As of July.30.2018

Technical Regulatory Standards on Japanese Railways

Railway Bureau
Ministry of Land, Infrastructure, Transport and Tourism

Contents of Ministerial Ordinance to Provide Technical Regulatory Standards on Railways

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Ministerial Ordinance to Provide Technical Regulatory Standards on Railways

Chapter 1 General Rule

[Ministerial Ordinance]

(Objective)

Article 1. This Ministerial Ordinance is set forth to secure the safe and stable transport and thereby to contribute to the promotion of public welfare, by establishing the necessary technical standards for facilities to be used for rail transportation (hereinafter referred to as "facilities"), and rolling stock structure and handling.

[Approved Model Specifications]

(Preamble)

"Ministerial Ordinance Providing for the Technological Standard for Railways" (Ministerial Ordinance No.151 prescribed by the Ministry of Land, Infrastructure and Transport, 2001) (hereinafter referred to as the "Ministerial Ordinance") was established recently. Following this, standard interpretation, which substantiates and quantifies the details of the Ministerial Ordinance etc., with regard to the structure, maintenance, operation and handling of facilities and rolling stock, in order to achieve the Objective of Chapter 1 of the Ministerial Ordinance, (hereinafter referred to as 'Approved Model Specifications') has been prescribed as follows.

In the prescription of the Approved Model Specifications, specific concepts behind Ministerial Ordinance and other rules of similar nature, which can be deemed appropriate in consideration of factors including historical performance, current technological standard and trend in technical development, shall be indicated with regard to the structure and handling of facilities and rolling stock provided for use of railway transportation, on the premise that any danger capable of posing a risk to each and all persons and objects involved in train operation and other activities of similar nature is minimized, in the light of technical feasibility and economical efficiency.

The matters indicated in these interpretations shall be treated to conform to the Ministerial Ordinance but not necessarily negate the matters that are not included in the interpretations.

These interpretations shall be the authority in the examinations of licenses and other activities of similar nature by the country and in the creation of implementation standards by railway business operators, based on the above-mentioned principles, and railway business operators under the jurisdiction shall be guided with due consideration given to this intent in order to ensure such matters as the safety of railway transportation.

[Ministerial Ordinance]

(Definitions)

Article 2. Meaning of the terms used in the Ministerial Ordinance used in each of the following is defined as follows:

(1) Shinkansen: Means Shinkansen (the new trunk line railway) that is stipulated in the Article 2 of the Nationwide Shinkansen Railway Development Law (Act No.71 of 1970);

(2) Main Operating Body: Means a corporation that carries out the Shinkansen business;

(3) Main Construction Body: Means a corporation that carries out the Shinkansen construction;

(4) Gauge: Means the minimum distance between railheads in a tangent section where center of the track is straight;

(5) Main Track: Means a guide way on which trains are operated for service on scheduled basis;

(6) Side Track: Means a guide way other than a main track;
(7) Station: Means a place to be used for passengers to board or alight, or for freight to be loaded or unloaded;
(8) Signal Station: Means a place to be used mainly for trains to pass each other or wait for each other;
(9) Marshaling Yard: Means a place to be used for shunting cars or making up a train;
(10) Station and Halt: Means a station, signal station and marshalling yard;
(11) Railway Shed (or Train depot): Means a place to be used primarily to house cars;
(12) Cars: Means locomotive, passenger car, freight car, or special car (snowplow, track inspection car, electric inspection car, accident rescue car, and/or those cars that have special structures or facilities) to be primarily used for railway business;
(13) Train: Means a set of coupled cars, referred to as consist to be run on the guide way outside of station and halt;
(14) Motive Power Unit: Means cars equipped with some form of motive power;
(15) Block: Means a section or a length of track to be exclusively occupied by one train;
(16) Rail Signal: Means signal, sign and indicator;
(17) Signal: Means a device to indicate the operating conditions for the crew in operation of a train or a car (hereinafter referred to as “train/car”);
(18) Sign: Means a method of indicating the intent of a crew between each other;
(19) Indicator: Means the device to indicate the location, direction or condition of an item to a relevant person;
(20) Dangerous Items: Means the items that are determined dangerous by the Public notice from the Minister of the Ministry of Land, Infrastructure, Transport and Tourism, but are not subject to the paragraph 2 of Article 20 of the Explosives Control Law (Act No.149 of 1950).

[Public Notice to Stipulate Dangerous Items under the Item 20, Article 2 of the Ministerial Ordinance Providing for the Technical Standard for Railways]

The hazardous items prescribed in the public notice related to Item 20, Article 2 of the Ministerial Ordinance Providing for the Technological Standard for Railways (Ministerial Ordinance No.151 prescribed by the Ministry of Land, Infrastructure and Transport, 2001) shall be defined in the following list.

Type	Item
High-pressure gas	Acetylene gas, Natural gas, Liquid air, Liquid nitrogen, Liquid oxygen, Liquid ammonia, Liquid chlorine, Liquefied propane and other compressed or liquefied gasses
Small pyrotechnics	Match, Blasting fuse, Electric fuse, Signal flare, Rocket signal, Firework, Smoke generator and any other similar items
Oiled paper, oilcloth and the like	Oiled paper or oilcloth and their products, Quasi-wool villi and their products, and animal and plant fibers and their products whose animal and plant fat or wax content exceeds 5%
Flammable fluid	Crude mineral oil, Volatile oil, Solvent naphtha, Benzene, Toluene, Xylene, Methanol, Alcohol (including denatured alcohol), Acetone, Carbon disulfide, Paint diluents, Nitrobenzene, Nitrotoluene and other flammable fluid and flammable fluid products whose flash point is 25°C or less
Flammable solid substance	Metallic potassium, Metallic sodium, Potassium amalgam, Sodium amalgam, Magnesium (excluding those in a tabular, rod-like or massive form), Aluminum powder, Yellow white phosphorus, Phosphorus sulfide, Cellulose nitrate, Niter, Ammonium nitrate, Dinitro compound, Trinitoro compound (excluding those used for explosion), Picric acid and other flammable solid products whose

	content of flammable solid substance exceeds 10%
Hygroscopic pyrogen	Hydrosulfite, Quicklime, Calcined dolomite, Calcium phosphide and Carbide
Acids	Nitric acid, Sulfuric acid, Hydrochloric acid, Sulfonyl chloride acid (including Sulfuryl chloride), Bifluoride, Lead acid battery (limited to those filled with chemical solution), and other strong acids whose strong acid content exceeds 10%
Oxidative corrosives	Potassium chlorate, Barium chlorate, Sodium chlorate, Ammonium hyperchloride, Phosphorus chloride, Sodium peroxide, Barium peroxide, Bleaching powder, Bromine and other oxidative corrosives and oxidative corrosive products whose oxidative corrosive content exceeds 30%
Volatile poison	Dimethyl sulfate, Ferrosilicon, Sulfur, Chloropicrin, Tetraalkyl lead and its products, Ethylparathion, Methylparathion and agricultural chemicals (limited to those which include Chloropicrin, Ethylparathion, Methylparathion, Schradan, Methyldemeton, Monofluroro acetamide and Tetraethyl pyrophosphate)

Supplementary provisions

1 This public notice shall come into force as from 1 April 1987.

2 For the time being, the term "Item 20, Article 20 of the Ministerial Ordinance Providing for the Technological Standard for Railways (Ministerial Ordinance No.151 prescribed by the Ministry of Land, Infrastructure and Transport, 2001)" in the main rules shall be deemed to be replaced with "Item 20, Article 20 of the Ministerial Ordinance Providing for the Technological Standard for Railways (Ministerial Ordinance No.151 prescribed by the Ministry of Land, Infrastructure and Transport, 2001)" and "Item 4, Paragraph 1, Article 2 of the Railway Vehicle Operation Rule prior to the repeal stipulated by Item 4, Article 1of the Ministerial Ordinance related to the Enforcement of Ministerial Ordinance Providing for the Technological Standard for Railways and the Attendant preparation or the like of Ministerial Ordinances pertaining to the Ministry of Land, Infrastructure and Transport (Ministerial Ordinance No. 19 prescribed by the Ministry of Land Infrastructure and Transport, 2002)".

[Ministerial Ordinance]

(Implementation Standard)

Article 3. A railway operator (In case of Shinkansen, it applies equally to the main operating or the main construction, hereinafter the same definition shall apply in this Article) shall set a standard (hereinafter referred to as "implementation standard") to implement this Ministerial ordinance and abide by that standard.

2. If the main construction body (excluding the main construction body that is also a main operating body) wants to set or alter the implementation standard, it shall consult with the main operating body in advance.

3. In case the Minister of Land, Infrastructure, Transport and Tourism has set the details of the Ministerial Ordinance by way of public notice, the implementation standard shall be set in accordance with those details.

4. When a railway enterprise wants to set or alter the implementation standard, it shall submit a notification of change in advance to a Director of the relevant District Transport Bureau (In regards to Shinkansen, to the Minister of Land, Infrastructure, Transport and Tourism. hereinafter the same shall apply in this Article).

5. A Director of the relevant District Transport Bureau may instruct or order to modify the implementation standard in case he recognizes that the standard does not comply with the stipulation of this Ministerial Ordinance.

[Approved Model Specifications]

I-1 Related to Article 3 (Implementation Standard)

1 Railway business operators shall formulate detailed implementation standards that reflect the actual state of affairs at individual railway business operators within the Ministerial Ordinance in carrying out design, maintenance and operation of facilities and rolling stock.

Items in the implementation standards shall correspond to items in the Ministerial Ordinance etc., and the contents shall be described in specific terms through quantification or the like, conforming to the examples, design methods, verification methods etc., indicated in the Approved Model Specifications.

2 Implementation standards shall be prescribed based on this Approved Model Specifications, however, the structures etc., which are not in accordance with this Approved Model Specifications shall not be precluded, in the cases where, depending on the past technical accomplishments, the railway business operator proved the compliance with the Ministerial Ordinance with such objective study methods as corroborative data-based validation or theoretical analyses, and in such cases, the explanation about the evidence etc., shall be provided when the notification is made. However, this does not apply where the facilities, rolling stock and handling that are deemed to have been granted a permission for special structure or handling (hereinafter referred to as “special permission”) under the General Railway Structure Rule, Shinkansen Railway Structure Rule, Special Railway Structure Rule, Shinkansen Railway Vehicle Operation Rule and Railway Vehicle Operation Rule prior to repeal (hereinafter referred to as ‘former Ministerial Ordinance’) or deemed to have been granted a special permission as a provisional measure based on the supplementary provisions, which do not conform to this Approved Model Specifications.

3 Of the facilities, rolling stock and handling described in the 2 Proviso, those which are deemed to have been granted a special permission during the period prior to the first reconstruction or modification following the enforcement of former Ministerial Ordinance has completed shall be grouped into the ones with a premise that reconstruction or modification will be carried out after the enforcement of the Ministerial Ordinance and others, and defined in the implementation standards by such methods as attaching provisional measures or conditions to the standard.

4 The facilities, rolling stock and handling described in the 2 Proviso shall be defined in the implementation standards by such methods as attaching conditions to the standard, with consideration given to the conditions where the structure differs from that in former Ministerial Ordinance.

[Operation Notice]

1 Related to Article 3 (Implementation Standard)

(1) The structure of facilities and rolling stock temporarily used due to disaster or the like, may not have to conform to the stipulations provided in the implementation standards, provided safety can be ensured within the scope of the Ministerial Ordinance.

(2) Implementation standards for operation and handling shall be established in the manner that the basic handling, which the staff engaged in the operation-related work will need when carrying out duties, is clear.

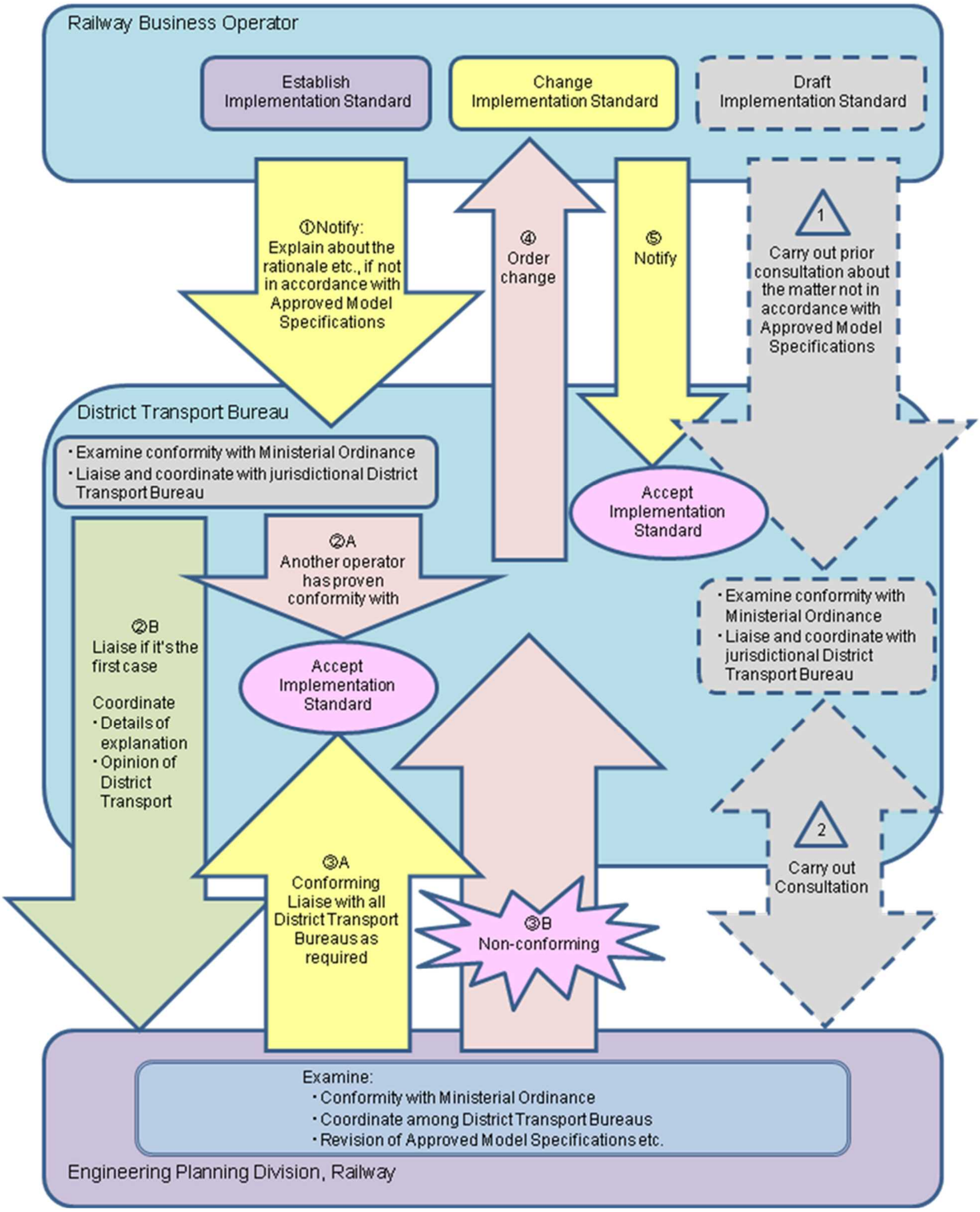
(3) In cases an implementation standard is accepted, a copy of the said implementation standard (the said implementation standard if it is pertaining to Shinkansen) shall be sent to the Engineering Planning Division.

