of Rail inspection and RDDC	**Civil Technology center** ・Observation of Seismometer spaire parts ・Observation of repair work for SHINKANSEN Civil Engineering Structure ***Overnight work**			・Inter-divisional discussions among Trainees（Mid-term Report)		
	30-May	**31-May**	**1-Jun**	**2-Jun**	**3-Jun**	**4-Jun**	**5-Jun**
AM	**Summary of Facilities subjects**	**SHINKANSEN Track Technology center(iii)** ・Work flow of work plan ・Work flow of work coordination ・Overview of Maintenance Work Management System ・Patrol plan in case of disaster and etc.	**SHINKANSEN Track Technology center(iv)** ・Observation of Maintenance Depot ・Observation of Maintenance Car ・Observation of Training Facility ・Observation of night work and etc. ***Overnight work**	（Off duty）	**Day off**		
PM	**Structural Technology Center** ・Overview of Structural Technology Center ・Examples of technical assistance provided in the past						
	6-Jun	**7-Jun**	**8-Jun**	**9-Jun**	**10-Jun**	**11-Jun**	**12-Jun**
AM	**Civil Technology Center** ・Observation of general inspection at day and night （Special general inspection of bridge & viaduct） ***Overnight work**	（Off duty）	**Overview of East-i**	**Facilities Division of Branch** ・Observation of the areas affected by the Great East Japan Earthquake	**Civil Technology Center** ・Observation of Disaster prevention works of SHINKANSEN ・Slope Disaster Prevention Measures	（Off duty）	
PM			**On-board traveling by East-i** **From Tokyo to Sendai depot** ・Measurement by East-i		**Civil Technology Center** ・Observation of general inspection using Maintenance car （SHINKANSEN Tunnel Hammering test ）		
	13-Jun	**14-Jun**	**15-Jun**	**16-Jun**	**17-Jun**	**18-Jun**	**19-Jun**
AM	**Partner Company (Track Maintenance division)** ・Corporate overview ・Overview of the duties ・Effort for safety ・Observation of training facilities	**Partner Company (Civil division)** ・Corporate overview ・Overview of the duties ・Effort for safety	**Partner Company** ・Overview of management of maintenance car and etc.	**Wrap-up session (Facilities)**	Working towards "OJT program"（Final Report） ・Closing ceremony		
PM		**Civil Technology Center** **・ Observation of civil engineering structure in Tokyo SHINKANSEN Rolling Stock Center**	**Painting company** ・Effort for safety and etc.	Summary of JICA "KOMLs Training"			

Electric

Appendix 2

Training Schedule of JICA "Key O&M Leaders Training in Japan"

Legends: Common program / Division-wise program(Lectures) / Division-wise program(Observations)

1 Common Program（ Training will be conducted online until 25-Apr.）

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	18-Apr	19-Apr	20-Apr	21-Apr	22-Apr	23-Apr	24-Apr
AM	AM: Trainees arrive in Japan (Quarantine period ends on 25-Apr.).	・Briefing/Orientation	・JR East's safety initiatives	・Rail officials' spirits ・Management philosophy ・Workplace management	・Concept and endeavors of quality improvement of transportation and customer service at JR East		
PM		・Special Lecture by Director General of SHINKANSEN General Management Department ・Roles of Key O&M Leaders	・Safety management of SHINKANSEN	・Basics of SHINKANSEN operation	・ Overview of JR East General Education Center ・ Material procurement of SHINKANSEN		
	25-Apr	26-Apr	27-Apr	28-Apr	29-Apr	30-Apr	1-May
AM	・Special lecture by General Manager of SHINKANSEN Electrical & Signal Network System Department	(Transfer from hotel in Narita to hotel in Shinjyuku) ・JICA Tokyo Orientation ・Face-to-face orientation ・Lending of equipment (uniforms, etc.)	・ Service quality improvement in SHINKANSEN operations	・Case of the opening operation of the TOHOKU SHINKANSEN	Day off (Japanese national holiday)		
PM	・ Special lecture by General Manager of SHINKANSEN Facilities Department ・ Special lecture by General Manager of SHINKANSEN Transport & Rolling Stock Department		・ Safety initiatives in SHINKANSEN operations ・ Overview of SHINKANSEN General Control Center ・ Special lecture by Director General of SHINKANSEN General Control Center	・ Importance of Inter-departmental cooperation Part1 (Special lecture) ・ Importance of Inter-departmental cooperation Part 2 (Special lecture)			
	2-May	3-May	4-May	5-May	6-May	7-May	8-May
AM	・ Importance of Inter-departmental cooperation Part 3	Day off (Japanese national holiday)	**Lectures about Facilities, Electric and S&T** ・Overview of common rules of Facilities, Electrics and S&T ・Overview of System		・(Column)TESSEI's SHINKANSEN Cleaning ・Inter-divisional discussions among Trainees ・Evaluation of trainee progress and understanding		
PM	・Special lecture by Experts ・Concrete actions for untiringly pursuing safety						

2 Division-wise Program (Lectures and Observations)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	9-May	10-May	11-May	12-May	13-May	14-May	15-May
AM	**Lectures about Facilities, Electric and S&T** ・Overview of each division	JR East General Education Center ・Site tour of the center ・Site tour of the Accident History Exhibition Hall	JR East General Education Center ・Practical training of outdoor OHE	**OCC** **(Day time operation of Electric Power Controller)** ・Overview of Electric Power Center (OCC) ・Observation of OCC (day time)	**OCC** **(Planning work and night time operation of Electric Power Controller)** ・Overview of planning work in Electric Power Center ・Observation of OCC (night time) ***Overnight work**	（Off duty）	
PM		**JR East General Education Center** ・Practical training of indoor PSI					
	16-May	17-May	18-May	19-May	20-May	21-May	22-May
AM	Day off (Japanese national holiday)	**Overview of electrical facilities** ・Overview of Power Supply System ・Overview of Overhead Equipment ・Overview of Power Distribution System	**Overview of maintenance of electrical facilities** ・Overview of maintenance for electrical facilities ・Overview of Implementation Standards etc.	**Overview of East-i and maintenance cars** ・Overview of East-i (GIT) ・Overview of maintenance cars	**General Inspection Train (East-i)** ・Observation		
PM			**Tokyo Electrical Construction & System Integration Office** ・Observation				
	23-May	24-May	25-May	26-May	27-May	28-May	29-May
AM	・Inter-divisional discussions among Trainees(Explanation of OJT training）	**SHINKANSEN Electric & Signal Network System Department（Electrical Unit）**	**TSS and Distribution Substation** ・Observation	**Electric & Signal Network System Department (Electrical)**	・Evaluation of trainee progress and understanding		
PM	**SHINKANSEN Electric & Signal Network System Department（Technical Planning Unit）** ・Overview				・Inter-divisional discussions among Trainees（Mid-term Report)		
	30-May	31-May	1-Jun	2-Jun	3-Jun	4-Jun	5-Jun
AM	Day off	Day off	**Safety and accident cases** ・Overview of three major industrial accidents ・Overview of accident examples	**Group company** **(Facility Management)** ・Overview of company ・Observation of Training Equipment	**Group company** **(OCC Systems)** ・Overview of company ・Observation of COSMOS Equipment Room ・Observation of SCADA Equipment Room and SCADA Controller		
PM							
	6-Jun	7-Jun	8-Jun	9-Jun	10-Jun	11-Jun	12-Jun
AM	**C-SCADA** ・Overview of C-SCADA ・Observation of C-SCADA facilities	**Electric Power Technology Center** ・Overview of Electric Power Technology Center ・Overview of each group and Electric Power Maintenance Center	**Overall Inspection** ・Overview of Overall Inspection for OHE and MV/LV ・B meeting (before work meeting) and etc.	（Off duty）	**Maintenance Depot** ・Overview of Maintenance Depot and Maintenance Car ・Observation of Mechanical Traversing Devices	（Off duty）	
PM	**Electric Power Technology Center** ・Overview of Electric Power Maintenance Center		**Maintenance work for Power Supply System** ・Lecture before night work ・Observation of maintenance work for Power Supply System and etc. ***Overnight work**		**Close-up Inspection using maintenance cars for OHE** *Overnight work		
	13-Jun	14-Jun	15-Jun	16-Jun	17-Jun	18-Jun	19-Jun
AM	**Partner company** **(Electric facility maintenance)** ・Overview of company ・Observation of Training Center	**Partner company** **(Electric construction)** ・Overview of company ・Observation of Training Center	**Partner company** **(Electric construction)** ・Overview of company ・Obsevation of Training Center	**Partner company** **(Electric facility maintenance)** ・Observation of Service Center	Working towards "OJT program"（Final Report） ・Closing ceremony		
PM				Summary of JICA "KOMLs Training"			