[Business Communication]

1. Conformity with the Ministerial Ordinance of the structure etc., which is not in accordance with the Approved Model Specifications shall be checked also by the Ministry in order to ensure consistency of handling across the District Transport Bureaus. Therefore, in the case where a District Transport Bureau received an explanation, by a railway business operator, about the conformity with the Ministerial Ordinance of the structure etc., which is not in accordance with the Approved Model Specifications, it shall promptly liaise with the Engineering Planning Division, annexing the details and the opinions of the District Transport Bureau. Provided, however, that, this does not apply to the cases where the structure etc., whose conformity with the Ministerial Ordinance has already been proven by another railway operator and the conformity with the Ministerial Ordinance can also be confirmed by the relevant railway business operator.
2. In the case where 1 is applicable and matters under the jurisdiction of other District Transport Bureaus are included, the appropriate District Transport Bureau shall promptly liaise with the jurisdictional District Transport Bureaus and coordinate the opinions or the like with the District Transport Bureaus and communicate with the Engineering Planning Division.

(Reference)

Handling of the cases not in accordance with the Approved Model Specifications (Concept)



[Ministerial Ordinance]

(Submission of Documents)

Article 4. According to the stipulation of the paragraph 4 of the previous Article, a notification to District Transport Bureau, shall be submitted to the Director of the relevant District Transport Bureau who has the jurisdiction over the land of that particular case. (In case the particular case overlaps the jurisdictions of more than two Directors, the notification shall be submitted to the relevant Director who has the major jurisdiction of the particular case. Hereinafter referred to as the “relevant Director of the District Transport Bureau”)

2. As stipulated in the paragraph 4 of the previous Article, a notification to the Minister of Land, Infrastructure, Transport and Tourism shall be submitted via a relevant Director of the District Transport Bureau.

[Ministerial Ordinance]

(Prevention of Danger)

Article 5. Construction work shall be carried out carefully so as not to threaten lives by in the carrying out of grading, earth cutting, excavation, embankment, drilling piles and so on.

[Approved Model Specifications]

Matters related to I-2 Article 5 (Prevention of Danger)

Railway constructions involving excavation of earth and sand, such as grading earth cutting, excavation, embankment and drilling piles, and so on, shall be carried out so as not to pose any risk to people through landslide, subsidence, outflow of removed earth or the like under construction work and for the duration.

[Ministerial Ordinance]

(Prevention of Extreme Noise)

Article 6. A railway enterprise shall strive to prevent extreme noise to be generated with the movement of a train.

[Approved Model Specifications]

Matters related to I-3 Article 6 (Prevention of Extreme Noise)

1. The noise from Shinkansen shall be in accordance with the Environment Standard (Public notice given by the Ministry of the Environment (former Environment Agent). However, while a countermeasure against a sound source is the most fundamental measure for preventing or mitigating noises, it is difficult to achieve this promptly, and so, in response to the request of the Ministry of the Environment (former Environment Agent), for the Tokaido, Sanyo, Tohoku and Joetsu Shinkansens, the achievement of 75 decibels or less in succession according to the density of dwellings along the railway lines, through countermeasures against the sound source, shall be set as the target for the time being.

   A power mean of the peak noise level shall be measured at1.2m above the ground in the open air along the railway line and the location representing the noise in the area shall be, in principle, at a position 25m away from the center line of the near side of the track.

   However, the above shall not be applicable to restricted industrial districts, sparsely inhabited mountain forests, moors and agricultural lands.
2. In the event of a new construction or large scale modification of general railway (except Shinkansen), the following noise levels shall be achieved at 1.2m above the ground in the open air along the railway line and at a position12.5m away in horizontal distance from the center line of the near side track.
   (1) For a new construction, the equivalent noise level shall be 60 decibels or less in daytime (7:00 – 22:00) and 55 decibels or less in night time (22:00 – 07:00 on the following day).

(2) For a large-scale modification, the noise level shall be improved compared with the level prior to the modification.

In the case prescribed above, the term ‘new construction’ shall mean the section where the construction is carried out with the authorization for executing construction work prescribed by Article 8 of the Railway Operation Act, and the term ‘large-scale modification’ shall mean the section where the construction is carried out with the authorization for modification of railway facility prescribed by Article 12 of the Railway Operation Act, for introducing double track or quadruple track lines, continuous road-railway grade separations or grade separations or any grade separations equivalent to the above.

(1) and (2) does not apply to the following sections and cases.

(i) The area where building a house is not authorized and the area where the living of general residents is unlikely.

(ii) The underground section (except semi-underground and trench)

(iii) The section where installation of a soundproof wall (including balustrade) is difficult such as crossings, the section in which a turnout is installed and the section where the adoption of long rails is difficult, such as the section with sharp bends.

(iv) In the case where the service is carried out in an extraordinary manner due to accident, natural disaster, New Year’s eve or the like.

[Ministerial Ordinance]

(Measures To Be Provided for Smooth Transport of the Elderly and the Handicapped)

Article 7. The measures provided by a railway operator for the improvement of the user-friendliness and safety for the transport of the elderly and the handicapped (Act No.68 of 2000).

[Ministerial Ordinance]

(Emergency restoration setup)

Article 8. (Deleted)

Chapter 2 Staff

[Ministerial Ordinance]

(Safety Assurance of Train Operation)
Article 9. Safety shall be assured in train operation by comprehensively utilizing the knowledge and skill of staff members, and with all relevant facilities of train operation.

[Ministerial Ordinance]

(Education and Training, etc. of Staff)
Article 10. A railway operator shall provide adequate education and training to those who are directly engaged in train/car operation and do maintenance relevant works for rail facilities and rolling stock, in order for them to be well versed in necessary knowledge and skills.
2. A railway operator shall not put its staff or crew who are directly engaged in train/car operation to work until after confirming that they possess the appropriate aptitude, skill and knowledge needed to perform their duties.
3. A railway enterprise shall not let its staff or crew who are directly engaged in train/car operation performs their duties if they are recognized to be unable to adequately exercise their skill.

[Approved Model Specifications]

II-1 Related to Article 10 (Education and Training of Staff)

1. 'Staff who are engaged in work directly related to the operation of trains/rolling stock' shall be defined as follows:
   (1) Staff who maneuver trains/rolling stock or the like.
   (2) Staff who carry out such operation coordination work as changing the trains/rolling stock operation sequence or the passing of rolling stock or cancelling a service.
   (3) Staff who carry out on-board work in trains/rolling stock in order to protect trains, operate brakes, or give signals required for operation.
   (4) Staff who handle route control, block or rail signals or operate switch stands.
   (5) Staff who perform or supervise, alone, the work directly related to the operation of trains/rolling stock for the maintenance or engineering work or the like of tracks, electric railcar tracks or operation safety facilities.
   (6) Staff who operate railway crossing safety facilities.
2. 'Staff who are engaged in the maintenance of facilities and rolling stock and any other similar work' shall be defined as follows and in the case where a railway business operator outsources 'Service of facilities and rolling stock and any other similar work', any staff other than those belonging to a railway operator, who perform the outsourced work shall be included.
   (1) Staff who carry out maintenance of structures, tracks and buildings.
   (2) Staff who carry out electric installations, operation security facilities.
   (3) Staff who perform inspection and repair work for rolling stock.
   (4) Staff who directly perform the device switching operation of electric power equipments
3. The ascertainment of aptitude of the staff described in 1 shall be carried out through the examination of physical and mental functions.
4. The implementation of education and training for the staff described in 1 and the ascertainment of aptitude, knowledge and skills shall be undertaken by the railway business operator to which the relevant staff member belongs (the railway business operator which outsourced the relevant work, if the business operator to which the relevant staff member belong is a non-railway business operator. The same shall apply hereinafter), according to

the prescribed operating procedure. Provided, however, that in the case where the provision of education and training and the ascertainment of aptitude, knowledge and skills are managed by the relevant railway business operator, they may have others undertake these duties.

5. For the staff described in 1(1) and (3), a framework to provide such appropriate supervision as requesting a report on the matters required for the operation, prior to on-board duties, during the operation of trains or at any other appropriate timing, or to give instructions, shall be in place.
6. Education and training for the staff described in 2 shall include education and training carried out by others under the supervision of the railway business operator.

[Operation Notice]

2 Related to Article 10 (Education and Training of Staff)

Education and Training of the staff who are engaged in work directly related to the operation of trains/rolling stock shall be as follows.

(1) With regard to the education and training of staff

(i) Operating procedures shall stipulate the type, provider, target recipient of education, training or the like, and any other matters required for education and training or the like.

(ii) Education, training or the like shall be carried out regularly according to the prescribed annual plan.

(iii) Education and training shall be carried out for those who have been transferred to a different location even when the job description stays unchanged, in addition to those who will be newly engaged in work, and shall cover the rolling stock, track, operation safety facilities and operation and handling in the newly assigned location, as required.

(iv) Education and training provided for the familiarization in the case where the line on which those staff who maneuver motive power units are responsible for the maneuver of trains etc., has changed (including the case where the transportation service is newly starting) shall be as follows.

a. A tour of and maneuvering training in the assigned section of the track shall be carried out. In this case, the number of maneuvering training shall be for 5 or more round trips. Provided, however, that the number of maneuvering training may be increased or decreased as appropriate, in the consideration of the length of the assigned section, complexity of the track and signal indication or the like.

b. Maneuvering training shall be carried out in the same service pattern as the trains in operation (It means the trains in the condition in operation after the launch, in the case where the transportation services is newly starting. The same shall apply hereinafter). However, in the case when it is found to disrupt the section already in operation, they shall be carried out in the service pattern as similar as possible to the trains in operation.

(2) With regard to the ascertainment of aptitude

(i) Examination of physical functions shall include the examination of visual functions, audibility, illnesses and physical functions and carried out not less than once a year, depending on the job descriptions and the results shall be checked to validate that these will not impede the performance of work.

(ii) Examination of mental functions shall be carried out not less than once three years, and shall include such examinations as job aptitude test (Kraepelin test), identification, substitution, segmentation and inference tests, reaction speed test and attention allocation test, selected in consideration of job descriptions. The results shall be checked to validate that these will not impede the performance of work. In this case, job aptitude test shall be carried out without exception.

(iii) In the case where job aptitude test are carried out by the business operator themselves, the executor shall be a person who is either a certificate holder of the aptitude test training run by the Railway Technical Research Institute or a person qualified to conduct the Uchida Kaerpelin test.

(iv) With regard to Approved Model Specifications 5, such operation methods as the timing of reports or instructions to supervise staff appropriately, shall be stipulated in the implementation standard.

(3) With regard to the ascertainment of knowledge and skills, the timing of and method for regularly checking the proficiency with the stipulations related to operation and handling and other matters that need to be abided by and the extent of putting them into practice shall be stipulated in the operating procedure.

(4) Standard for the implementation of (2) and (3) shall be established and appropriate actions shall be taken for those who do not satisfy the standard, and have them start work only when the standard have been satisfied.

[Ministerial Ordinance]

(Duties, etc. of Crew to Operate a Motive Power Unit)

Article 11. A train shall have a crew on board to drive a motive power unit. However, that this provision does not apply in those cases when safe train operations would not be impaired even without a crew, due to the type of facilities and car design and structure.

2. A crew that drives a motive power unit shall be the one that has obtained the driving license specified in the Item 1 through Item8 and also Item 12 of the paragraph 1 of the Article 4 of the Ministerial Ordinance (Minister of Transport Ordinance No. 43 of 1956). Note, however, that this does not apply to the following cases.

(1) When a crew apprentice is riding with a licensed person to get a direct guidance on board a motive power unit.

(2) When a motive power unit is moving on the side track which would not interfere with a main track.

3. A crew who drives a motive power unit shall not be on duty, when under the influence of alcohol or drug.

[Approved Model Specifications]

II-2 Related to Article 11 (On-board Duties of Staff who Maneuver Motive Power Units)

1. 'Those cases where safe train operations would not be impaired even without the relevant staff onboard, due to such reasons as the structure of facilities and rolling stock' in the proviso of Paragraph 1 shall mean the case where the following items are satisfied and the criteria stipulated by Item 3, Article 36, Article 58 and Paragraph 2, Article 86 are complied with.

   (i) In the case where the structure is such that a person or the like cannot easily enter on to the track and the railway is in no danger of such situations as rock-falls impeding the course of trains to happen. Provided, however, that this does not apply if a device capable of detecting the occurrence of the events on the tracks that pose an impediment to the train services and stopping the trains automatically, and if any other measures are taken to ensure that there is no danger of safe train operation being impeded.

   (ii) In the case where the railway structure or configuration is such that the protection of trains against adjacent tracks is not required. Provided, however, that this does not apply if the staff in charge of protecting trains are onboard, or if a device capable of detecting the occurrence of the events that pose an impediment to the adjacent tracks, and stopping the trains automatically.

   (iii) In the case where the railway is such that, in emergency situations, passengers are able to evacuate easily.

2. Item 2, Paragraph 2 shall mean the move within the zones that will not impede train services on the main track such as the side track zone outside the sections in which an operation error on a storage and retrieval track or a side track could pose an immediate impediment to the main track.
3. A crew who drives a motive power unit shall not be on duty, when under the influence of alcohol or drug.

'Revision' Paragraph 3 added to the Approved Model Specifications related to Article 11 (April 28, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.18) Enforced as from 1 July.

'Revision' Paragraph 2 of the Approved Model Specifications related to Article 11 revised (July 14, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.40) Enforced as from 1 October.

Chapter 3 Guide Way

Section 1. Gauge

[Ministerial Ordinance]

(Gauge)

Article 12. Gauge shall be able to maintain the safe and stable car operation, given the structure of rolling stock, the maximum design speed and other relevant factors into consideration.

[Approved Model Specifications]

Ⅲ-1 Related to Article 12 (Gauge)

Gauge shall be as follows in order to ensure the safe rolling stock operation, and shall take the structure of the rolling stock, such as width, and past performance records into consideration.

(1) Gauge of ordinary railways (excluding Shinkansen railways) shall be 0.762m, 1.067m, 1.372m, or 1.435m.

(2) Gauge of Shinkansen railways shall be 1.435m.

Section 2. Guide Way Alignment

[Ministerial Ordinance]

(Guide way Alignment)

Article 13. Radius of curve and gradient of the main track shall be able to ensure the high-speed and large capacity performance of the rail transport, taking the maximum design speed and tractive effort into consideration. This does not apply, however, to those prohibitive cases from the standpoint of topography.

[Approved Model Specifications]

Ⅲ-2 Related to Article 13 (Guide Way Alignment)

The curve radius of the main track (excluding the curves inside a turnout and in the vicinity of a turnout (hereinafter referred to as a “curve incidental to a turnout”)) and the gradient of the main track, taking the performance of the rolling stock and other factors into consideration, shall be determined so as to attain at least approximately 80% of the maximum design speed of said line, excluding cases that are prohibited by topography. However, the gradient of the main track for the line on which operation is carried out by locomotive traction shall be such that will enable the designed traction load of this line, taking the performance of the locomotive and other factors into consideration.

[Ministerial Ordinance]

（Radius of curvature）

Article 14. Radius of curvature shall be set in order not to impair safe car operations, taking the performance capability of negotiating a curve, the operation speed, and other relevant factors into consideration.

2. Radius of curvature along a platform on the main track shall be set as large as possible.

[Approved Model Specifications]

Ⅲ-3 Related to Article 14 (Radius of curvature)

A curve radius that does not impede safe car operation on a main track shall comply with the following criteria, taking the amount of cant, the operation speed and other factors into consideration.

(1) Curve radius of ordinary railways shall be as follows.