S&T

Appendix 2

Training Schedule of JICA "Key O&M Leaders Training in Japan"

Legends
- : Common program
- : Division-wise program(Lectures)
- : Division-wise program(Observations)

1 Common Program(Training will be conducted online until 25-Apr.)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	18-Apr	19-Apr	20-Apr	21-Apr	22-Apr	23-Apr	24-Apr
AM	AM: Trainees arrive in Japan (Quarantine period ends on 25-Apr.).	・Briefing/Orientation	・JR East's safety initiatives	・Rail officials' spirits ・Management philosophy ・Workplace management	・Concept and endeavors of quality improvement of transportation and customer service at JR East		
PM		・Special Lecture by Director General of SHINKANSEN General Management Department ・Roles of Key O&M Leaders	・Safety management of SHINKANSEN	・Basics of SHINKANSEN operation	・ Overview of JR East General Education Center ・ Material procurement of SHINKANSEN		
	25-Apr	26-Apr	27-Apr	28-Apr	29-Apr	30-Apr	1-May
AM	・Special lecture by General Manager of SHINKANSEN Electrical & Signal Network System Department	(Transfer from hotel in Narita to hotel in Shinjyuku) ・JICA Tokyo Orientation ・Face-to-face orientation ・Lending of equipment (uniforms, etc.)	・ Service quality improvement in SHINKANSEN operations	・Case of the opening operation of the TOHOKU SHINKANSEN	Day off (Japanese national holiday)		
PM	・ Special lecture by General Manager of SHINKANSEN Facilities Department ・ Special lecture by General Manager of SHINKANSEN Transport & Rolling Stock Department		・ Safety initiatives in SHINKANSEN operations ・ Overview of SHINKANSEN General Control Center ・ Special lecture by Director General of SHINKANSEN General Control Center	・ Importance of Inter-departmental cooperation Part1 (Special lecture) ・ Importance of Inter-departmental cooperation Part 2 (Special lecture)			
	2-May	3-May	4-May	5-May	6-May	7-May	8-May
AM	・ Importance of Inter-departmental cooperation Part 3	Day off (Japanese national holiday)	**Lectures about Facilities, Electric and S&T** ・Overview of common rules of Facilities, Electrics and S&T ・Overview of System		・(Column)TESSEI's SHINKANSEN Cleaning ・Inter-divisional discussions among Trainees ・Evaluation of trainee progress and understanding		
PM	・Special lecture by Experts ・Concrete actions for untiringly pursuing safety						

2 Division-wise Program (Lectures and Observations)

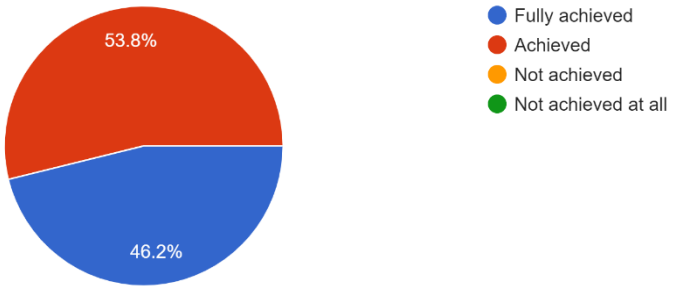
	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	9-May	10-May	11-May	12-May	13-May	14-May	15-May
AM	**Lectures about Facilities, Electric and S&T** ・Overview of each division	JR East General Education Center ・Site tour of the center ・Site tour of the Accident History Exhibition Hall	**OCC (S&T Controller)** ・Observation of S&T Controller Room ・Introduction of Past Accident Cases, Response to Accident, and Explanation of Accident Report and Daily Work Report ・Observation of S&T Controller Work (Daytime) and etc. ・Observation of S&T Controller Work (Nighttime) and etc. ***Overnight work**	（Off duty）	**Overview of Signaling Equipment** ・SAINT (DS-ATC) ・Electric Point Machine ・Track Circuit and etc.		
PM		**JR East General Education Center** ・Observation of S&T Training Facilities					
	16-May	17-May	18-May	19-May	20-May	21-May	22-May
AM	**Overview of Signaling Equipment** ・Other signaling equipment	**General Inspection Train (East-i)** ・Observation	**Overview of S&T Organization** **Overview of S&T Maintenance Work** ・Overview of Maintenance Work ・"Implementation Standard for S&T Equipment for MAHSR Train Operation Safety" ・Explanation of Inspection Item, Inspection Periodicity and Other Items ・Working Procedure	**Overview of S&T Maintenance Work** ・Explanation of Response to Equipment Failure and etc. **Overview of S&T Construction Work** ・Induction countermeasure for S&T Equipment ・ Overview of Repair Construction Work for S&T Equipment ・ Overview of Maintenance Car and etc.	S&T Maintenance Center ・ Observation of S&T Equipment (Especially Non-insulated Track Circuit)		
PM	**Overview of Telecommunication Equipment** ・Train Radio System ・CIC and etc.		**Tokyo Electrical Construction & System Integration Office** **・ Observation**				
	23-May	24-May	25-May	26-May	27-May	28-May	29-May
AM	・Inter-divisional discussions among Trainees(Explanation of OJT training）	**SHINKANSEN Electric & Signal Network System Department（S&T Equipment Management Unit）**	**SHINKANSEN Electric & Signal Network System Department（Shinkansen Operation System Unit）**	**SHINKANSEN S&T Technology Center I** ・Overview of Technology Center ・Observation of each group ・Observation of Spare Parts Storage Room	・Evaluation of trainee progress and understanding		
PM	**SHINKANSEN Electric & Signal Network System Department（Technical Planning Unit）** ・Overview				・Inter-divisional discussions among Trainees（Mid-term Report）		
	30-May	31-May	1-Jun	2-Jun	3-Jun	4-Jun	5-Jun
AM	**S&T Equipment** ・Site Visit to Train Crew Depot ・Site Visit to Sub-Station ・Site Visit to SER ・Observation of Night Work and etc. *Overnight work	（Off duty）	**SHINKANSEN Rolling stock Center** ・On-board Device ・Site visit to Rolling stock Center ・Observation of Inspection of ATC On-board Device ・Observation of Inspection of Mobile Station	**Group company (Facility Management)** ・Overview of company ・Observation of Training Equipment	**Group company (OCC Systems)** ・Overview of company ・Observation of COSMOS Equipment Room ・Observation of SCADA Equipment Room and SCADA Controller		
PM							
	6-Jun	7-Jun	8-Jun	9-Jun	10-Jun	11-Jun	12-Jun
AM	**C-SCADA** ・Overview of C-SCADA ・Observation of C-SCADA facilities	**SHINKANSEN S&T Technology Center II** ・Description of Response to Accident / Equipment Failure (Trouble Shooting)	Day off	Day off	**OCC (COSMOS System Controller)** ・Observation of COSMOS System Controller Room ・Observation of COSMOS System Controller Work (Daytime) and etc. ・Observation of COSMOS System Controller Work (Nighttime) and etc. ***Overnight work**	（Off duty）	
PM	**Signaling and Telecommunication Equipment in CER** ・Observation of CER and etc..						
	13-Jun	14-Jun	15-Jun	16-Jun	17-Jun	18-Jun	19-Jun
AM	**Partner company (Electric facility maintenance)** ・Overview of company ・Observation of Training Center	**Partner company (Electric construction)** ・Overview of company ・Observation of Training Center	**Partner company (Electric construction)** ・Overview of company ・Obsevation of Training Center	**Partner company (Electric facility maintenance)** ・Observation of Service Center	Working towards "OJT program"（Final Report） ・Closing ceremony		
PM				Summary of JICA "KOMLs Training"			

1. The training objectives

The training objectives of the Key O&M Leaders Training is to acquire a systematic and comprehensive understanding of the overall picture of O&M on Japan's Shinkansen system from the perspectives of the following five fundamental policies. Have you achieved the following training objective?

1-1. Comprehend the safety philosophy

[Response ratio]



[Main reasons]

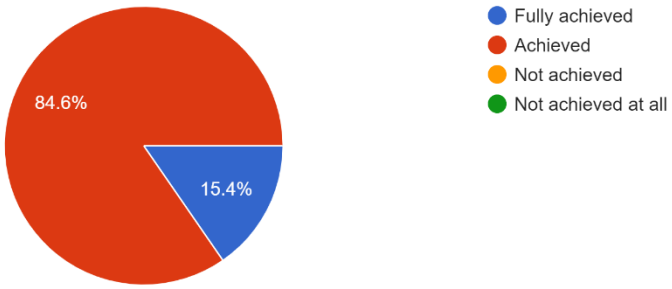
- We understood safety philosophy clearly, main point drive them at bottom to top approach.
- The safety philosophy had been covered in the common training program in detail. For better comprehension, i want to observe/ participate in safety activities like challenge safety campaign in OJT program.
- A JR East safety philosophy had been discussed in the common training program in detail. For better understanding .I would like to participate in safety related activities in OJT program.
- During our training main focus was to understand safety required in Shinkansen O&M. During my KOML Training, I find that Every activity of JR/East/ Shinkansen starts only after Safety confirmation for that activity. Lot of planning for safety is given to avoid any incident/accident.
- We have learned about safety practices and systems followed in Shinkansen. We would like to go through the rules and regulations in Shinkansen to further deepen our understanding. Also observe more abnormal workings.
- Could understand the safety philosophy during the normal operations. But need to know more about safety followed during abnormal situations

[Discussion]

Regarding "Comprehend the safety philosophy," all the KOMLs answered "Fully achieved" or "Achieved." In particular, many were of the opinion that they had deepened their understanding of the safety philosophy through the Common Subjects.

1-2. Understand the Shinkansen-specific technologies, facilities and rules

[Response ratio]



[Main reasons]

- We have got the overview of technologies, facilities and rules. Considering the time period of KOML, the objective has been achieved completely, but for setting up O&M system in India, we need to go in further details. For example, only the name of Train operation methods were discussed, but we want to understand the detail procedure of all Train operation methods.
- Understanding on overview level achieved.
- We got the overview of technologies, facilities and rules during training. In KOM L Training, the objective has been achieved completely, in view of set up O&M system in India, we need to understand in details. For example, at station we saw attention to train condition but we want to know day to day all activities at station in detail.
- Theoretically, classes where conducted more and Practical Training at site and with partner company is very Limited. All the major maintenance work done by Partner company and more weightage should have been given to understand the Shinkansen technology used for maintenance.
- We have learned about the technologies and facilities in Shinkansen. Due to limited time in this training, for some observations we could not spend sufficient time.

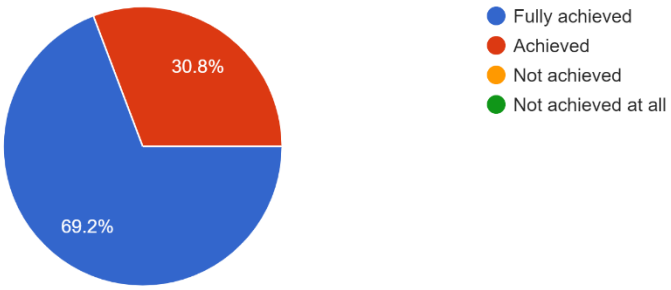
- To understand fully, the training time was insufficient. To fully understand each and every technology, more time is required.
- Excellent explanation by tutor, by seeing actual working system
- Understood upto the very basic functional level. But need to understand further for Maintenance vehicles, SCADA, Functional of Control Panels in TSS during various situations, OHE facilities like Cantilever Brackets, ATDs, Anchoring Arrangements.

[Discussion]

Regarding "Understand the Shinkansen-specific technologies, facilities and rules," all the KOMLs answered "Fully achieved" or "Achieved," but some answered "More time is needed" due to the limited training period.

1-3. Understand the risk management, learning from past accidents/events

[Response ratio]



[Main reasons]

- We have understood the concept of "Learn from past accidents" and "No accident to be forgotten". Most of the rules in JR-East have been framed from the past experience of accidents.
- Accident exhibition hall is very use-full in understanding the impact and loss caused to customer due to accident. Also visit to Miyagi prefecture to see the impact of earthquake and tsunami was eye opening for us. However, I was looking more to understand risk management in terms of risk identification & assessment tools being used in Shinkansen facility department.
- Risk management and safety has been clarified.
- Lot of emphasis on learning from past accidents given in this training.