① Curve radius (excluding a curve incidental to a turnout, the same shall apply to ②) of ordinary railways (excluding Shinkansen and railways with a gauge of 0.762m) shall not be less than 160m. And, the radius of a curve incidental to a turnout shall not be less than 100m.

② Curve radius of ordinary railways (limited to railways with a gauge of 0.762m) shall not be less than 100m. And, the radius of a curve incidental to a turnout shall not be less than 40m.

③ Curve radius of Shinkansen shall not be less than 400m. (the radius of a curve incidental to a turnout on the line only for dead-head car trains operation shall not be less than 200m.)

(2) Curve radius of special railways shall be as follows.

① Curve radius of special railways (excluding trackless electric vehicle, cable railways, superconducting magnetic levitation railways and electromagnetically guided type railways) shall not be less than 100m. This does not apply to cases that are prohibited by topography.

② Curve radius of cable railways shall not be less than 300m.

③ Curve radius of superconducting magnetic levitation railways shall not be less than 800m.

④ Curve radius of electromagnetically guided type railways shall not be less than 15m, as a standard. This does not apply to cases that are prohibited by topography.

(3) Notwithstanding the provisions of (1) and (2), on sections where only rolling stock having a construction that takes passing through sharp curves into consideration, the minimum curve radius may be a value corresponding to the curving performance of said rolling stock.

(4) Notwithstanding the provision of (1) above, the curve radius of ordinary railways may be a value corresponding to the curving performance of the rolling stock when the curve radius is prohibited by topography and (i) where the value calculated by the following formula is 1.2 or greater, or (ii) where the value is smaller than 1.2, but an anti-derailment guard or the like is installed.

(estimated derailment coefficient ratio) = (critical derailment coefficient)/(estimated derailment coefficient)

Where,

derailment coefficient=Y/Q

Y=lateral wheel load

Q=vertical wheel load

(5) Notwithstanding the provisions of (1) to (4) above, the minimum curve radius along the platform on railways other than those for trackless electric vehicle and cable railways shall not be less than the value shown in the following table. However, excluding the [longitudinal] end part of the platform where there are few passengers around or platform equipped with platform doors directly connecting to the rolling stock.

Ordinary railways (excluding Shinkansen), special railways (excluding Shinkansen)	400m (300m, for sections where only rolling stock of less than 18m in length travels)
Shinkansen	1,000m

[Operation Notice]

3 Related to Article 14 (Radius of curvature)

“. . .the [longitudinal] end part of the platform ” in the proviso in (5) of Approved Model Specifications is defined as the approximate length of one vehicle that stops at the platform, measured from the [longitudinal] end of the platform. “. . . where there are few passengers around” refers to cases where there are no passenger stairs and ticket barriers at the end part of the platform, and no potential for passengers to congregate.

[Ministerial Ordinance]

(Cant)

Article 15. To prevent overturning of rolling stock, cant shall be provided according to the gauge, curve radius, operation speed, etc., to resist the centrifugal force and wind power imposed to them. This rule does not apply, however, to such areas as switches, curves incidental to switch and side tracks that do not allow cant to be provided but are protected by some preventive measures including speed restriction, so that there in no danger of car overturn.

2. Cant shall be gradually decreased over a considerable distance, taking the amount of cant and the speed and structure of the rolling stock into consideration, so that there is no chance of interfering with the safe car operation.

[Approved Model Specifications]

Ⅲ-4 Related to Article 15 (cant)

Cant provided to the circular curves of railways, except cable railways, shall comply with the following criteria, taking the centrifugal force exerted on the rolling stock during traveling into consideration. However, in cases where the center of gravity of a rolling stock is disproportionately high in relation to the gauge, or where the rolling stock is light in weight, safety shall be verified against overturning due to wind forces while the rolling stock is not moving, or when it is traveling at a restricted speed in curve.

(1) The standard for cant for ordinary railways shall be the value calculated by the following formula. However, in the case of a curve incidental to a turnout or the like, this does not apply provided that it has been verified that there is no danger of the rolling stock overturning due to measures such as restricting the traveling speed,

$C=GV^2 / 127R$

In this formula, C, G, V and R represent the following values respectively.

C: Cant (unit: mm)

G: Gauge (unit: mm)

V: Average speed of the train passing through the relevant curve (unit:km/h)

R: Curve radius (unit; m)

In this case, cant shall not be greater than the values calculated by the following formula.

$C=G^2 / 6H$

Where, H represents the following value.

H: Distance from the rail surface to the center of gravity of the rolling stock (unit:mm)

(2) Cant of special railways (excluding trackless electric vehicle and cable railways) shall be as follows.

① Ratio of cant for suspended railways, straddle-type monorails, guide-rail-type railways and electromagnetically guided type railways shall use the value calculated by the following formula as the standard, but it shall not be greater than 12%.

$i=V^2 / 1.27R$

Where, I, V and R represent the following values respectively.

i: Ratio of cant (unit: %)

V: Average speed of the train passing through the relevant curve (unit:km/h)

R: Curve radius (unit; m)

② Angle of cant of normal conducting magnetic levitation railways (only linear induction motor propulsion system; hereinafter the same), except for a curve incidental to a turnout, shall use the value calculated by the following formula as the standard. However, the value shall not be greater than 8 degrees.

$\theta=\tan^{-1} (V^2 / 127R)$

Where, θ, V and R represent the following values respectively.

θ: Angle of cant (unit: deg.)

V: Design permitted speed in curve (unit: km/h)

R: Curve radius (unit: m)

③ Angle of cant of superconducting magnetic levitation railways shall use the value calculated by the following formula as the standard. However, the value shall not be greater than 10 degrees.

$\theta=\tan^{-1} (V^2 / 127R)$

Where, θ, V and R represent the following values respectively.

θ: Angle of cant (unit: deg.)

V: Design permitted speed in curve (unit: km/h)

R: Curve radius (unit: m)

(3) Cant of railways other than cable railways shall be gradually decreased according to the following criteria.

① In the case where transition curve is provided, decreasing shall be done along the whole length of the transition curve.

② In the case where transition curve is not provided (excluding the case where two successive curves having the same direction are connected), cant shall be gradually decreased in the adjacent tangent section, of which the distance from the beginning or the end of the circular curve is (i) more than 300 times of cant value when the maximum wheelbase of the rolling stock traveling in this curve is 2.5m or smaller, (ii) more than 400 times of cant value when greater than 2.5m.

③ In the case of ②, assuming curve shaped cant variations, the maximum transition gradient shall be (i) 1/300 when the maximum wheelbase of the rolling stock traveling in this curve is 2.5m or smaller, (ii) 1/400 when greater than 2.5m.

④ In cases where two successive curves having the same direction are connected without a transition curve, the difference in cant values of these two circular curves shall be gradually decreased in the circular curve having the larger curve radius, and done so in a distance that is more than 400 times of the difference in cant value. In this case, assuming curve shaped cant variations, the maximum transition gradient shall be 1/400.

[Ministerial Ordinance]

(Gauge widening)

Article 16. Gauge widening shall be provided at circular curve sections to prevent excessive lateral force to the track, taking the curve radius and bogie wheelbase of rolling stock into consideration. This rule does not apply, however, to those cases where the radius of curve is large, the wheelbase of rolling stock is short and/or there is no chance for the excessive lateral force to be generated.

2. Gauge widening shall be gradually decreased over the considerable distance in order not to interfere with safe car operations, taking the bogie wheelbase of rolling stock into consideration.

[Approved Model Specifications]

Ⅲ-5 Related to Article 16 (Gauge widening)

Gauge widening for ordinary railways shall be determined as follows, taking curve radius, wheelbase, the number of axles and other such factors of the rolling stock traveling on this curve section into consideration.

(1) Gauge widening shall not exceed the value calculated by the following formula.

① For line sections where only two-axle rolling stock travels,

$S_{max}=1000\ (B^2 / (2R)) - \eta$

② For line sections other than ①

$S_{max}=1000\ (9B^2 / (32R)) - \eta$

where, S_{max}, B, R and η represent the following values respectively.

S_{max}: Maximum value of gauge widening (unit:mm)

B: Maximum wheelbase of the rolling stock traveling on said curve (unit:m)

R: Curve radius (unit:m)

η: Movable allowance between wheel and rail (unit:mm)

③ Notwithstanding the provisions of ① and ② above, the maximum value for gauge widening shall be 25mm (16mm for a railway with a gauge of 0.762m).

(2) Gauge widening shall be gradually decreased in accordance with the following criteria.

① In the case where a transition curve is provided, decreasing shall be done along its entire length.

② In the case where transition curve is not provided, gauge widening shall be gradually decreased in the adjacent section, of which the distance from the beginning or the end of the circular curve is equal to or greater than the maximum wheelbase of the rolling stock traveling on said curve. However, this does not apply to curves inside a turnout.

[Ministerial Ordinance]

(Transition Curve)

Article 17. Transition curve shall be provided between tangent track and circular curve track to secure the safe car operation, taking the structure of the rolling stock, the amount of cant and operation speed into consideration. This rule does not apply, however, to curves incidental to switch, circular curves with a small cant and other cases where it is difficult to provide transition curve, and also other preventive measures are taken. Preventive measures include speed restriction, installation of derailment prevention device and others that will not impair the safe car operation.

[Approved Model Specifications]

Ⅲ-6 Related to Article 17 (Transition curve)

The transition curve shall comply with the following criteria, which are dependent upon the wheelbase and other factors of the rolling stock that travels on said transition curve.

(1) The length of the transition curve shall be as follows, taking the traveling speed of the train into consideration. However, in the case of a curve incidental to a turnout, a circular curve with a small cant, or other types of curves, this criteria may not be applied if it has been verified that safe traveling of the rolling stock can be ensured by restricting the traveling speed.

① The length of the transition curve of ordinary railways (excluding Shinkansen) shall not be less than the value calculated by the following formula.

(A) For the line section where the maximum wheelbase of the rolling stock traveling on the said curve is greater than 2.5m

$L=400\ C_m$

(B) For the line section where the maximum wheelbase of the rolling stock traveling on the said curve is equal to or smaller than 2.5m

$L=300\ C_m$

Where, L and C_m represent the following values respectively.

L: Length of transition curve (unit: m)

C_m: Actual cant (difference between two actual cants when transition curve is inserted between two circular curves; unit: m)

In this case, assuming curve shaped cant variations, the length of the transition curve shall be so determined that the maximum gradient of cant is (i) 1/400 for a line section where the maximum wheelbase of the rolling stock traveling on the said curve is greater than 2.5m, or (ii) 1/300 for a line section where it is otherwise.

② The length of a transition curve for Shinkansen (excluding superconducting magnetic levitation railways) shall not be less than the value calculated by the following formula.

(A) For a line section where the maximum speed of a train traveling on said curve is less than 200km/h.

$L=300\ C_m$

(B) For a line section where the maximum speed of a train traveling on the said curve is equal to or greater than 200km/h.

$L=450\ C_m$

Where, L and C_m represent the following values respectively.

L: Length of transition curve (unit: m)

C_m: Actual cant (difference between two actual cants when transition curve is inserted between two circular curves; unit: m)

③ Notwithstanding the provisions ① and ② above, the length of the transition curve on the outlet side of ordinary railways may be the value corresponding to the curving performance of the relevant rolling stock, (i) where the value calculated by the following formula is 1.2 or greater, or (ii) where the value is smaller than 1.2 but a anti-derailing guard or the like is installed along the said transition curve.

(estimated derailment coefficient ratio) = (critical derailment coefficient)/(estimated derailment coefficient)

Where ,

derailment coefficient=Y/Q

Y=lateral wheel load

Q=vertical wheel load

④ The length of the transition curve of suspended railways shall not be less than the value calculated by the following formula.

$L=V^3 / 28R$

⑤ The length of the transition curve of straddle-type monorails and guide-rail-type railways shall not be less than the value calculated by the following formula.

$L=V^3 / 14R$

$L=V^3 / 17R$ (where the above value is impossible to obtain because of the topography)

Where, L, V and R represent the following values respectively.

L: Length of transition curve (unit: m)

V: Maximum speed of the train traveling on said curve (unit: km/h)

R: Curve radius (unit: m)

⑥ The length of the transition curve of normal conducting magnetic levitation railways shall not be less than the value calculated by the following formula.

$L=(L_m \cdot G \cdot \sin\theta) / \delta l$

Where, L_m, G, δl, θ and V represent the following values respectively.

L_m: Length of one-side module of the rolling stock (unit: m)

G: Center-to-center distance of the rails (unit: m)

δl: A constant depending upon the structure of the rolling stock (unit: m)

θ: Angle of cant (unit: deg.)

V: Speed of the train (unit: km/h)

⑦ The length of the transition curve of superconducting magnetic levitation railways shall no be less than the value calculated by the following formula. However, this does not apply when there are topographical restrictions and when additional measures have been taken to prevent impairment of the running safety of trains.

$L = 0.145\theta \cdot V$

In this formula, L, θ and V shall have the following meanings, respectively.

L: Length of transition curve (unit: m)

θ: Angle of cant (unit: deg)

V: Maximum speed of the train traveling on the said curve (unit: km/h)

⑧ The length of the transition curve of electromagnetically guided type railways shall not be less than the value calculated by the following formula.

$L=V^3 / 28R$

Where, L, V and R represent the following values respectively.

L: Length of transition curve (unit: m)

V: Speed of the train traveling on the said curve (unit: km/h)

R: Curve radius (unit: m)

[Ministerial Ordinance]

(Gradient)

Article 18. Gradient shall be set in the manner that a car can be started, operated continuously at a designated speed and brought to a stop within a designated braking distance, taking situations into consideration such as the car performance of motive device and braking device and operation speed.

2. Gradient of the area where a train comes to a stop shall be set not to interfere with train departure and arrival, taking situations into consideration such as the car performance of motive device and braking device.

3. Gradient of the area where rolling stock are dwelled or coupled and decoupled shall be set to keep a car from rolling out. This rule does not apply, however, when an appropriate preventive measure is provided.

[Approved Model Specifications]

Ⅲ-7 Related to Article 18 (Gradient)

The maximum gradient of the track in traveling areas and stopping areas (including parking areas and areas for coupling and decoupling the rolling stock) shall be determined in consideration of the performance of motive device, braking device, operation speed and other such factors of the rolling stock.

(1) The maximum gradient of ordinary railways (excluding Shinkansen) shall be according to the following standards.

① The maximum gradient in the traveling areas for trains shall be as follows.

(A) 25/1000 on tracks traveled by trains pulled by locomotive (limited to the line sections where freight trains travel). (Including where the equivalent assessed gradient is

25/1000)

(B) 35/1000 on tracks other than (A).

(C) Notwithstanding the provisions of (A) and (B) above, the maximum gradient of the track used only by trains powered by linear induction motor trains shall be 60/1000.

(D) Notwithstanding the provisions of (A)～(C) above, the maximum gradient in turnout areas shall be 25/1000.

② The maximum gradient in the stopping areas shall be 5/1000. However, it may be 10/1000 in the areas not used for parking or coupling/decoupling of the rolling stock, but only if there is no possibility of interference with train departure and arrival.

(2) The maximum gradient of Shinkansen (excluding superconducting magnetic levitation railways) shall be according to the following standards.

① The maximum gradient in the traveling areas for trains shall be as follows.

(A) 25/1000.

(B) Where the above standard cannot be applied for topographic or other reason, it may be 35/1000, taking the performance of the motive device, power transmission device, running gear and braking device into consideration.

② The maximum gradient in the stopping areas for trains shall be 3/1000.

(3) The maximum gradient of suspended railways, straddle-type monorails and guide-rail-type railways shall be according to the following standard.

① The maximum gradient in the traveling areas for trains shall be 60/1000. This does not apply, however, when prohibited by topographic or other inevitable reasons.

② The maximum gradient in the stopping areas for trains shall be 5/1000. However, it may be 10/1000 in the areas not used for parking or coupling/decoupling of the rolling stock, but only if there is no possibility of interference with train departure and arrival.

(4) The maximum gradient of normal conducting magnetic levitation railways shall be according to the following standard.

① The maximum gradient in the traveling areas for trains shall be 60/1000.

② In the stopping areas for trains, gradients shall not be provided.

(5) The maximum gradient of super conducting magnetic levitation railways shall be according to the following standard.

① The maximum gradient of the travelling sections for trains shall be 40/1000. However, this does not apply when there are topographical restrictions and when there is no possibility of interference with travelling train.

② The maximum gradient in the stopping areas for trains shall be 3/1000

(6) The maximum gradient of electromagnetically guided type railways shall be according to the following standard.

① The maximum gradient in the traveling areas for trains shall be 70/1000.

② The maximum gradient in the stopping areas for trains shall be 10/1000.

[Ministerial Ordinance]

(Vertical Curve)

Article 19. Vertical curve shall be installed wherever a gradient changes so that it does not interfere with the safe car operation, taking operation speed and the structure of rolling stock into consideration. This rule does not apply, however, to those cases where a gradient change is minimum, operation speed is low, or a safe car operation is not impaired.

[Approved Model Specifications]

Ⅲ-8 Related to Article 19 (Vertical Curve)

1 The radius of a vertical curve shall not be less than the following values. However, this does not apply if it has been verified that safe operation of the rolling stock can be ensured based upon operation speed and other factors.

(1) 2,000m (3,000m where the horizontal curve radius is not greater than 600m) for ordinary railways (except Shinkansen). However, where the change of gradient is smaller than 10/1000, insertion of vertical curves may be omitted.

(2) 10,000m (5,000m for the sections where the traveling speed is not greater than 250km/h) for Shinkansen (except superconducting magnetic levitation railways).

(3) 1,000m for straddle-type railways, suspended railways, guide-rail-type railways and electromagnetically guided type railways. However, where the change of gradient is smaller than 10/1000, insertion of vertical curves may be omitted.

(4) 1,500m for normal conducting magnetic levitation railways. However, where the change of gradient is smaller than 10/1000, insertion of vertical curves may be omitted.

(5) 40,000m for superconducting magnetic levitation railways (3,000m for section running only by the support wheel).

2 In the case of railways other than trackless electric vehicle and cable railways, the combined use of a vertical curve and a transition curve should be avoided as far as possible.

Section 3. Structure Gauge

[Ministerial Ordinance]

(Structure Gauge)

Article 20. Structure gauge at a tangent line shall be set to provide an adequate distance from the car clearance not to impair train operations and the safety of passengers and crew, taking the vibration caused be car operation in consideration.

2. Structure gauge at a tangent line where electric locomotive hauled or electric multiple units are operated, shall be determined in such a way as to provide a sufficient distance from the car clearance to prevent electric shock or fire.

3. Structure gauge at a curve shall be larger than those specified in the preceding two paragraphs depending upon the deviation of rolling stock, and shall be slanted according to the amount of the cant.

4. No building or structure shall be built within the construction gage.

5. Any object other than a train/car shall not be placed within the construction gage. This rule does not apply, however, to inevitable cases like carrying out necessary construction work, as long as appropriate precautions like speed restriction, for example, are taken to secure safety.

6. Nothing shall be placed even outside of the structure gauge that could fall into the structure gauge.

[Approved Model Specifications]

Ⅲ-9 Related to Article 20 (Structure Gauge)

A railway company shall specify a structure gauge and make sure not to build buildings or other structures within it. Standard drawings of structure gauge at a tangent line are shown in Figs. 1, 2 and 3. Fig. 1 is for ordinary railways (except Shinkansen); Fig. 2 is for Shinkansen (excluding superconducting magnetic levitation railways); and Fig.3 for superconducting magnetic levitation railways. In the case of special railways (excluding superconducting magnetic levitation railways), the shapes and dimensions to be required to correspond to the type of the railway shall be stipulated.

(1) Structure gauge at a tangent line of ordinary railways and cable railways shall be set in such a way that the clearance between structure gauge and basic rolling stock gauge for the locations shown in the left side column of the next table shall be not less than the values shown in the right side column respectively

Location of structure gauge	Clearance between structure gauge and rolling stock gauge (unit: mm)
Locations to the sides of the windows of the rolling stock	400 (200 is limited to rolling stock having a structure that prevents a passenger from extending [any part of] his/her body out of the windows) 500 for Shinkansen
Locations upward and to the sides of platform	50

(2) Even within the basic structure gauge, certain constructions can be built if they are necessary for the traveling of rolling stock or the maintenance of railway facilities and if there is no possibility of impeding the safe travel of the rolling stock. In such a case, this shall be stipulated in the structure gauge provisions.

(3) Structure gauge at a curve (including the structure gauge for platforms along curves) for railways except trackless electric vehicle, superconducting magnetic levitation railways and electromagnetically guided type railways, shall be increased, according to the deviation of the rolling stock, by adding the values calculated by the following formulae to both sides of the structure gauge at a tangent line, and shall be slanted corresponding to the cant. However, if, in ordinary railways (except Shinkansen) and special railways, the amount of deviation due to the curve radius is substantially smaller than the clearance between the structure gauge and the basic rolling stock gauge, the increase of the structure gauge at a curve according to the deviation may be omitted, with the exception of platforms. On Shinkansen, when the curve radius is 2,500 m or greater, the increase associated with the deviation may be omitted.

① Deviation toward inside of curve W_1

$W_1 = R - \sqrt{(R-d)^2 - (L_1 / 2)^2}$

$d = R - \sqrt{R^2 - (L_0 / 2)^2}$

② Deviation towards the outside of curve W_2

$W_2 = \sqrt{(R + B / 2 - W_1)^2 + (L_2 / 2)^2} - R - B / 2$

Where, L_0, L_1, L_2, B, R, W_1 and W_2 represent the following values respectively.

L_0: Wheelbase

L_1: Distance of fixed axles of bogie

L_2: Length of rolling stock

B: Width of rolling stock

R: Curve radius

W_1: Deviation toward the inside of the curve

W_2: Deviation toward the outside of the curve

(4) In railways except trackless electric vehicle, superconducting magnetic levitation railways and electromagnetically guided type railways, structure gauge on the section from the end of a circular curve (where two transition curves are connected directly, the point of the connection, hereafter the same) to a point outside the end of the transition curve (where there is no transition curve, the end of said circular curve) for the length of the longest rolling stock traveling on said line, shall be determined by gradually decreasing the value for said section that should be added at the end of relevant circular curve in (3) above, and adding it to both sides of the structure gauge at a tangent line.

(5) In electromagnetically guided type railways, the structure gauge shall be as follows.

① The structure gauge at a tangent line shall be determined by taking into consideration the width of the rolling stock controlled by the magnetic induction device, tire blowouts, and other such factors.

② The structure gauge at a curve shall be increased by adding the necessary value to both sides of the structure gauge at a tangent line that corresponds to the deviation of the rolling stock, and shall be slanted to correspond to the cant.

③ The structure gauge in the section provided with a guard wall shall be determined in consideration of the maximum protrusion of the rolling stock from the guard wall when the guide wheels are in contact with the wall, etc.

Section 4. Width of Formation Level and Distance between Track Centers

[Ministerial Ordinance]

(Width of Formation Level)

Article 21. The width of formation level at a tangent track shall be appropriately set to maintain the function of the track appropriate to the track structure. Also it shall be able to provide enough space for crew to take shelter when a train is approaching.

2. The width of formation level at a curve shall be made larger than the one in the previous article, according to the deviation of rolling stock and the amount of cant.

[Approved Model Specifications]

Ⅲ-10 Related to Article 21 (Width of Formation Level)

The width of formation level shall be such that it can maintain the function of the track, taking the gauge, track structure, permanent way appurtenance, maintenance work and other factors into consideration, and shall meet the following criteria.

(1) The width of the formation level for ordinary railways (except Shinkansen) and cable railways shall be as follows.

① The width of formation level for embankment and cutting sections (distance from the center of the track to the outer edge of the formation) shall be such that it can transmit the load exerted on the track smoothly to the roadbed in a manner compatible with the structure of the track and can maintain the function of the track. On the side where the trackmen will work or take shelter, the width shall be arranged in such a manner as to increase the structure gauge of the said section by 0.6m or more.

② In above, the width of formation level at a curve shall be increased by a substantial amount. The standard for the amount of the increment shall use the value attained by the following formula.

$y=\alpha\cdot C$

Where, α and C represent the following values respectively.

y: Dimension of increment (unit: mm)

α: Standard values calculated in the standard cross-section for each gauge

(3.26 for gauge 762mm)

(3.35 for gauge 1,067mm)

(2.67 for gauge 1,372mm)

(3.06 for gauge 1,435mm)

C: Actual cant (unit: mm)

③ The width of formation level in the sections having the structure of elevated viaducts or others shall be 2.75m or greater. However, this can be reduced if there is no problem from the viewpoint of the track structure, sheltering area, and other factors.

④ In the sections of ballast-less bridges, tunnels, or other construction, where it is difficult to provide sufficient formation width for the crew to take shelter, sheltering bays shall be provided by taking into consideration the traveling speed of the train and other factors. The sheltering bays shall be set every 50 meters.

(2) The width of formation level for Shinkansen (excluding superconducting magnetic levitation railways) shall be as follows.

① The width of formation level for embankment and cutting sections shall be 3m or more.

② In ① above, the width of formation level at a curve shall be increased by a substantial amount. The calculation formula for the amount of this increase shall be the same as ② of (1) above. Here, the standard value of α shall be as follows.

α: 2.94

③ The width of formation level in the sections having the structure of elevated viaducts or others shall be 3m or greater. However, this can be reduced if there is no problem from the viewpoint of sheltering and other factors.

④ The width of formation level shall be increased to a width equal to or greater than 3.5m, for the side where sheltering or the like is provided, and shall take into consideration wind pressure from the passing train and other such factors. Where the traveling speed exceeds 250km/h, measures shall be taken to ensure the safety of trackmen and others who take shelter.

(3) The width of formation level for superconducting magnetic levitation railways shall be as follows.

① The width of formation level for embankment and cutting sections shall be 3.15m or more.

② In ① above, the width of formation level at a curve shall be increased by a substantial amount. As standard, the calculation formula for the amount of this increase shall be as follows.

$$y=1/2\ (\beta \cdot \sin\theta)$$

In this formula, y, β and θ shall express the following values.

y: Dimension of increment (unit: mm)

β: Height from the formation level to the guide way side wall crown (unit: mm)

θ: Angle of cant (unit: deg)

③ The width of formation level in the sections having the structure of elevated viaducts or others shall be 3.15m or greater. However, this can be reduced if there is no problem from the viewpoint of sheltering and other factors.

[Ministerial Ordinance]

(Distance between Track Centers)

Article 22. The distance between track centers at a tangent track shall be set to maintain the safe car operation by eliminating the possibility of pitching cars touching each other or hurting a passenger leaning out of a train window.

2. Distance between track centers at a curve shall be larger than the one described in the previous provision, according to the deviation of rolling stock.

[Approved Model Specifications]

Ⅲ-11 Related to Article 22 (Distance between Track Centers)

The distance between track centers shall be such that there is no possibility to impeding safe car operation and the safety of passengers and trackmen, and shall conform to the following criteria.

(1) The distance between track centers of ordinary railways (except Shinkansen) and special railways (except trackless electric vehicle, superconducting magnetic levitation railways and magnetic induction railways) shall be as follows.

① The distance between track centers at a tangent line of the main track (to be limited to the track for a train traveling at 160km/h or less speed) shall not be less than the maximum width of the basic rolling stock gauge plus 600mm. However, the said distance shall not be less than the maximum width of the basic rolling stock gauge plus 400mm on lines that have limited the travel of trains to those having a structure that prevents passengers from extending [any part] of their bodies from the windows of these trains.

② If [train] sheltering is expected between the tracks, the distance in ① above shall be increased by 700mm or more.

③ The distance between track centers at a curve shall be increased by the value corresponding to the deviation of the rolling stock as attained by the following formula to the distance stipulated in ① or ② above. However, if the value calculated in the following formula is sufficiently small compared to the clearance between the structure gauge and the basic rolling stock gauge, the increment corresponding to the deviation of the rolling stock can be omitted. The calculation formula for the deviation due to a curve shall be the same as the formula for increasing the structure gauge at a curve according to the deviation of the rolling stock as stipulated in Approved Model Specifications (3) of Article 20.

$W=A + W_1 + W_2$

Where, W, A, W_1 and W_2 represent the following values respectively.

W: Dimension of increment

A: Deviation due to the difference in amount of cant

W_1: Deviation due to the curve in the particular track

W_2: Deviation due to the curve in the adjacent track

(2) The distance between track centers of Shinkansen (excluding superconducting magnetic levitation railways) shall be as follows.

① The distance between track centers at a tangent line of the main track (to be limited to the track for a train traveling at 300km/h or less speed) shall not be less than the maximum width of the basic rolling stock gauge plus 800mm (600mm for the sections where the train will travel at 160km/h or less). The value shall be increased where necessary for conducting work or the like.

② The distance between track centers at a curve shall be increased by adding the increment calculated in ③ of (1) to the distance stipulated in ① above that corresponds to the deviation of the rolling stock. However, where the curve radius is 2,500m or greater, this increase corresponding to the deviation may be omitted.

(3) The distance between track centers (center-to-center distance of the guideway) for superconducting magnetic levitation railways shall be 5.8m or more. However, this does not apply when there is no possibility of interference with travelling train.

(4) The distance between track centers (center-to-center distance of the travel way) for electromagnetically guided type railways shall be as follows.

① The distance shall be determined so that the structure gauges of the two adjacent tracks do not overlap.

② The stipulation in ② of (1) shall be applied to electromagnetically guided type railways.

Section 5. Structure of Guide Way

[Ministerial Ordinance]

(Track)

Article 23. Railway track shall conform to the following standards:

(1) It shall conform to the structure of a rolling stock and shall be able to guide it to a specified direction.

(2) It shall withstand the anticipated load.

(3) It shall not deform to the extent to jeopardize the safe car operation.

(4) It shall not impede the maintenance of way.

2. Protective devices shall be installed to prevent derailment or to minimize the consequence of derailment, at those critical areas where derailment could be a possibility and/or the damage of derailment could be detrimental.

3. At the linear motor railway system, the above ground facilities together with its accessories and fastening devices shall be equipped with the necessary capabilities to operate the train/car, installed at the location that would not impair the safe car operation and have the safe structure to withstand the attractive or suction forces that accompanies the motive power generation.

[Approved Model Specifications]

Ⅲ-12 Related to Article 23 (Track)

The track shall be of the following structure, and the following installation conditions of the turnouts and guard rails shall be taken into consideration in order to ensure the safe traveling trains.

(1) The safety of the track structure of ordinary railways (including turnouts) shall be based on the notification “Design Standards for Railway Structures and Commentary (Track Structures).” If the design is implemented by using a method other than those stipulated in the “Design Standards for Railway Structures and Commentary (Track Structures),” the safety shall be confirmed through the verification of the following items.