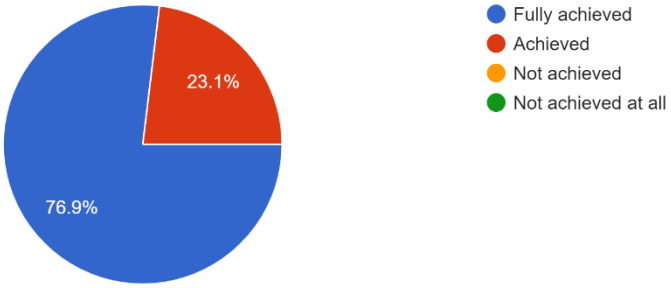
- There were lot of examples of past accidents of JR-East and their countermeasures. It gave us a complete picture of learning from past accidents and risk management.
- Yes, I understand risk management, learning from past accidents, and creating a culture to recognize the risk and discuss it directly as much as possible.
- I could see that various rules and regulations are built after learning from past incidents.

[Discussion]

Regarding "Understand risk management, learning from past accidents/events," all the KOMLs answered "Fully achieved" or "Achieved." Many commented that they were able to understand the attitude of "learning from past accidents" through lectures on safety in the Common Subjects and a visit to the Historical Pavilion of Accidents in the JR East General Education Center.

1-4. Understand the basic concepts of the transportation quality improvement, including the inter-divisional cooperation

[Response ratio]



[Main reasons]

- Emphasis was given on inter-divisional cooperation in common training program. During field visit in division-wise training program, we actually observed how the inter-divisional cooperation is implemented everywhere in JR-EAST. For example, for handling any major transport disruption, members from all division form disaster management team in OCC.
- Lot of lecture on interdepartmental cooperation and quality of transportation.
- Tutor explained in detailed information related to the respected department, as well as discussion among KOML's

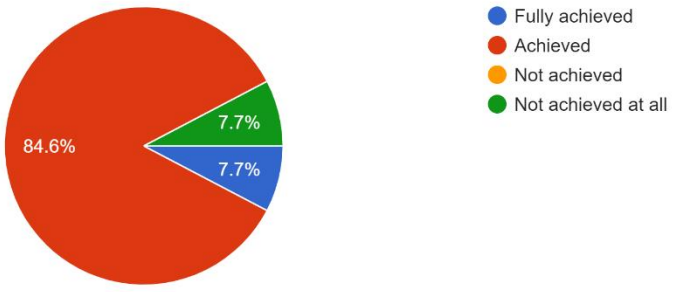
- There was lot of emphasis on transportation quality and inter-department cooperation. In the field systems following and used for information sharing could not be witnessed.
- This was fully achieved as we could see in the field also like in the Multi-department Maintenance car working at the Maintenance depot.
- The interdepartmental cooperation was visible in all the work like Work Plan developement, Work Flow Management, Maintenance Car Time Table, Commencement of Maintenance Work time etc.

[Discussion]

Regarding "Understand the basic concepts of the transportation quality improvement, including the inter-divisional cooperation," all KOMLs answered "Fully achieved" or "Achieved." Many made positive comments about the fact that they were able to see the actual situation through site observations after learning the concepts in the Common Subjects.

1-5. Understand the work of each Shinkansen division and Site Office, including the "on-site-first policy."

[Response ratio]



[Main reasons]

- Due to limitation of time period of KOML training, I have understood the overview of work of each division & site office, but to understand the work volume of each division, sufficient longer time is required for each site office.
- Lectures were sufficient on this topic.
- We have visited Technology Center, Maintenance Center, Station Equipment Room etc understand the their working

- Achieved to some extent as we could understand the working of each division and site office. But there were some divisions in the HO which need further more understanding e.g. Shinkansen Planning and Strategy Office
- I could understand the work of my own division and site offices fully but to understand full the work of each shinkansen division needs more time and on-site work with other department.

[Discussion]

Regarding "Understand the work of each Shinkansen division and Site Office, including the 'on-site-first policy,'" all the KOMLs answered "Fully achieved" or "Achieved" (one KOML answered incorrectly), but some commented that they did not have enough time to understand the full picture and that they wanted to learn the contents of other divisions beside their own.

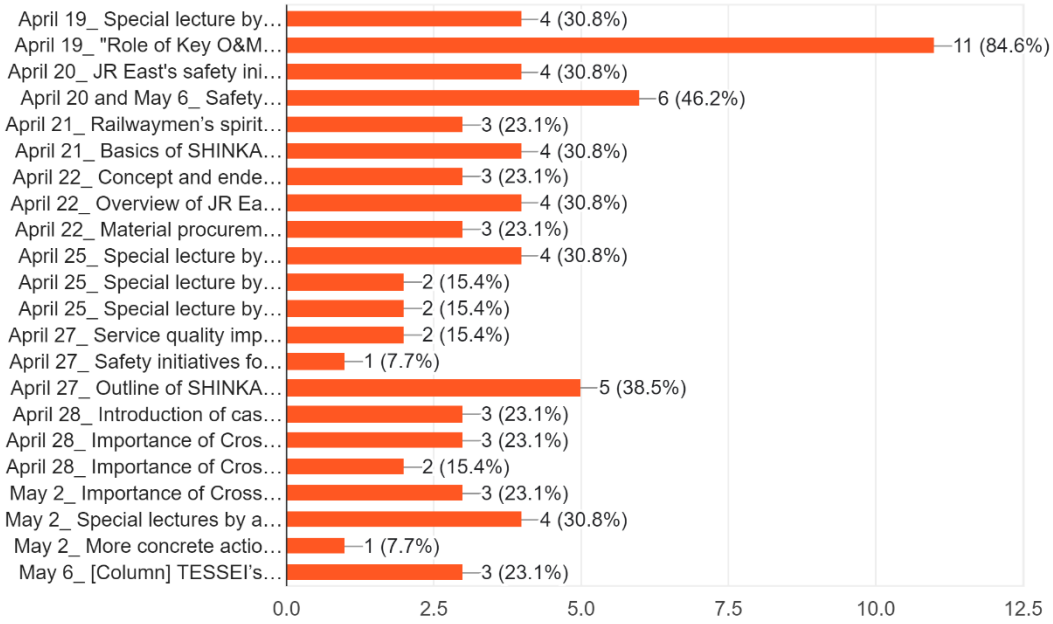
[General comments]

It can be said that the objectives of this training were achieved, since all KOMLs answered that they fully understood all five fundamental policies of the Key O&M Leaders Training.

2 The Common Subject

2-1. Choose 3 Common Subject sessions that were especially useful.