① Examination of the stress generated in structural elements and deformation of the track panel

With respect to the occasional very high load or the repeated load generated as a train travels along a track, the stress on each structural element of the track shall be calculated by taking into account the track structure, the rolling stock and operating conditions, the quality of track geometry and other factors. Then, the structural elements shall be examined for fatigue and breaking strength from the viewpoint of safe running of the rolling stock. Also, an investigation into abrupt lateral displacement should take the differences due to the track structure and the load conditions into consideration, and a safety check against plastic deformation shall be carried out comparing the lateral force on sleeper generated by the very high load with the resistance to lateral displacement of the sleepers in the ballast bed.

② Check concerning long-term stability of a track

Regarding the deterioration due to the accumulated vertical or lateral displacement caused by the repeated passage of trains along a track, the estimated value of the deterioration of the vertical or lateral displacement calculated from the performance of track structure and train load conditions shall be checked against the allowable value of the development of the vertical or lateral displacement derived from the rolling stock and operating conditions, assumed maintenance cycle, and mainly the quality level of track geometry for safe travel and the like.

③ Check of buckling stability

A study shall be performed of the buckling stability of the track with respect to the increased rail axial force caused by a rise in temperature.

(2) The track structure of special railways (excluding superconducting magnetic levitation railways; the same in (2) below) shall be as follows.

① The track girder or running path of special railways (excluding cable railways) shall adequately withstand the very heavy and repeated loads due to the motion of trains along the track.

② Expansion joints shall be installed when connecting track beams of special railways (excluding cable railways) to each other. However, in the case of electromagnetically guided type railways, the expansion joint shall not exert any adverse effect on the electromagnetic induction.

③ In cable railways, the track bed of section that has a gradient of 500/1000 or more shall be made of concrete.

(3) Turnouts for railways other than trackless electric vehicle and electromagnetically guided railways shall be appropriate for the running gear of the rolling stock and shall have a geometry and structure that smoothly guides the rolling stock through the track or diverging track, enabling the rolling stock to pass, and shall be designed in such as manner that the stress generated in the structural elements by the passing of the rolling

stock does not exceed the allowable values for the materials concerned. Turnouts shall be installed according to the following criteria.

① Turnouts shall not be installed on transition curves or on vertical curves. However, where the operating speed of train is low and cant deviation (restricted to curve diminishing) is small, it is permissible that the certain part of turnout may be on transition curve.

② Turnouts shall not be installed on a ballast-less bridge. However, this does not apply when there are topographical restrictions and when additional measures have been taken to prevent impairment of the safe travel of trains.

③ Turnout shall not be installed behind the abutment of a bridge. However, this does not apply when there are topographical restrictions and when additional measures have been taken to prevent impairment of the safe travel of trains.

(4) Guard rails on the main track of ordinary railways shall be installed as fallows.

① At curves where the numerical value calculated by the following formula is smaller than 1.2, or other locations where there is a possibility of a derailment occurring, an anti-derailing rail or an anti-derailing guard (or a safety rail at a location where it is not appropriate to install an anti-derailing rail or an anti-derailing guard such as the locations of frequent rockfalls or deep snows (hereafter, "rockfall locations and the like")) shall be installed.

(estimated derailment coefficient ratio) = (critical derailment coefficient)/(estimated derailment coefficient)

Where,

derailment coefficient=Y/Q

Y=lateral wheel load

Q=vertical wheel load

② On a ballast-less bridge, an anti-derailing rail, an anti-derailing guard or an inner bridge guard rail (an inner bridge guard rail for rockfall locations and the like) shall be installed.

③ On a high embankment, an anti-derailing rail, an anti-derailing guard or a safety rail (a safety rail for rockfall locations and the like) shall be installed.

④ A crossing guard rail shall be installed at a level crossing where there is frequent traffic.

(5) The ground facilities for linear motor propelled railways shall conform to the following criteria.

① The primary equipment (coils) and secondary equipment (reaction plates) of a linear induction motor shall keep necessary clearance for allowing trains to pass safely.

② The reaction plates shall be of a structure that is adequately safe with respect to suction forces and the like, and shall be fastened at the specified fastening force.

③ The ground facilities shall be capable of comprising the electric circuit and an electromagnetic circuit for generating stable motive power by electromagnetic interaction with the on-board facilities of the prime mover.

④ The motive power of ③ shall be sufficient for the weight of the rolling stock and other factors.

(6) The ground facilities for superconducting magnetic levitation railways shall conform to the following criteria.

① The guideway side walls (excluding ground coils) and runways shall adequately withstand the very heavy and repeated loads due to the motion of trains along the track.

② The runways at the bridge edges shall be equipped with expansion joints if it is necessary for the running safety of trains.

(7) The ground facilities for electromagnetically guided railways shall conform to the following criteria.

① The width of the traveling path shall be sufficient so as to not to impair the safe travel of rolling stock, and shall take into consideration the control width, etc. of the rolling stock by the electromagnetic guiding equipment as measured from its ground facilities. Also, the width of the traveling path shall be increased at a curve to correspond to the deviation of the rolling stock, etc.

② If a guard wall is installed, it shall have adequate strength, and shall pose no risk of becoming deformed, in the event of a collision when the rolling stock is traveling at the assumed maximum speed and [striking at the] maximum approach angle.

③ If a movable safety wall is installed at a switch of the traveling path, it shall have adequate strength, and in addition shall operate smoothly in respect to the direction of advance of the rolling stock and allow the rolling stock to pass safely.

[Operation Notice]

4 Related to Article 23 (Track)

(1) The track structure of ordinary railways (limited to a maximum design speed of 130km/h or less) shall be checked for safety for each of the check items indicated in Approved Model Specifications (1). However, when the measured values are at least as high as the corresponding values in the table below, it is possible to consider that these checks have been performed.

Max. design speed	Weight of rail, number of sleepers, and thickness of ballast bed	Design passing tonnage											
		Passing tonnage exceeding 20 million t/year			Passing tonnage exceeding 10 million t/year but not more than 20 million t/year			Passing tonnage exceeding 5 million t/year but not more than 10 million t/year			Passing tonnage not more than 5 million t/year		
Speed exceeding 110km/h	Weight of rail,	50	60	50	50	60	50	50	60	50	50	60	50
	Number of Sleepers for every 25m	39	39	42	37	37	40	37	37	40	37	37	40
	Thickness of ballast bed	250	200	200	200	150	150	200	150	150	200	150	150
Speed exceeding 90km/h but not more than 110km/h	Weight of rail,	50	60	50	50	60	50	37	40	37	37	40	37
	Number of Sleepers for every 25m	39	39	42	37	37	40	37	37	40	37	37	40
	Thickness of ballast bed	200	150	150	200	150	150	200	150	150	200	150	150
Speed exceeding 70km/h but not more than 90km/h	Weight of rail,	50	60	50	50	60	50	37	40	37	30	37	30
	Number of Sleepers for every 25m	39	39	42	37	37	40	37	37	39	34	34	36
	Thickness of ballast bed	200	150	150	200	150	150	150	120	120	150	120	120
Speed not more than 70km/h	Weight of rail	50	60	50	50	60	50	37	40	37	30	37	30
	Number of Sleepers for every 25m	39	39	42	37	37	40	37	37	39	34	34	36
	Thickness of ballast bed	200	150	150	200	150	150	120	100	100	120	100	100

Remarks

1) Unit of rail weight: kg, Unit of ballast bed thickness: mm

2) The number of sleepers when continuous welded rails are used can be made the value obtained by subtracting 1 from the value in the above table.

3) In case of paved track, only the number of sleepers can be decreased.

4) In the case where the road bed is made of concrete, bedrock or a material that has at least the equivalent bearing capacity, only the thickness of the ballast bed need not conform to the above.

(2) Confirmation that the stress generated in the structural elements of a turnout is no greater than the allowable value for the materials concerned, as stipulated in Approved Model Specifications (3), shall hereafter only be required for newly designed turnouts.

[Ministerial Ordinance]

(Structures)

Article 24. Structures such as earthwork, bridge, and tunnel shall be able to withstand the anticipated load. They shall also be free from any impediment for the safe car operation like the deviation of structures caused by the load and impact of the train.

[Approved Model Specifications]

Ⅲ-13 Related to Article 24 (Structures)

The design of earthworks, bridges, tunnels and other structures shall conform to the notifications in the following "Technical Standards for Railway Structures."

(1) Design Standards for Railway Structures and Commentary (Earth Structures)

(2) Design Standards for Railway Structures and Commentary (Concrete Structures)

(3) Design Standards for Railway Structures and Commentary (Steel and Composite Structures)

(4) Design Standards for Railway Structures and Commentary (Foundation Structures)

(5) Design Standards for Railway Structures and Commentary (Shield Tunnel)

(6) Design Standards for Railway Structures and Commentary (Steel-Concrete Hybrid Structures)

(7) Design Standards for Railway Structures and Commentary (Cut and Cover Tunnel)

(8) Design Standards for Railway Structures and Commentary (Seismic Design)

(9) Design Standards for Railway Structures and Commentary (Urban Mountain Tunnel)

(10) Design Standards for Railway Structures and Commentary (Displacement Limits)
(11) Design Standards for Railway Structures and Commentary (Retaining Structures)

Design of a structure using the allowable stress method (excluding seismic design) shall conform to “Design of Structures Using the Allowable Stress Method” in the attached sheet No.6.

[Revision] Jan 13, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.135 (edited standards for each structure and stipulated displacement limit)

[Ministerial Ordinance]

(Facilities to Abate Extreme Noise)
Article 25. Shinkansen guide way shall be equipped with the devices to abate extreme noises generated from the high-speed operation, depending upon the situation or condition along the right of way.

[Approved Model Specifications]

Ⅲ-14 Related to Article 25 (Facilities to Abate Extreme Noise)
In cases where schools (schools covered by Article 1 of the School Education Law (1947 Law No.26)), hospitals (hospitals covered by Paragraph 1 of 5 of Article 1 of the Medical Service Law (1948 Law No.205)), or dwellings and the like (“the like” shall include child-care centers covered by Paragraph 1 of Article 39 of the Child Welfare Law (1947 Law No.164)) are located along Shinkansen lines, and where it is necessary to safeguard the environment depending upon their geographical situations (such as existence of schools, hospitals and other institutions, and density of residences), the devices to abate extreme noises generated from the high-speed train operation, such as sound-proof walls, shall be installed, referred to the measures for reducing conspicuous noise by above-ground facilities.

Section 6. Buildings

[Ministerial Ordinance]

(Buildings)
Article 26. Safety related buildings within the rail premise and overbridge, platform sheds and other relevant buildings within the rail facilities shall withstand the anticipated load and shall not impair the safe car operation and safe utilization by passengers.

[Approved Model Specifications]

No Approved Model Specifications

Section 7. Safety Facilities

[Ministerial Ordinance]

(Facilities to Prevent Disasters and Other Incidents)

Article 27. Facilities or devices to prevent or detect any fallen or falling objects shall be installed at the cut sections where traffic on the line may be impaired as a result of an object dropping onto the track, or entrance of tunnels.

2. At stations and tunnels, relevant facilities or devices shall be installed to prevent immersion and also drain appropriately if needed.

[Approved Model Specifications]

No Approved Model Specifications

[Ministerial Ordinance]

(Protection of Below Bridges, etc.)

Article 28. Bridges that span the busy road, guide way or rivers and could constitute a hazard to the traffic beneath them shall be equipped with the protective devices to prevent any danger to those that pass under these bridges.

2. If overhead bridges spanning the busy road, or river are vulnerable from the impact of the automobiles and ships underneath, they shall be equipped with relevant protective devices to minimize the impact from them. Railway other than Shinkansen, however, may simply put the “Danger” sign.

[Approved Model Specifications]

No Approved Model Specifications

[Ministerial Ordinance]

(Facilities of Underground Stations, etc.)

Article 29. Underground railway stations that are built mainly with underground structure and tunnels leading to stations or long tunnels (hereinafter referred to as "underground stations, etc.") shall be equipped with ventilators of adequate ventilating capability. This does not apply, however, to those cases that are accessible to sufficient natural ventilation.

2. Underground stations, etc., shall be equipped with fire extinguishers, evacuation facilities and other necessary fire-prevention equipment, depending upon the structure and facility.

[Approved Model Specifications]

III-15 Related to Article 29 (Facilities of Underground Stations, etc.)

Fire fighting measures at underground stations, etc. shall be as shown below.

1 Scope of application

These standards are applicable to underground stations and the tunnels connected to them. The term "underground station" refers to a station having its platforms provided underground (excluding stations located in mountainous regions).

2 Fireproofing of structures, etc.

(1) Structures shall be made fireproof according to the following stipulations.

1) Structural items and interior dressings (including substrata) shall use non-flammable materials as stipulated by Item 9 of Article 2 of the Building Standard Law (hereinafter called "non-flammable materials"). However, the interior finish of the floors and walls (limited to finished sections to a height of no more than 1.2 meters from the floor) of habitable rooms of the offices such as the operation command center, the electric power command center, the signal handling center, and the disaster prevention control center (hereinafter called "habitable rooms) shall be fireproof as far as possible.

2) As far as possible, furnishings such as desks and lockers shall not be made of flammable materials.

3) Substations, distribution stations and machine rooms shall be partitioned from other areas by floors and walls having a fire-resistant construction and also fire doors. Also, if cables and the like pass through these partitions, the penetrations of the partitions shall be filled with non-flammable material.

Fire doors shall be specialized fire prevention facilities as stipulated by Paragraph 1 of Article 112 of the enforcement ordinance of the Building Standard Law (hereinafter called “fire doors”), and shall be provided with automatic closing devices, such as door closers and similar equipment.

(2) Structural materials, interior dressings, bookshelves, and other parts of kiosks (limited to simple ones) shall be made of non-flammable.

3 Provision of a disaster prevention control center

(1) A railway station shall have a permanently manned disaster prevention control center that collects information, conveys notifications and commands, makes announcements for passengers, and also monitors and controls fire shutters and other facilities.

In this case, it is desirable that the disaster prevention control center be a shared facility with the station office.

(2) The disaster prevention control center shall be provided with lighting facilities that are powered by emergency power in the event of a power outage.

(3) The emergency power source shall be either storage batteries or a dedicated power generator. This shall also apply to the following emergency power sources as well.

4 Provision of alarm facilities, notification facilities, evacuation guidance facilities, and the like

(1) Alarm facilities

1) A railway station shall be provided with automatic fire alarm facilities, and the disaster prevention control center shall be provided with a receiver for the alarm facilities.

2) Detectors for the automatic fire alarm facilities shall be provided in habitable rooms, kiosks, substations, distribution stations, machine rooms, and other such locations. Automatic fire alarm facilities shall be provided with emergency power sources.

(2) Notification facilities

1) The following facilities shall be installed at a railway station.

(A) Communication facilities such that the disaster prevention control center shall be capable of communicating with the fire brigade, the police, the operation command center, the electric power command center, and various parts of the station (habitable rooms, both ends of the platform, and places that are important from the viewpoint of communication within the area that is controlled by the station), and also with related adjacent buildings.

(B) Broadcasting facilities that can be controlled from the disaster prevention control center. (The range over which announcements can be made from the disaster prevention control center shall include the platforms, concourse, passageways and other areas controlled by the station.)

(C) Auxiliary wireless communication facilities

2) Communication facilities to enable communication from a train or the inside of a tunnel to the operation command center shall be provided between stations. In this case, the communication facilities that permit communication from the inside of a tunnel to the operation command center shall be provided at intervals of no more than 250 meters inside the tunnel.

3) Communication facilities and broadcasting facilities shall be provided with emergency power sources.

(3) Evacuation guidance facilities

1) A railway station shall be provided with the following facilities.

(A) At least two different evacuation passageways from the platform to the ground level

A different evacuation passageway here shall mean an evacuation passageway that does not coincide with that of another evacuation passageway.

In this case, the evacuation passageway (stairways shall be limited to those of a non-spiral structure) shall enable passengers to be safely evacuated to the ground level, and the distance to the ground level shall be as short as possible. Also, as a general rule, it shall be possible to reach the ground level only by ascending from the platform.. However, this does not apply when passengers evacuate to an adjacent building by descending from the platform, or in the case of opposite platforms, when there is a connecting passageway going down from one platform to another provided that a partition between tracks is installed to prevent smoke from flowing. The distance between the end of the platform to the entrance or exit of the nearest evacuation passageway shall be as short as possible.

(B) Lighting facilities that can instantaneously and automatically turn on the lights under emergency power in the event of a power outage, and ensure an illumination intensity of at least 1 lux at the main parts of the floor surface

(C) Evacuation exit guide lights and passageway guide lights

Technical standards concerning evacuation exit guide lights and passageway guide lights shall conform to the provisions of Paragraph 2 of Article 26 of the enforcement ordinance of the Fire Defense Law.

However, if the distance from the end of the platform to the entrance or exit of the nearest evacuation passageway is long, passageway guide lights shall be installed on the floor, along the lower part of the walls, and at other necessary locations.

2) The following facilities shall be provided between railway stations.

(A) Lighting facilities that can promptly power the lights by emergency power in the event of a power outage, and maintain an illumination intensity of at least 1 lux at the main parts of the floor surface of the passageway used for evacuation

(B) Indicators installed near lighting facilities powered by an emergency power source, which indicate the distance to and the direction of the railway station exit or tunnel exit

Indicators shall be installed at a height of no more than 1.5 meters above the floor of the passageway used for evacuation, at intervals of within 100 meters, in such a way that they are adequately recognizable.

(4) Smoke exhaust facilities

1) Facilities that can effectively remove smoke as necessary to ensure that passengers can evacuate safely shall be provided at railway stations and also between railway stations.

(A) The required capacity etc., of smoke exhaust facilities shall be determined according to the Attachment 7.

(B) It is permissible to combine the mechanical ventilating facilities with smoke exhaust facilities.

(C) If, based upon the vertical alignment of the tunnel, it can be expected that the smoke in a tunnel can be adequately exhausted by the natural ventilation openings, it is permissible not to install smoke exhaust facilities.

(D) Smoke exhaust facilities that require an electric power supply shall be provided with an emergency power source.

2) At a railway station, hanging barriers or the like shall be installed as necessary between the platform and the track, at stairways, escalators, and other locations, in order to block off the flow of smoke.

In this case, facilities that block off the flow of smoke shall mean hanging barriers protruding downward from the ceiling, or other barriers that have at least the equivalent effectiveness in blocking of the flow of smoke (including barriers that descend when activated by a detector, and can also be operated by remote control from the disaster prevention control center), and shall be made of, or covered with, non-flammable material.

(5) Fire doors and the like

1) Connecting underground passages between one railway station and other station of another line (excluding cases where the same platform is used) and between the railway station and underground shopping malls etc., shall be provided with fire doors and the like ([fire doors provided with hinged or sliding doors and the fire shutter (limited to those that move up and down),and this shall also apply to the following fire doors and the like]).

2) Fire doors and the like shall be provided at evacuation stairways and the like of the

platform and also at other necessary locations to enable passengers to evacuate safely.

In this case, the fire shutters used shall mean specific fire prevention facilities stipulated by Paragraph 1 of Article 112 of the enforcement ordinance of the Building Standard Law., They shall lower when activated by a detector down to a height of 2 meters above the floor, and shall also be capable of being lowered by remote control from the disaster prevention control center. In addition, said fire shutters shall be of a 2-stage closing construction whereby they are closed completely by an attendant at the locations where they are installed. It shall be possible to verify the lowering and closure of the fire shutter from the disaster prevention control center.

(6) Others

1) Self-contained-compressed air breathing apparatus shall be provided at railway stations. In this case, the breathing apparatus shall conform to JIS T 8155, JIS T 8156 or JIS M 7601, and the number of units permanently provided shall be at the least the number of staff engaged in work such as helping passengers, guiding officers engaged in fire extinguishing and fire prevention activities, and other such work.

2) In principle, dedicated ventilating facilities shall be installed at a substation. However, in the case of an existing substation where it is difficult to install dedicated ventilating facilities, a fireproof damper shall be installed at the ventilation port.

3) A kiosk shall not be located at the places where it impedes the evacuation of passengers, or between the end of the platform and the nearest entrance or exit of an evacuation passageway.

4) A convenience store type kiosk shall be compartmented to protect it from fire and smoke.

5) If the fourth and lower underground levels of a railway station have a total floor area of at least 1000 square meters, emergency power outlet(s) shall be provided for each of the fourth and lower underground levels.

6) Emergency power outlets shall be provided with an emergency power source.

7) The distance from each part of a habitable room to the evacuation exit at a railway station shall be no more than 100 meters.

8) A passageway between railway stations that is used to evacuate passengers shall be of a construction that does not impede evacuation.

5 Provision of fire extinguishing facilities

(1) The following fire extinguishing facilities shall be provided at a railway station.

1) Fire extinguishers

Fire extinguishers shall be provided according to the provisions of Paragraphs 2 and 3 of Article 10 of the enforcement ordinance of the Fire Defense Law, at the locations in a railway station deemed necessary for fire extinguishing activities.

2) Indoor fire hydrants

Indoor fire hydrants shall be provided according to the provisions of Paragraphs 3 and 4 of Article 11 of the of the enforcement ordinance of the Fire Defense Law, at the locations in a railway station deemed necessary for fire extinguishing activities, and shall be provided with an emergency power source.

3) Internal piping for distributing water for spraying equipment or sprinkler equipment that have water supply ports

Habitable rooms (excluding rooms relating to train operation safety), and the like, shall be provided with internal piping for distributing water for spraying equipment or sprinkler equipment that have water supply ports, according to the provisions of Paragraph 2 of Article 12 and also Paragraph 2 of 2 of Article 28, of the enforcement ordinance of the Fire Defense Law.

A convenience store type kiosk shall be provided with sprinkler equipment that has a water supply port, according to the provisions of Paragraph 2 of Article 12 of the enforcement ordinance of the Fire Defense Law.

4) Internal piping for distributing water for fire fighting

Outlets for internal piping for distributing water for firefighting at a railway station shall be provided at the locations deemed necessary for fire extinguishing activities on platforms, concourses and in passageways. Internal piping for distributing water for firefighting shall be provided according to the provisions of Paragraph 2 of Article 29 of the enforcement ordinance of the Fire Defense Law. However, this does not apply in the case where indoor fire hydrants equipped with water supply ports are installed, and in addition it is deemed that they are effective for performing fire extinguishing activities.

(2) If the distance between the outlets of internal piping for distributing water for fire fighting on the platforms of adjacent railway stations exceeds 500 meters, internal piping for distributing water for firefighting shall be installed between adjacent railway stations as well.

The distance between the outlets of internal piping for distributing water for firefighting shall be so determined as to be necessary for performing fire extinguishing activities, and according to the provisions of Paragraph 2 of Article 29 of the enforcement ordinance of the Fire Defense Law.

6 Maintenance of fire fighting equipment

Fire fighting equipment shall be subject to an operation check at least once a year and kept in a maintained condition.

7 Indicators shall be provided at railway stations to inform passengers of the following items.

(1) In principle, if a fire breaks out in a train that is traveling through a tunnel, the train will continue traveling to the next station and then evacuate the passengers.

(2) That it is possible to evacuate from the front and the rear of the train.

(3) Necessary information, including an evacuation route map, that will enable passengers to safely evacuate in an emergency.

8 At each railway station, a manual stipulating the following items relating to the action to be taken by the staff in charge in the event that a fire breaks out, education and training, and also collaboration with a fire fighting organization shall be prepared. In this case, the contents of the manual shall be determined after adequate consultation with the fire fighting organization.

(1) Items relating to action to be taken by the staff in charge in the event of a fire

(2) Implementation method etc., of education and training for the staff in charge (this training mainly refers to training in initial fire extinguishing activities, evacuation guidance, etc.)

(3) Providing effective information concerning fire fighting activities to the fire fighting organization

[Notice concerning applicable timing] (2004: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.125)

1 The provisions of Approved Model Specifications 1 to 5 relating to Article 29 shall apply from December 27, 2004, (There is a proviso.)

2 The provisions of Approved Model Specifications 6 to 8 relating to Article 29 shall apply from July 1, 2005.

[Operation Notice]

5 Related to Article 29 (Facilities of Underground Stations, etc.)

(1) In (1) of Approved Model Specifications 8, the action to be taken by railway staff in charge in the event of a fire shall mean the initial fire extinguishing activities, the method and procedure of carrying out evacuation guidance etc., to be performed. For this reason, the method and procedure of carrying out the items set out below shall be stipulated for each underground station, taking into consideration the intrinsic role of the railway staff, and

said method and procedure shall be maintained at each underground station. In this case, the method and procedure shall be determined taking into account the actual situation of crewmen on board the trains, the posting of personnel at the stations, and also the construction of the stations, and other items.

1) Notifying the fire fighting organization and other institutions
2) Providing information to passengers concerning the outbreak of the fire etc.
3) Checking the operation of fire fighting equipment, such as smoke exhaust facilities, and operating this equipment
4) Initial fire extinguishing activities
5) Passenger evacuation guidance

(2) “Education for the staff in charge” in (2) of Approved Model Specifications 8 refers to the disaster prevention education that is carried out at normal times to enable the railway staff in charge to carry out initial fire extinguishing, evacuation guidance, and other activities, promptly and appropriately in the event of a fire, and also to make an effort to improve one’s ability to carry out self-protecting fire fighting activities.

Regarding “ training,” a plan shall be drawn up and training shall be carried out periodically at least once a year. Also, after “training” has been held, the results shall be evaluated.

(3) “Effective information concerning firefighting activities” in (3) of Approved Model Specifications 8 shall mean information that the railway company can make available to the fire fighting organization. It also refers to maps indicating the locations of various fire disaster prevention facilities, the disaster prevention setup, and other information at normal times, and also refers to the current status regarding the evacuation of passengers, the operation status of the disaster prevention facilities, and other information in the event that a fire breaks out.

[Ministerial Ordinance]

(Prevention of Rolling Stock Runaways, etc.)

Article 30. For those places susceptible for dangers from car runaways or over-speeding, appropriate protection devices shall be installed, taking train/car speed, track gradient and other factors into consideration.

[Approved Model Specifications]

III-16 Related to Article 30 (Prevention of Overrun of Rolling Stock etc.)

The following facilities shall be provided at locations where there is a risk of deviation or overrun of rolling stock, excluding trackless electric vehicles, leading to a dangerous situation.

(1) At a point where the main tracks or important side tracks intersect with each other at the same ground level or branch from each other, and there is a possibility of them interfering with each other, a refuge siding shall be provided. However, this does not apply if equipment that can automatically stop a train is provided, or if one of the following is applicable.

1) If facilities that display a warning signal are provided with another main signal on the outer side of the main signal at the starting end of said line section

2) If the length of the track from the main signal (or from the train stop indicator in the case where a train stop indicator is provided) at the starting end of said line section to the clearance post of the track or the tongue rail of the facing turnout (excluding turnouts for the refuge siding) is at least 100 m

(2) The following car stop, and other facilities, shall be provided at the end, and the like, of the track.

1) At the end of a refuge siding or a track where there is a risk of a serious damage occurring, a car stop made of heaped gravel or other car stop that has a cushioning effect that is at least as good as that of heaped gravel shall be provided according to the estimated approach speed of a train and its weight.

2) At the end of a track line other than the lines mentioned in 1), a car stop for stopping rolling stock at its body or coupling shall be provided.

3) At a location on a side track where two lines are connected together or intersect each other, or a movable bridge is located, a derailing switch or a stop block shall be provided.

[Ministerial Ordinance]

(No Trespassing to Guide Way)

Article 31. To those areas where there is a possibility of trespassing, if needed, adequate preventive devices shall be installed or “danger” sign shall be displayed.

2. Notwithstanding the previous stipulation, adequate preventive devices shall be installed for Shinkansen, except those areas such as bridges, tunnels and other hard to trespass structures.

[Approved Model Specifications]

No Approved Model Specifications

[Ministerial Ordinance]

(Evacuation Facilities, etc.)

Article 32. Railway track shall be built to provide safe on foot evacuation for passengers in case of emergency. This rule, however, does not apply if adequate evacuation facilities are provided depending upon the rail structure.

[Approved Model Specifications]

III-17 Related to Article 32 (Evacuation Facilities, etc.)

A railway track shall enable evacuating passengers to walk away from an accident site. However, this does not apply in the case of a suspension type railway, a straddle-beam type railway, a levitation railway, or other railways, when evacuation equipment such as a fire escape sling are installed on the rolling stock or the like, or if an evacuation guide path etc., is provided.

Section 8. Wayside Posts

[Ministerial Ordinance]

(Wayside Posts)

Article 33. Pertinent wayside posts shall be installed alongside the main track to secure the guide way maintenance and the safety of train operation.

[Approved Model Specifications]

III-18 Related to Article 33 (Wayside Posts)

The following wayside posts shall be provided on a main track in order to ensure that tracks are appropriately maintained and trains can run safely. However, (1) does not apply to the superconducting magnetic levitation railways.

(1) Clearance post

(2) Distance post

(3) Curve post

(4) Grade post

Chapter 4 Station and Halt

Section 1 Station and Halt

[Ministerial Ordinance]

(Track Layout at Station and Halt)

Article 34. Track layout at station and halt shall conform to the train operation.

2. The effective length of a main track to be provided as passing track at station and halt shall be long enough to accommodate the longest train.

[Approved Model Specifications]

No Approved Model Specifications

[Ministerial Ordinance]

(Station Facilities)

Article 35. Necessary facilities shall be provided at stations for passengers and freights, depending upon the number of passengers and the volume of freight to be loaded and unloaded.

2. Each station shall be provided with facilities to make useful and relevant information available to passengers who come to use the station.

[Approved Model Specifications]

IV-1 Related to Article 35 (Station Facilities)

1 The facilities necessary for handling passengers or freight shall be as stated below. These facilities must be provided according to the number of boarding and alighting passengers, the amount of freight handled, etc.

(1) Necessary station facilities for handling passengers shall include platforms, facilities for passenger flow (passageways, concourses, stairs, passengers' overpasses, elevators, escalators, etc.), facilities for serving passengers (ticket offices or gates), queue facilities (ticket offices, and waiting rooms), business facilities (station office facilities), toilets, lighting facilities, etc.

(2) Necessary station facilities for handling freight shall mean freight loading and unloading facilities (platforms, and also loading and unloading facilities on container arrival and departure lines), freight passageways, freight sorting and storage facilities, related buildings (station main buildings, storage sheds, employees' rooms), facilities related to forwarding of freight, etc.

2 Facilities for providing useful information to passengers who use a station shall mean facilities for providing appropriate information for guiding passengers to ticket offices or gates, concourses, platforms, toilets, etc. They should include guidance signs, location signs, information signs, and regulation signs.