[Response ratio]

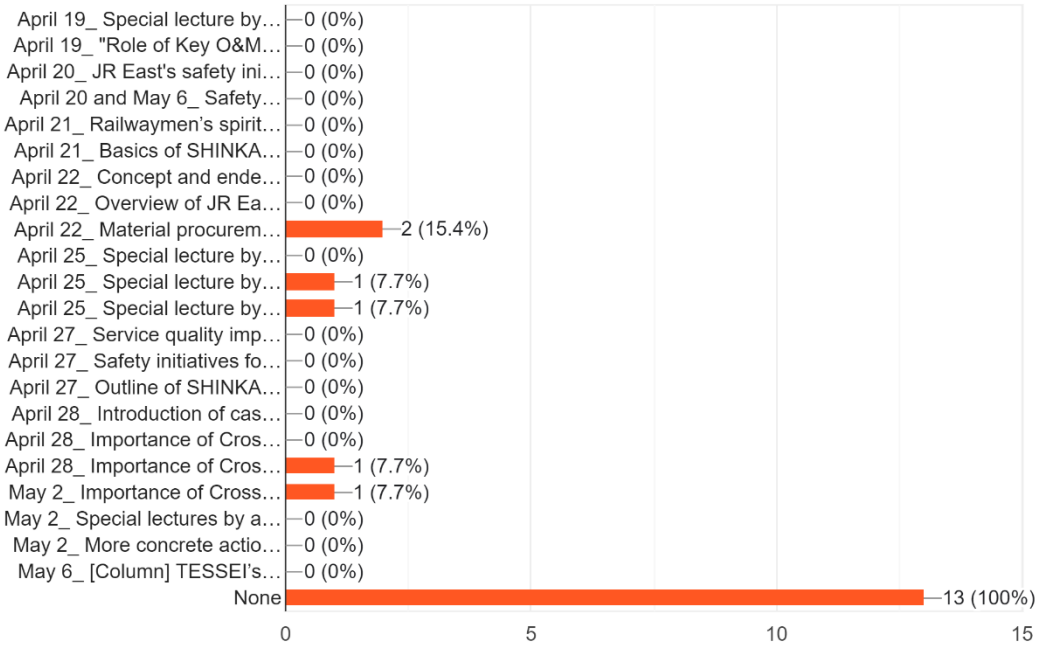


[Main reasons]

- Lecture on "Role of Key O&M Leaders" by Mr.Kumamoto was an enlightening session for us, the understanding of our roles in preparatory work & after opening had been deepened. We had learnt about many past accidents and learnings from them.
- All the subject are the main pillar to developed O&M structure in MAHSR.
- Many of the common subject lectures have explained the basics of Shinkansen system in Japan

2-2. Choose Common Subject sessions that were not necessary

[Response ratio]



[Main reasons]

- Material procurement is an critical aspect of O&M organization, it was good that the session was covered in the training program, but the practices of material procurement in India is quite different from Japan.
- I found all sessions essential at this stage of understanding the overall services of Shinkansen.
- All are required , nothing is left

2-3. Common Subject sessions(lectures) that were not covered, but should have been included. And give the reason.

- Transit oriented development not covered.
- Risk management technique in Shinkansen O&M, Role play by each department in case of disaster/ transport disruption
- Some of new IT solution may be add in this sessions, like AI, VR etc
- More lectures on material management, ITC
- Some lectures about finance could be included.

[Discussion]

Regarding the Common Subjects, all the lectures broadly received the answer "Useful." In particular, 11 out of 13 KOMLs answered that the lecture on the "Role of Key O&M Leaders" by Mr. Kumamoto, Senior Executive Officer of JR East, was

"Especially useful." All KOMLs answered that "None" of the subjects were not necessary, and all the KOMLs evaluated the subjects highly.

3 Division-Wise Subject

3-1. Please describe 3 to 5 Division-Wise Subject sessions that were especially useful and give the reason.

- Rolling Stock and facilities specific to SHINKANSEN. Before this KOML training, I had a lot of doubts about ATC system. After this session, almost doubts had been cleared.
- Overview of Shinkansen Signalling Systems, good content
- Electrical schematics: able to understand overall concept
- Structural technology centre lecture covered wide range and was very effective
- Earthquake management System: Understood the system and how it is working
- Inter departmental cooperation
- Overview of Electrical Facilities (LVMV). It was comprehensive and gave a fair idea of Power Distribution Facilities
- Site visit of JR East General Education Center and site tour of the Accident History Exhibition Hall gives us more practical experience and realize the seriousness of past accidents. (Tragedy of accidents, fear of accidents, the extent of damages)
- 0512_NIght Work of Facility Controller
- OCC
- Overview of Train Crew Depot. Since my role in MAHSR shall be mostly related to Train crew, the session helped me understand the working of Train crew depot in Japan.
- Setup of Train Crew depot and working is totally different to India . After visit i could be able to understand working of Crew depot, and it will be help to setup in India.
- Overview of Telecom Equipments, Good content
- S TIMS: Could able to understand Control functions and over all.
- Rail research institute lecture covered wide range and was very effective

- Service Quality Improvement, by this lecture I understand how to improve service quality of customer
- Safety management
- Training facilities of JRE and partner companies
- Overview of Electrical Facilities (OHE).
- Some more topics on Cantilever Brackets, ATDs, Anchoring Arrangements and more clarity on the Crossover sections can be given
- OCC Visit, tasks of facility controller, gives us an overview of work control during the night and understand the various OCC systems
- 0517_Concept of Maintenance Civil
- Overview of the duties of Transport Division
- Overview of Maintenance of Shinkansen, Good content
- Bogie and General Inspection: able to think on future perspective of MAHSR, on heavy maintenance
- Procedure in case of abnormal situation made me understand basics of steps taken at such time.
- TSS and Working, I understood working of TSS which is very useful for Shinkansen operation
- Inspection and defects category
- Day and Night Observation of TSS and mainline
- Overview of Electrical Facilities (PSI).
- On-board traveling by East-i, from Tokyo to Sendai depot gives us an understanding of track measurement by East-i run.
- 0511_Outline of Track Inspection
- Laws and regulations of Train Operation
- Understanding of train operation had been deepened.
- Overview of Failure response, Good content
- Sendai General control centre: able to think on similiar set up requirement in MAHSR
- Implementation standards for MAHSR civil facilities also cover wide range of topic and easy to understand.
- GIT
- Overview of Maintenance Work for Electrical Facilities
- Train Operation duty at station
- Attention to train condition in Train Operation
- Disaster spare parts deployment, Good content

- Morioka Depot: Staff motivation philosophy and safety double check and follows unique style
- Disaster management
- Organisation of HQ

3-2. Please describe Division-Wise Subject sessions that were not necessary and give the reason.

- All the sessions were necessary
- All are important
- I didn't find anything unnecessary

3-3. Please describe the Division-Wise Subject sessions that were not covered, but should have been included.

- Calculation of minimum headway is recommended to be included.
- Working of sales division at station.
- Interlocking table creation, Parameter Table creation, Cable core details, SER wiring diagrams (Indoor and outdoor)
- basics design understanding of structure repair/ strengthening measures, cost estimation in maintenance, Risk analysis and management, contract management , approach to various manual and rules, early warning equipment handling and observation, use of latest technology such as Drone, AI in patrol and inspection, Noise panel specification and design, repair method and its implementation for civil structure, bearing, steel girder, tunnel ,platform, station etc.
- In Rolling Stock Automatic train control system may be include
- More theoretical lectures on systems (OHE and PS)
- OHE Equipment such as Types of Cantilever Brackets, Insulators, Auto-Tensioning Device, Anchoring Arrangements
- We need more practical training and site visits to understand the real work of partner and group companies.
- More large machinery machine work like RDDC, RGM and all different types of maintenance work, Inspection Work Practicals could have been included.
- Rolling stock - VCC in depth.
- OCC equipment division working

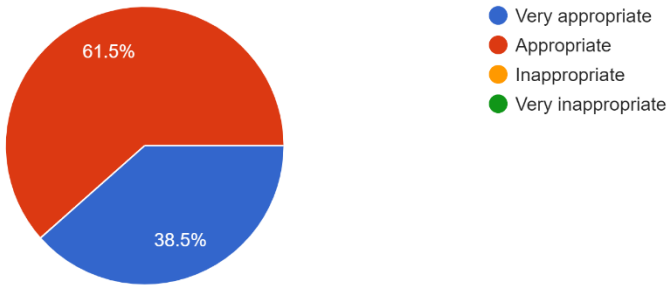
[Discussion]

Regarding the Division-wise Subjects, a wide range of subjects received the opinion of "Especially useful," all KOMLs answered "All the subjects were useful," and all the KOMLs evaluated the subjects highly. However, each KOMLs made requests about subjects that were not included but should have been included.