[Ministerial Ordinance]

(Platforms)

Article 36. Platforms shall conform to the following standards:

(1) The effective length of a platform shall be longer than the distance between the forefront passenger car and the rearmost passenger car of the train that departs from and arrives at the platform. (In case a conductor rides on a car other than passenger cars, that particular car is included in determining the distance. hereinafter the same shall apply in this article.) The effective length shall also be able to provide the safe and smooth getting off and on of passengers. This provision does not apply, however, to exceptional cases due to topographic conditions when necessary measures such as closure of passenger entrance and exit are taken.;

(2) The platform width and the distance between the edge of the platform and other structures such as columns, entrance to passenger overbridge, entrance to underpass and waiting rooms shall be adequately set not to interfere with the safe and smooth movement of passengers;

(3) Platforms shall be equipped with appropriate safety measures to secure passengers, depending upon the train speed, frequency and operational patterns.

[Approved Model Specifications]

IV-2 Related to Article 36 (Platforms)

A platform shall not impair the safe use by passengers, and shall satisfy the following standards.

(1) The effective length of a platform of a railway excluding a trackless electric vehicle shall be at least the maximum length from the front-most passenger car to the rear-most passenger car of a train (from the front edge of the front-most platform door to the rear edge of the rear-most platform door in case the platform doors connecting directly to the train are installed) that arrives at, and/or departs from, said platform, and in addition, shall not impede the safe and smooth boarding and alighting of passengers. Note, however, that if the number of boarding and/or alighting passengers on said platform is small, and if there exist some unavoidable train operation reasons, it is permissible for the effective length of the platform to be shorter than the length of the arriving and departing train provided that such measures as closing of the doors concerned and announcements are taken to prevent the risk of passengers falling etc.

(2) The width of the platform shall be as follows.

1) The width of a platform of an ordinary railway (excluding Shinkansen) or a special railway (excluding Shinkansen) shall be at least 3 m at the center part and at least 2 m at the end parts in the case where both sides of the platform are used, and at least 2 m at the center part and at least 1.5 m at the end parts in the case where only one side is used.

2) The width of a Shinkansen platform shall be at least 9 m in the case where both sides are used, and at least 5 m in the case where only one side is used. Note, however, that the width at the end parts of a curved platform can be at least 5 m in the case where both sides are used, and at least 4 m in the case where only one side is used.

(3) The distance from columns, the walls of the entrance to a passenger overpass, etc., on the platform to the edge of the platform of an ordinary railway (excluding Shinkansen) or a special railway (excluding a trackless electric vehicle and Shinkansen) shall conform to the following.

1) The distance from a column on the platform to the edge of the platform shall be at least 1.0 m.

2) The distance from the entrance to an overbridge, the entrance to an underpass, the waiting room, etc., on the platform, to the edge of the platform shall be at least 1.5 m.

3) The provisions of 1) and 2) do not apply to a platform with equipment adequately protecting passengers from other trains (hereinafter called “platform screen doors or movable platform barriers”).

4) In the case of a platform provided with platform screen doors or movable platform barriers the distance from the entrance to an overbridge, the entrance to an underpass, the waiting room, etc., on the platform, to the platform screen doors or movable platform barriers shall be at least 1.2 m (or at least 0.9 m at a location where there is no likelihood of interference to the boarding and alighting of passengers).

(4) The distance from columns, the walls of the entrance to a passengers' overpass, etc., on a Shinkansen platform, to the edge of the platform shall be as follows.

1) The distance from columns on the platform to the edge of the platform shall be at least 2 m.

2) The distance from the entrance to an overpass, the entrance to an underpass, the waiting room, etc., on the platform, to the edge of the platform shall be at least 2.5 m (or at least 3 m in the case of a platform facing a track on which through-trains travel).

3) The provisions of 1) and 2) does not apply to a platform provided with. platform screen doors or movable platform barriers.

4) In the case of a platform provided with platform screen doors or movable platform barriers, the provisions of (3) 4) above shall apply.

(5) The following shall apply in order to ensure the safety of passengers on the platform, according to the speed of the train, the number of trains, the operation pattern, etc.

1) Of the provisions of Article 7, the following shall be deemed standard for ensuring the safety of passengers on the platform, for general passengers as well.

(A) The surface of the platform and the surface of the floor part of the rolling stock where passengers board and alight shall be as flat as possible.

(B) The clearance between the edge of the platform and the edge of the floor surface of the rolling stock or the boarding step shall be as small as possible within the range where the running of the rolling stock is not impeded. Note, however, that if this clearance is unavoidably large due to structural considerations, facilities for warning passengers to this effect shall be provided.

(C) At the end of the platform other than the track side, a fence shall be erected to prevent passengers from falling. Note, however, that the above does not apply if the end concerned is a stairway, and there is no danger of general passengers falling.

(D) The surface of the platform shall be finished so that passengers cannot readily slip on it.

(E) Facilities for warning passengers of the approach of a train using text, etc., and also audible warning facilities shall be provided on the platform. Note, however, that this does not apply if there are no electrical facilities available or it is not possible for such measures to be taken for technical reasons.

2) The copestones, etc., on the edge of the platform shall be of a non-slip finish.

3) In the case of a platform of an ordinary railway where trains pass by the platform at the speed more than 130 km/h, one of the following measures shall be adopted depending upon the speed of the passing train and the shape of the rolling stock.

(A) Install platform screen doors or movable platform barriers.

(B) Adopt measures to prevent passengers from gaining access to the platform when a train is passing the platform.

(C) Ensure the safety of passengers by having the platform attendant warn the passengers, etc.

4) In the case of a railway excluding a straddle-beam type railway, suspension type railway and a trackless electric vehicle, the following measures shall be taken in order to ensure passenger safety in the case of a platform located in a section of a railway where trains run frequently and at high speed. Note, however, that this excludes the case where platform screen doors or movable platform barriers are installed.

(A) A pushbutton or fall detection mat shall be installed in order to stop the train in an emergency.

(B) Refuge bays shall be provided beneath the platform along its entire length to enable passengers who fall off the platform to take refuge. Note, however, that if this is not possible for structural reasons, etc., steps may be provided to enable passengers to climb up onto the platform.

5) The platform of a railway that uses unmanned units shall be provided with platform screen doors or movable platform barriers.

6) The platform of a magnetic induction type railway shall be provided with platform screen doors or movable platform barriers.

7) The rules prescribed in 1) (A) and (E), and 2) do not apply to the platforms equipped with the platform doors directly connecting to the rolling stock.

[Operation Notice]

6 Related to Article 36 (Platforms)

(1) The meanings of “if there exist some unavoidable train operation reasons” and “such measures to be taken to prevent the risk of passengers falling, etc.” in the case where “it is permissible for the effective length of the platform to be shorter than the length of the arriving and departing train” in Approved Model Specifications (1) above are as shown in the table below.

Unavoidable train operation reasons	Measures to be taken to prevent the risk of passengers falling, etc.
In the case where the length of the platform should be extended in order to cope with increased transportation capacity, etc., but it is difficult to arrive at a solution by consultation for topographical reasons (when there is a level crossing, a river, etc., at the end of the platform), etc., and in addition it is considered urgently necessary to increase the transportation capacity etc.	1) The doors shall be prevented from being opened. and 2) An announcement shall be made.
In the case where an unscheduled train that is operated in order to temporarily meet a demand is stopped	1) The doors shall be prevented from being opened or equivalent measures shall be taken, or guidance shall be given when the passengers are alighting, and at the same time 2) An announcement shall be made.

(2) In Approved Model Specifications (3) 3), “platform screen doors or other facilities for adequately protecting passengers from other trains (hereinafter called “platform door, etc.”)” shall include movable platform barriers, but not fixed barriers.

(3) The provisions of Approved Model Specifications (3) 4) shall also apply to the locations of the fixed barriers on a platform provided with fixed barriers.

(4) “Movable platform barriers, etc.” in the provisions of Approved Model Specifications (5) 3) shall not include fixed barriers.

[Ministerial Ordinance]

(Access for Passengers, etc.)

Article 37. The width of passenger walkways and stairways shall be appropriately set not to impede the movement of passengers.

2. Passenger stairways shall be provided with appropriate measures to prevent passengers from falling down the stairs.

[Approved Model Specifications]

IV-3 Related to Article 37 (Access for passengers, etc.)

The width of accesses for passengers and stairs for passengers shall conform to the following criteria in order to prevent any impediment to the smooth flow of passengers, and also to prevent passengers from falling off stairs for passengers, etc.

(1) The width of accesses for passengers and stairs for passengers shall be at least 1.5 m.

(2) Stairs for passengers shall have one landing every 3 m or so of height.

(3) Stairs for passengers shall have handrails.

Section 2. Train depot, etc.

[Ministerial Ordinance]

(Train depot, etc.)

Article 38. Train depot shall have sufficient capacity to accommodate relevant rolling stock.

2. Rolling stock inspection facilities shall be equipped with sufficient and adequate capabilities to accommodate full inspection and repairs.

[Approved Model Specifications]

No Approved Model Specifications

Chapter 5 Intersection with Road

[Ministerial Ordinance]

(Intersection with Road)

Article 39. Railway shall not intersect with roads at grade (Roads here mean the roads used by the general public traffic. The same definition shall apply hereinafter.). This definition, however, does not apply to those conventional line that do not operate at high-speed like, Shinkansen, where traffic volume at rail crossing is small or where it is difficult to make a separate crossing from the topographical standpoint.

[Approved Model Specifications]

V-1 Related to Article 39 (Intersection with roads)

The case where a railway intersects with a road at grade level shall be limited to a railway line excluding a Shinkansen line and a line on which trains run at speeds similar to the Shinkansen (more than 160 km/h but less than 200 km/h), when both the railway and road traffic are small, or when it is in fact difficult to make a grade separated crossing due to topography or some other reason.

[Ministerial Ordinance]

(Level Crossing Roads)

Article 40. Level crossing roads shall be provided with appropriate consideration for the safe and smooth passage of people and automobiles (hereinafter referred to as “level crossing road passengers, etc.”) and with safety facilities prescribed under the Article 62.

[Approved Model Specifications]

V-2 Related to Article 40 (Level crossing roads)

A level crossing road of an ordinary railway (excluding Shinkansen lines), a trackless electric vehicle or a cable railway shall conform to the following criteria.

(1) The surface of a level crossing road shall be paved.
(2) The angle of intersection between the railway and the road must be at least 45 degrees.
(3) A warning sign must be erected.
(4) The level crossing security facilities stipulated in the Approved Model Specifications of Article 62 shall be provided.

(5) A level crossing road over which a train passes at very high speed (more than 130 km/h but no more than 160 km/h) shall be provided with a crossing gate and obstruction detecting device (limited to level crossing roads used by automobiles). In this case, the level crossing road over which automobiles pass must not be used by large vehicles. Note, however, that a level crossing road over which large automobiles must unavoidably pass shall be provided with such equipment as to effectively prevent large automobiles from interfering with the operation of the level crossing, by way of increasing the visibility of the level crossing, etc., such as by using a double deck type crossing gate, a large crossing gate, an overhung type warning device, etc.

Chapter 6 Electric Facilities

Section 1 Electric line facilities

[Ministerial Ordinance]

(Contact Lines and Other Facilities)

Article 41 Catenary line, feeder line and their accessories including apparatus, wire and protection equipment shall be installed not to cause electric shock and fire, according to the location, installation method and standard voltage.

2. Overhead contact line and feeder line shall be installed at an appropriate height depending upon the location, installation method and standard voltage to make them free from of the risk of electric shock or other impediment to train traffic.
3. Contact line shall be withstood the predictable maximum wind pressure load, tension of electric wire, etc. and also shall be installed appropriately to collect electricity without any impediment according to the train speed and feeder system.
4. Contact line and feeder line shall be installed in such a manner as to prevent failures caused by an inadvertent contact or confusion with other contact line or feeder line that differs in standard voltage, frequency and so on.
5. The voltage of contact line shall be maintained at sufficient level to guarantee adequate train operations.

[Approved Model Specifications]

VI-1 Related to Article 41 (Contact Lines and Other Facilities)

1 Overhead contact lines shall be erected as a single overhead contact line system or a double overhead contact line system. Railways in underground structures, on elevated structures or in other dedicated sites that people cannot easily enter may use a third-rail system, and suspended railways, straddle-type monorails, guide-rail system railways and levitated railways may use a double rigid conductor system.

2 Autotransformers in autotransformer feeding systems (excluding those located at substations) as well as equipment and electric wires attached thereto shall be located so that they cannot easily be touched.

3 The provisions concerning the construction method for AC overhead feeders shall apply mutatis mutandis to the method of erecting electric wires for the purpose of supplying power from substations to autotransformers (excluding overhead contact lines and feeders, hereafter referred to as "auxiliary feeders").

4 Equipment to be loaded excluding autotransformers shall not be connected to an auxiliary feeder.

5 The provisions concerning the construction method for AC negative feeders shall apply mutatis mutandis to the method for erecting protective wires of autotransformer feeding systems (hereinafter called “AT

protective wires”).

C negative feeders shall apply mutatis mutandis to the method of erecting AT protective wires.

6 Booster transformers in booster transformer feeding systems as well as series capacitors, equipment and electric wires attached thereto shall be located so that they cannot easily be touched.

7 Foothold metal fittings used for climbing up and down by operators shall be located not less than 1.8 meters above the platform at supports for overhead contact lines and feeders above the platform. However, this does not apply in the following cases:

(1) The support has a structure in which internal foothold metal fittings can be contained.

(2) Equipment to prevent unauthorized ascent is fitted to the support.

(3) Fences, surroundings, etc., are constructed around the support to ensure that only the operator can enter.

(4) Unauthorized ascent is prevented by the presence of a shed or similar on the platform.

8 Third-rail systems shall be installed in consideration of the following matters:

(1) The third-rail shall be fitted with protection equipment so that it cannot easily be touched, and the distance between the third-rail and the protection equipment (limited to top protection plates) shall not be less than 75 millimeters.

(2) The third rail shall be installed on the side opposite the platform in stations. However, if this is not possible due to the structure of the station and if top and front protection plates are fitted, or if there is no risk of electric shock to passengers on the platform due to the installation of a platform door, etc., this does not apply.

9 The positive overhead contact lines of double rigid conductor systems on straddle-type monorails, guide-rail-type railways and levitated railways shall be constructed on the side opposite the platform in stations. However, if top and front protection plates are installed, or if there is no risk of electric shock to passengers on the platform due to the installation of a platform door, etc., this does not apply.

9.2 Feeders (excluding overhead feeding lines; the same shall apply to 9.2) to be located in long tunnels (tunnels located underground in urban areas with a length exceeding 1.5 km; those in locations other than underground in urban areas with a length exceeding 2 km; and those in which stations are constructed, where the distance between stations (i.e., the distance between the ends of platforms) or between the tunnel end and the platform end of the nearest station exceeds 1 km) (the same shall apply to 9.4 and to Approved Model Specifications 24 (3) and 58 in relation to Article 46) shall involve the following:

(1) The electric wire shall be cable based on the applicable voltage.

(2) Feeders shall be applied for any one of the following flame-resistance measures:

[1] Using cable with sheathing featuring non-inflammability or self-extinguishing incombustibility properties

[2] Covering cable with fire-spread prevention tape, fire-spread prevention sheeting, fire-spread prevention paint or similar featuring non-inflammability or self-extinguishing incombustibility

properties,

[3] Installing cable sheathed in a tube or a trough featuring non-inflammability or self-extinguishing incombustibility properties

9.3 "Non-inflammability" and "self-extinguishing incombustibility properties" in 9.2 (2) shall be as follows:

(1) Non-inflammability

Made of non-inflammable materials as specified in Article 2 Section 9 of the Building Standards Law, or having equivalent or higher specifications

(2) Self-extinguishing incombustibility properties

[1] In the case of sheathing for electric wire: fire-spread prevention tape, fire-spread prevention sheeting, fire-spread prevention paint or similar covering the electric wire

The material shall meet the requirements of the flame resistance test specified in Annexed Table No. 21 in Appendix No. 1 of the Ministerial Ordinance Prescribing the Technical Standards of Electrical Appliances (Ministerial Ordinance No. 85, prescribed by the Ministry of International Trade and Industry, 1962), or shall have equivalent or higher specifications.