4 Training structure and methods

4-1. Do you find the design of the course (the structure of modules in the course) appropriate for you to achieve the Course Objectives?

[Response ratio]



[Main reasons]

- The course was well structured. I appreciate the idea of first teaching the common subjects then division-wise theoretical training of for overview of division working and field training of the site offices for understanding the working in detail.
- More subject specific topics could have been covered
- It shall be helpful , if more lecture with partner company and understanding how they plan and execute the maintenance work. Also More focus should have been given on core topic like I find civil engineering weightage is less as compared to track engineering. If civil engineer has to teach track then first basics may be taught then only detail technical learning .
- Although time is limited but covered all the topic
- The time table and sequence is very good, not a single lapse.
- Some courses were very cramped with very less time alloted
- The flow of the course has gradually introduced the aspects with Common subjects, Division-wise subjects, General Education Center and then practical training at Technology and Maintenance centers and then the sessions at Group and Partner companies was good.

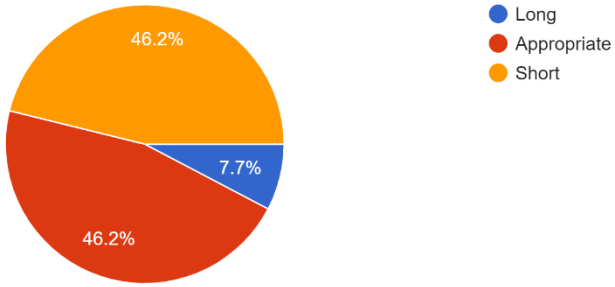
- I believe that theory lectures were ok. But more practical with partner companies could be done to see their way of working.

[Discussion]

Regarding the training structure, all KOMLs answered "Very appropriate" or "Appropriate." In particular, many had a positive opinion about the concept of learning the overall outline in the Common Subjects, then deepened understanding of each division in the Division-wise Subjects, and they actually saw what they had learned through site observations at the Site Office. They evaluated the training structure favorably.

4-2. Do you find the period of the course appropriate?

[Response ratio]



[Main reasons]

- The time period was appropriate for the defined objective of KOML training except station portion.
- Area is wide. Eventhough we are able to catch up.
- Few of the common lectures may be avoided especially repetitive one.
- Actually some of facility we do not visit due to time concern
- In a very short time, a lot of content was included which actually could not be completely understood and some times the questions were left unanswered due to time-constraint
- The Schedule were very tight. If there is no proper rest then your mind can't function well.

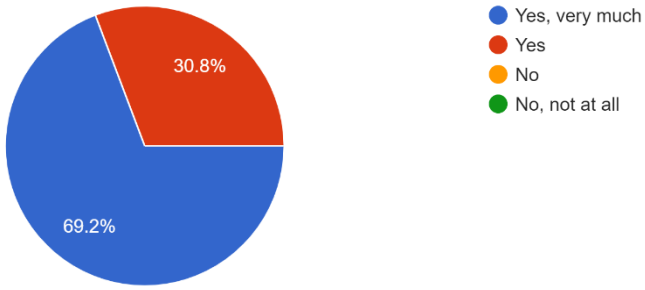
[Discussion]

Regarding the training period, about 50% of the KOMLs answered "Appropriate," and the remaining 50% answered "Short." The curriculum was designed to enable efficient access to many topics within the limited training period. Since the content of learning

was quite extensive, however, some requested that the strict schedule be improved by extending the training period.

4-3. Did you have enough opportunities to participate actively in the course, such as discussions and presentation?

[Response ratio]



[Main reasons]

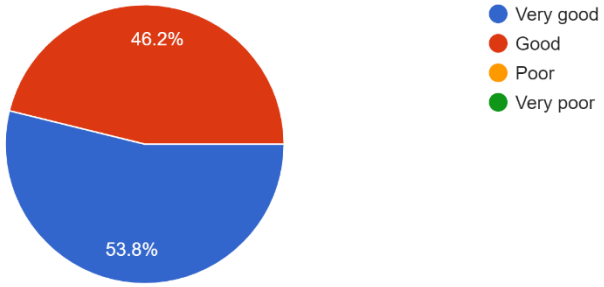
- More than enough opportunities were given by the instructors & tutors for that purpose.
- Instructors & tutors given the chance to participate in the course.
- Everywhere good coordination, able to provide answers
- Given time to ask question.
- Yes, Tutor explained us very nice and provided opportunity
- Except for some courses sufficient time was given
- Yes. I had ample opportunity to participate in the discussions but sometimes due to time constraints could not do.
- Yes, equal opportunities is given.
- The Q & A time were enough.
- Our tutors are very helpful in the matter of allowing us to ask doubts freely and clear it on spot with respective divisional managers , if not answered in that session , they will clear the queries on next day.(Each & every query is noted by our tutors), Very supportive.

[Discussion]

All KOMLs answered that they had sufficient opportunities for discussions and presentations. In particular, many commented favorably about sufficient opportunities provided by Tutors for questions and answers, and it can be said that interactive training operation was achieved.

4-4. Was the quality of lectures good enough for you to understand clearly?

[Response ratio]



[Main reasons]

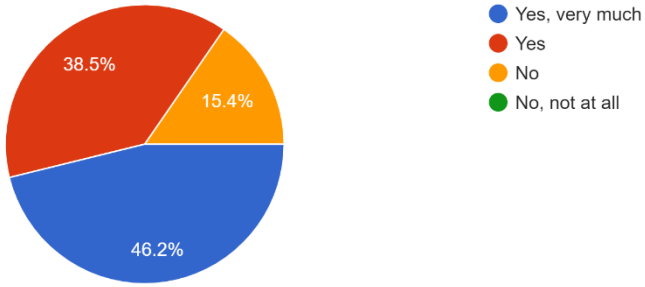
- It would have been better, if content of the theoretical-training program could have increased.
- Yes. Made in structured way.
- The lecture quality is best, the each point has been clarified properly.
- Lectures quality was good
- Of course, the quality of the lecture was excellent and very clear to understand.
- Most of the lecturers were very good in terms of their experience and knowledge of work.
- It is easily understood with pictorial representations , also allowing us to clear our doubts on spot by asking queries.

[Discussion]

Regarding the quality of lectures, all KOMLs answered favorably with "Very good" or "Good."

4-5. Were you satisfied with the textbooks and materials used in the course?

[Response ratio]



[Main reasons]

- Some more details could have been included
- Sufficient content is covered in material
- The learning materials provided is best, further advance details in class also provided.
- Yes the quality of textbooks and materials is good.
- Some textbooks and materials needed more explanations.
- Limited coverage due to limited time (Only basic outline), we are still hungry for knowing in depth.

[Discussion]

The textbooks and teaching materials used in this training were highly evaluated, as 11 out of 13 KOMLs answered "Very satisfied" or "Satisfied." There were also opinions that descriptions on more detailed handling should have been added, although the training period was limited.

4-6. Do you think the knowledge and experience you acquired through this training is useful?

[Response ratio]

[Main reasons]

- Same Shinkansen technology shall be adopted for MAHSR, the knowledge could be directly applied for setup of O&M.
- We could think and make O& M structure for MAHSR which each section responsibilities.
- India have different work culture so we may create some training to develop it
- Yes lot of learning are very useful and can be directly applied to work
- In this training we learnt about the case of JR-East. But for Indian case we need to adapt these systems.

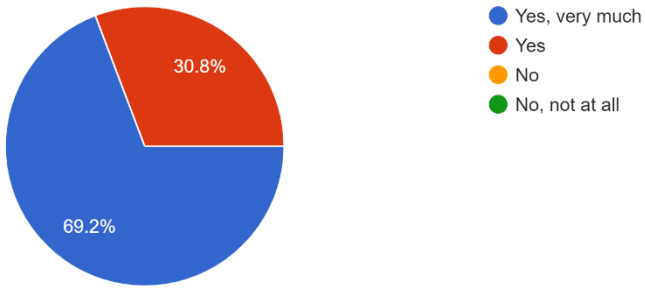
- Acquired knowledge and experience are mostly directly applied, but few of them are required to be adopted as per Indian conditions.
- I think most of things taught were relevant and will have help us do our preparatory work for opening of MAHSR.

[Discussion]

In response to the question "Do you think the knowledge and experience you acquired through this training is useful?," 10 out of 13 KOMLs answered "It can be directly applied to work." The remaining 3 KOMLs answered that they wanted to make use of what they learned by making changes based on differences in culture and systems between Japan and India.

4-7. Did you get appropriate facilitation (e.g. an advice for better understanding of the lectures, advice for making reports and presentation slides by Japanese side in order for you to achieve your objective?

[Response ratio]



[Main reasons]

- Yes, JICA coordinators and Tutors have quite helpful in this regard.
- Yes. Guidance is provided wherever necessary.
- Tutors were active in this regard.
- My tutors have helped me a lot for understanding the lectures, for making reports and especially presentation slides
- The guidance given by our lecturers were very good and they tried their best to help us understand.
- Really we understood all the lectures given by lecturers. they are very co-operative.

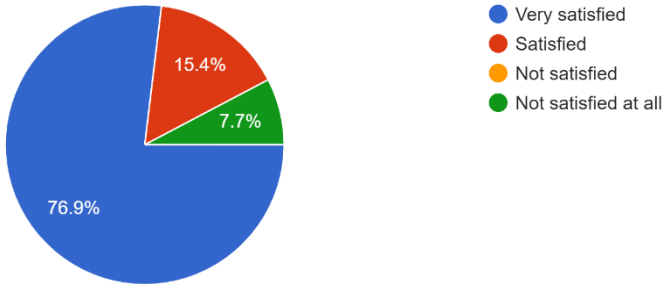
[Discussion]

Regarding the follow-up system for the preparation of reports and report meeting materials, all KOMLs answered "Very sufficient" or "Sufficient." Many responded favorably regarding the generous and active follow-up from Tutors and JICA Coordinators.

5 Coordinations and accomodations

5-1. Were you satisfied with the interpretation done by training coordinator(s) ?

[Response ratio]



[Main reasons]

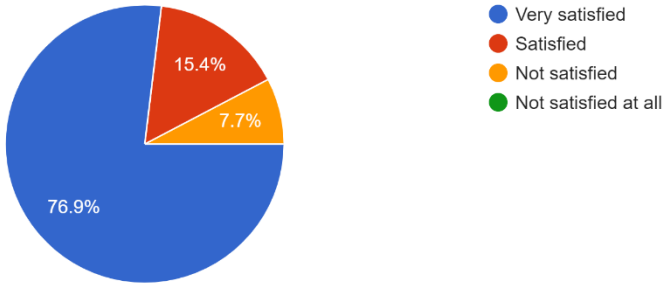
- Interpreter for our train operation division has done commendable job. Recommended for OJT program.
- Not able to translate technical content, so not useful.
- Well prepared and sound in Technical as well.
- I am happy with the interpretation and effort taken by coordinator however Few of the occasion it can be better as some time essence was lost during interpretation .
- Our coordinator Fukada san was the best coordinator we had. She not only just translated but also she understood the topic before the meeting. She is hard working. Ichikawa san also was good for more deep electrical lectures. Nakano san always did good job in the Overnight work
- Yes, our interpretation has done excellent coordination and interpretation work.
- The interpreters were prepared well in advance and very hardworking

[Discussion]

Regarding the interpreting by JICA Coordinators, 12 out of 13 KOMLs answered "Very satisfied" or "Satisfied," indicating a high degree of satisfaction.

5-2. Were you satisfied with the coordination done by training coordinator(s) ?

[Response ratio]



[Main reasons]

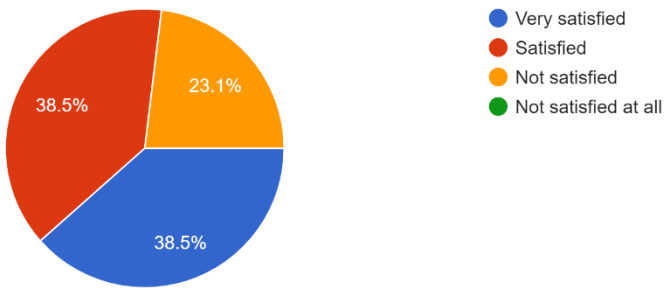
- Regular updates shared in time.
- Not good
- Very systematic and cooperative.
- They provided excellent guidance and help us lot
- The coordinators did their best to understand our questions and convey the Japanese side view to us.
- They were concerned about the well coordination of the training and did their best to make us feel comfortable in every situations.

[Discussion]

Regarding coordination and schedule management by JICA Coordinators, 12 out of 13 KOMLs answered "Very satisfied" or "Satisfied," indicating a high degree of satisfaction. The schedule was complicated, but there were positive comments about regular information sharing.

5-3. Concerning accomodations, please mark your level of satisfaction.

[Response ratio]



[Main reasons]

- The room size was not sufficient since we had a lot of luggage with us.
- Frequent vacation of accommodation was very discomforting
- Best accommodation facilities were provided.
- Schedule should be planned that frequent checkout from hotel is not required. Some time in a week 2 to 3 times check out and check in the same hotel we have to made which creates difficulties especially with logistics submission and resubmission.
- Accommodation provided near the learning location. I proud for this best arrangement. After site work, we can do rest best night schedule.
- Rooms very little small but located at convenient location
- Our accommodation was excellent and I like breakfast and cleanliness.
- Most of the Hotels where we stayed were very comfortable and food quality were also good.
- All are good, but please avoid weekly reports, so many sleepless nights we had.
- Room was not spacious. Everytime we went for site visit check out was must...

[Discussion]

Regarding accommodation facilities during the stay in Japan, 10 out of 13 KOMLs answered "Very satisfied" or "Satisfied," while 3 KOMLs answered "Not satisfied." Whereas there were many positive comments about the cleanliness of the accommodation facilities, there were many complaints about the facts that the JICA Tokyo Center was not available for this training and they had to check out of the hotel when traveling outside Tokyo, and that there was not enough space to store the luggage necessary for the approximately two month training period.

6 Comments or suggestions for this Key O&M Leaders Training and the future "Core Staff Training" (e.g. JM, Site Supervisors).

6-1. Any comments for this Key O&M Leaders Training.

- I liked the structure of KOML training but i think too many things were planned at the same time because of which we got tired in the last leg of training. My opinion is that site observation report were required & quite useful idea but weekly report could have avoided.
- Quality of translator shall be improved
- KOML training is a nice experience. I like to add that while covering day time lecture full day and again to go back to night visit (in between day lecture and night visit -

effective time to rest some time 1.5 hr or 2 hrs due to reach to hotel change cloth, dinner etc) it make difficult in learning.

- Excellent Training provided by all the Tutors, coordinator manage all training schedule awesome
- The training was useful and improved our understanding of system
- It would be better if the material is shared in advance and the length of course period can be little free
- I would like to experience more field and practical training. Practical training is required to be done on Rail Grinding Machine(RGM), Rail Defect Detection Car(RDDC), Turnout Inspection Trolley, Oscillation Measurement with
- The Schedule should be little relaxed. The time of training should be enhanced.
- Still few things need to cover up (2 months time period - rather than theoretical i prefer more practical), We belong to gemba and our thoughts are like this.

6-2. Any comments or suggestions for the future "Core Staff Training" (e.g. JM, Site Supervisors). -Course materials-

- Content of theoretical training should be increased for station operation division and also include sales division working .
- More contents may be included
- Course materal concept is OK. However based on role we have to have different one.
- Time spent on actual field work should be majority of training content
- For core staff training, division wise course materials can be more deeply prepared. Like more technicalities of OHE, PS and PD
- The practical and field training shall be given priority over classroom session for " Core Staff Training".
- The course material should cover maintenance procedure in details for each and every maintenance work and inspection work. The procedures for testing and machine working should also be given in details
- For Rolling stock staff - More practical knowledge required.
- CBT - computer based training (demonstrating Videos more) it will be remembered forever (un-erasable impressions)
- VCC - Vehicle control circuit in detail coverage (Allowing them to work and learn schematics system wise taking assistance with tutors)
- Our tutors need to conduct exams related to schematics (Electrical & Mechanical) both. It will help us to make our battalion ready for handling shinkansen maintenance.

6-3. Any comments or suggestions for the future "Core Staff Training" (e.g. JM, Site Supervisors). -Training curriculum (subjects) including design of course-

- CORE staff shall be placed in respective division after training in Japan. Focus should be more division wise training. Since core staff shall not be in managerial position, the period of common training can be shortened.
- More practical oriented could be included.
- Training Course sometimes become too tight and may cause distraction. Therefore flexibility and few innovative things can be done to make the learning effective and enjoyable.
- For core staff, it is better to introduce them to more practical and hands-on training
- Training curriculum and design of the course for "Core Staff" shall be planned to give them practical competency
- Site work should be more than the classroom lectures. The classroom lectures should be included in between the site works.
- please avoid weekly reports , focus on practical more and conduct exams
- Theoretical classes in a classroom during visit to a site office should not be considered as site visit.

6-4. Any comments or suggestions for the future "Core Staff Training" (e.g. JM, Site Supervisors). -Training periods-

- Training period should be so sufficient that core staff can comprehend all the required knowledge suitable for his role.
- Bogie and General Inspection need 1 year period is required.
- Training period shall be more focused on the core subject of the trainee .
- Most of the training shall be done at the site with various equipment like RGM, RDDC, RDDD, Motor Car, East-i, oscillation measurement devices, Track Geometry Inspection Trolley, Turnout Inspection Trolley, etc. They should be given practical on TRAMS, MWMS, and other systems in the actual field. The period of training shall be at the site as much as possible with partner and group companies of JR East.
- Japanese safety culture , working methodologies , punctuality

6-5. Any comments or suggestions for the future "Core Staff Training" (e.g. JM, Site Supervisors). -Any other suggestions (If any)-

- Since we as KOML has seen O&M of shinkansen in japan, it would be better if we KOML are involved in deciding the period & content for Core staff training in Japan
- Please arrange more core subject and also engage partner company (for facility department) in lecture as they are doing the actual maintenance work . Visits to Partner company and understanding their work planning and approach shall be given more weightage .

[Discussion]

Regarding the comments on this training and the recommendations for future training for core staff based on this training, many were of the opinion that training for core staff should have been arranged to increase the ratio of on-site training so that they were able to spend more time to learn actual work more deeply and acquire practical capabilities. Many were also of the opinion that the training curriculum and the amount of reports should be revised to avoid too heavy a burden on KOMLs during the training period.

[Conclusion]

It can be said that the objectives of this training were achieved, because the KOMLs answered that they fully understood all the items in the five fundamental principles of this training. Regarding the questions concerning individual training curriculums, the KOMLs highly evaluated the concept of learning the overall outline through the Common Subjects, then deepening their understanding of each division through the Division-wise Subjects, and actually observing what they learned through site observations of the Site Office. The training successfully provided curriculums for conveying knowledge, insight, and know how useful for problem solving and practical work based on the JR East Group's experience in the operation of high-speed railway, and for systematically and comprehensively understanding the overall picture of O&M for the Shinkansen in Japan.

The KOMLs also highly evaluated the fact that there were sufficient opportunities for questions and answers during lectures and site observations, interactive training through interim and final report meetings and the creation of various reports, and sufficient follow-up mainly by Tutors and JICA Coordinators. Through the opportunities provided, the KOMLs were able to create output for the specific tasks they would fulfill after returning to their home country in mind, such as planning to prepare for the commencement of operation of the Indian High Speed Railway.

Regarding the training schedule, most KOMLs evaluated the training as having been conducted smoothly despite the special circumstances due to the COVID-19 pandemic

(online training during the quarantine period, PCR testing and body temperature measurement for visits to JR East facilities, etc.) and the complicated training schedule. However, there were many opinions requesting that the size of rooms and the check-out procedures for travel to outside Tokyo be improved, since the accommodation building at JICA Tokyo was not available and the KOMLs had to stay at a hotel.

With regard to plans for future training for the development of core staff, some were of the opinion that the ratio between theoretical training and practical training and the amount of training curriculum and reports be revised. Therefore, we will reflect the opinions in the human resource development plan for the Indian High Speed Railway Project utilizing the findings gained in this training.

End