[2] In the case of tubes or troughs

The material shall meet the requirements of the flame resistance test specified in Annexed Table No. 24 in Appendix No. 2 of the Ministerial Ordinance Prescribing the Technical Standards of Electrical Appliances, or shall have equivalent or higher specifications.

9.4 Insulation distance in cases where a feeder to be located in a long tunnel, etc., (excluding overhead feeders, referred to as "feeders" in 9.4) comes close to another feeder, a transmission/distribution line, a low-current line or a water pipe, or passes over or under such items, shall not be less than the numerical values indicated in table below. However, this does not apply in the following cases:

(1) A sturdy fire-resistant partition wall is formed between the feeder and the other feeder, transmission/distribution line, low-current line or water pipe.

(2) In cases where a feeder comes close to or passes over/under a low-current line, etc., the feeder is sheathed in a sturdy tube or a trough with non-inflammability or self-extinguishing incombustibility properties, and the tube or trough is constructed so as not to come into direct contact with the low-current line, etc.

(3) In cases where a feeder comes close to or passes over/under a low-current line, etc., the low-current line, etc., is an optical fiber cable sheathed with materials featuring non-inflammability or self-extinguishing incombustibility properties, or an optical fiber cable sheathed in a tube or trough with non-inflammability or self-extinguishing incombustibility properties.

(4) In cases where a feeder comes close to or passes over/under a low-current line, etc., the feeder has a low voltage and the low-current line, etc., is treated with flame-resistance measures in accordance with the provisions of 9.2 (2).

(5) In cases where a feeder comes close to or passes over/under a low-current line, etc., a high-voltage or

extra-high-voltage feeder and a low-current line, etc., treated with flame-resistance measures in accordance with the provisions of 9.2 (2) are constructed so as to avoid direct contact.

(6) In cases where a feeder comes close to or passes over/under a water pipe, the feeder is sheathed in a sturdy tube or trough with non-inflammability or self-extinguishing incombustibility properties.

(7) In cases where a feeder comes close to or passes over/under another feeder or a transmission/ distribution line, any of the following apply to each line:

[1] A sheath with non-inflammability or self-extinguishing incombustibility properties is used.

[2] It is sheathed in a sturdy tube or trough with non-inflammability or self-extinguishing incombustibility properties.

(8) In cases where a feeder comes close to or passes over/under another feeder or a transmission/distribution line, any one of them has a sheath with properties of non-inflammability.

(9) In cases where a feeder comes close to or passes over/under another feeder or transmission/distribution line, any one of them is sheathed in a sturdy tube or trough with properties of non-inflammability.

Unit: meters

Other lines or water pipes / Feeders	Feeders located in tunnels, etc.			Transmission/distribution lines located in tunnels, etc.	Low-current lines located in tunnels, etc.		Water pipes located in tunnels, etc.
	Extra-high voltage	High voltage	Low voltage		General cases	Cases with a voltage of less than 170kV and the consent of the party in charge of the low-current electric wires, etc.	
Extra-high voltage		0.15	0.15	0.15	0.15	0.1	0.15
High voltage	0.15		0.15	0.15	0.15	0.1	0.15
Low voltage	0.15	0.15		0.15	No contact	No contact	No contact

9.5 "Non-inflammability" and "self-extinguishing incombustibility properties" in 9.4 shall be as follows:

(1) Non-inflammability

Made of non-inflammable materials as specified in Article 2 Section 9 of the Building Standards Law, or having equivalent or higher specifications

(2) Self-extinguishing incombustibility properties

[1] In the case of sheathing for a feeder or a transmission/distribution line

The material shall meet the requirements of the combustion test specified in IEEE Std. 383-1974, or shall have equivalent or higher specifications.

[2] In the case of sheathing for optical fiber cable

The material shall meet the requirements of the flame resistance test specified in Annexed Table No. 21 in Appendix No. 1 of the Ministerial Ordinance Prescribing the Technical Standards of Electrical Appliances.

[3] In the case of tubes or troughs

The material shall meet the requirements of the flame resistance test specified in Annexed Table No. 24 in Appendix No. 2 of the Ministerial Ordinance Prescribing the Technical Standards of Electrical Appliances, or shall have equivalent or higher specifications. However, for commercially available double tubes, it shall meet the requirements of the flame resistance test specified in 1.(4) g in Appendix No. 2 of the Ministerial Ordinance Prescribing the Technical Standards of Electrical Appliances.

10 The height above the rail top of a single overhead contact line on an ordinary railway (excluding Shinkansen railways) shall be 5 meters as standard, not less than 4.4 meters for DC, not less than 4.57 meters for AC, and not less than 4.8 meters in the case of installation at a level crossing. Additionally, each height shall be not less than the value obtained by adding 400 millimeters to the maximum height of all traveling vehicles with the current collector folded. However, in cases (1) and (2) below, these heights may be reduced to the numerical values specified.

(1) In the case of any of the following (excluding places corresponding to (2)):

Height to be obtained by adding 400 millimeters to the maximum height of all traveling vehicles with the current collector folded:

[1] Railways based on structures where people cannot easily enter, e.g., underground or elevated structures

[2] Locations of tunnels, snow-sheds, overbridges, bridges, eaves of platform sheds or similar, or places adjacent thereto

(2) In the case of the places specified in (1) [2] as well as at level crossings:

On DC overhead contact lines, a height of not less than 4.65 meters as well as the height obtained by adding 400 millimeters to the maximum height of all traveling vehicles with the current collector folded

(3) In any of the following cases, values of 400 millimeters in the provisions of part 10 above may be shortened to 250 millimeters (150 millimeters in the case of procedures to avoid cutting off the load current through pantographs on DC overhead contact lines):

[1] In the case of the two devices located as follows:

(A) A device enabling communication with respect to a substation or power control center from any train or vehicle

(B) An interlinked breaking device provided on the feeding side of a substation to stop the feed of electric power from the substation to the area to be fed

[2] In the case where an automatic circuit breaker or fault selector is located on the feeding side of a substation, with which the electric current flowing through the feeder circuit of this substation (hereafter referred to as "fault current") is detected when overhead contact lines are brought to arc grounding, and

where this feed can be stopped

[3] In the case where an automatic circuit breaker or fault selector and an interlinked breaking device are located on the feeding side of a substation to detect fault electric currents at any of the substations feeding electric power to the area to be fed, and can stop the feed of all substations and supply power to this area

11 In cases where an AC overhead contact line is provided over a level crossing where automobiles pass, a beam or a span wire bearing a danger warning shall be located on both sides of the railway tracks as well as above the road.

12 The height of the beam or span wire over the road surface in 11 above shall be no more than the value obtained by subtracting 50 centimeters (30 centimeters in the case of a steel beam with a lattice structure or a type with equivalent or higher strength) from the height above the rail top on an overhead contact line.

13 The height of overhead feeders shall comply with the following standards:

(1) In the case of spanning a railway or track, the height shall be not less than 5.5 meters above the rail top.

(2) In the case of spanning a road (excluding level crossings), the height shall be not less than 6 meters above the road surface.

(3) In the case of spanning a level crossing, the height above the level crossing surface shall be not less than the height of the overhead contact line (or 5 m if the height of the overhead contact line is less than 5 m).

(4) In the case of an overhead feeder constructed above a pedestrian bridge or a platform, the height of the overhead feeder shall comply with the standards outlined below. However, if a roof or other protection facilities are located between the overhead feeder and the pedestrian bridge or platform, the same does not apply.

[1] The height of AC overhead feeders shall be not less than 5 meters above the footpath surface or platform surface (excluding negative feeders).

[2] The height of overhead feeders with a standard voltage of DC 1,500 volts or AC overhead negative feeders shall be not less than 4 meters (3.5 meters when using cable or insulated electric wire for high voltage (i.e., voltage exceeding DC 750 volts and 600 volts but not more than AC 7,000 volts; the same shall apply below), (hereafter referred to as "high-voltage insulated electric wire") above the footpath surface or platform surface.

[3] The height of overhead feeders with a standard voltage of DC 750 volts or DC 600 volts shall be not less than 3.5 meters (3 meters when using cable or high-voltage insulated electric wire) above the footpath surface or platform surface.

(5) In cases other than 13 (1) to (4), the height of overhead feeders shall be not less than 5 meters above the ground surface. However, this may be reduced to 3.5 meters above the ground surface in the case of overhead feeders located in places where there are tunnels, snow-sheds, overbridges or similar, as

well as when there are other compelling reasons.

14 The height of overhead contact lines on Shinkansen railways shall be 5 meters above the ground surface as standard, and not less than 4.8 meters.

15 The height above the ground surface of overhead contact lines in double rigid conductor systems of straddle-type monorails and levitated railways shall be not less than 5 meters. However, this height may be below 5 meters but not less than 3.5 meters in the case of location in a place other than a road site and when a bottom protection plate is provided. This height may be less than 3.5 meters if a protection fence is provided so that people cannot easily enter the dedicated site and protection plates are provided on all sides, or if there is provision of a protection plate at a portion other than the current collection surface on a positive overhead contact line and measures are taken to prevent people from approaching while voltage is applied.

16 The height above the ground surface of overhead contact lines for trackless electric vehicle shall be not less than 5 meters and not more than 5.5 meters. However, in cases where there are unavoidable circumstances or where measures are taken to prevent the occurrence of faults, this height may be reduced to 3.8 meters.

17 The height above the ground surface of overhead contact lines at level crossings on cable railways shall be not less than 4.5 meters.

18 Single overhead contact lines on main lines (excluding those with overhead rigid conductor equipment) shall be grooved hard-drawn copper wire with a nominal cross-sectional area of not less than 85 square millimeters (not less than 110 square millimeters for Shinkansen railways) conforming to the Japanese Industrial Standards for grooved hard-drawn copper trolley wire or equivalent.

19 Suspension systems for single overhead contact lines shall consist of overhead contact lines with catenary suspension. However, in the case of railways excluding the Shinkansen type and the following cases, this does not apply:

(1) The case of suspension of overhead rigid conductor equipment in a section where trains travel at speeds of not more than 90 kilometers/hour (not more than 130 kilometers/hour in the case of using an overhead contact line and a pantograph to enable high-speed travel)

(2) The case of suspension in a direct suspension system with a structure applying tension of not less than 9.8 kN to an overhead contact line using an automatic tensioning device, as well as making the current collector less likely to be in a state of contact loss at support points of overhead contact lines in sections where trains travel at speeds of not more than 85 kilometers/hour

(3) The case of suspension in a direct suspension system with a structure making the interval between support points of an overhead contact line not more than 15 meters, as well as applying tension to the overhead contact line such that the maximum sag with a 15-meter interval between support points is not more than 50 millimeters in sections where trains travel at speeds of not more than 65 kilometers/hour

(4) The case of suspension in a direct suspension system for sections in which trains travel at speeds of not more than 50 kilometers/hour

20 In the case of suspension of an overhead contact line with a catenary system, the overhead contact line shall be installed as follows:

(1) The suspension method shall be based on train operation speeds.

(2) The interval between droppers for contact wire shall be 5 meters as standard.

(3) Tensioning device (the automatic type for main lines on Shinkansen railways) shall be provided on overhead contact lines and messenger wires at appropriate intervals.

21 Overhead rigid conductor equipment or double rigid conductor systems and third rails shall be installed as follows:

(1) The interval between support points shall be not more than 7 meters for overhead contact lines of overhead rigid conductor equipment, and not more than 5 meters for double rigid conductor systems and third rails.

(2) Expansion joints and anchoring shall be located at appropriate intervals.

(3) Each end shall be provided with an end approach, etc., and structured to avoid issues with respect to the sliding of current collectors.

22 The deflection of single overhead contact lines shall be within 250 millimeters (300 millimeters for Shinkansen railways) from the center plane of the track perpendicular to the rail surface in sections using pantographs as current collectors. However, this does not apply in the following cases:

(1) The deviation of two overhead contact lines where a current collector slides on four lines is within 250 millimeters at the overlaps of overhead contact lines for twin contact-wire systems such as twin simple catenary systems, and no current collector are adversely affected.

(2) A current collector is much less likely to separate from an overhead contact line at overlaps of overhead contact lines for three- rails, and no current collector is adversely affected.

23 The inclination of single overhead contact lines with respect to the rail surface shall be 5/1,000 in the case of suspension of an overhead contact line with catenary suspension or overhead rigid conductor equipment in sections where trains travel at speeds exceeding 50 kilometers/hour, and not more than 15/1,000 (not more than 3/1,000 regardless of speed on Shinkansen railways) in other cases. However, the value may be not more than 20/1,000 (not more than 15/1,000 on Shinkansen railways) for overhead contact lines in siding areas.

24 Supports for single overhead contact lines or double overhead contact lines shall be constructed as follows:

(1) The distance between supports shall be not more than 45 meters, (60 meters in the case of the structures outlined in 19 (2)) in the case of suspension of direct suspension systems, 60 meters in the case of suspension of simple overhead contact lines with catenary suspension, and 80 meters in the case of suspension of compound overhead contact lines with catenary suspension.

(2) Supports of overhead contact lines shall be constructed with the following safety factors with respect

to expected maximum wind loads, tension from electric wires, etc.:

[1] The safety factor of wooden poles shall be not less than 3 with respect to the breaking load at the time of new construction.

[2] The safety factor of concrete poles shall be not less than 2 with respect to the breaking load.

[3] The safety factor of metal poles, metal towers, beams and brackets shall be not less than 1 with respect to the allowable stress of the relevant materials.

(3) For wooden poles or concrete poles, the setting depth shall be not less than 1/6 of the full length, and such items shall be provided with a sturdy under-bracing at points on soft ground. However, if concrete or similar is used for the base, and the safety factor with respect to pull-up force, compressive force and overturning moment provided from a support is not less than 2, the same does not apply.

(4) Each safety factor for the base of metal poles or metal towers with respect to pull-up force, compressive force and overturning moment provided from a support shall be not less than 2.

(5) In cases where a support at a curved point is a single pole, a stay shall be provided. However, this does not apply if the safety factor of the base is not less than 2.

25 With messenger wires and main span lines for overhead contact lines with catenary suspension systems and the main span lines of direct suspension systems, the safety factor with respect to pull-up force shall be not less than 2.5.

26 Stays shall be constructed as follows:

(1) The safety factor with respect to pull-up force shall be not less than 2.5.

(2) In cases where stranded wire is used, a type with not less than three strands of elemental wire shall be adopted. However, excluding cases where branch lines are located at wooden poles, at portions in the ground or at portions 30 centimeters above the ground surface, a galvanized iron rod or one with equivalent or higher strength and durability shall be used and attached to stay blocks, etc.

(3) Elementary wiring shall be metal wire with a diameter of not less than 2 millimeters and a tensile strength of not less than 690 N per square millimeter.

(4) If a stay may come into contact with an overhead contact line, it shall be protected so as not to cause damage to the other line by such contact.

(5) Stays located at concrete poles or metal poles pursuant to the provisions of 24 (2) or Approved Model Specifications 3 (2) related to Article 46 shall not share strength with respect to the maximum wind load of not less than 1/2 the strength with respect to the maximum wind load that the concrete pole or metal pole must withstand.

(6) Stays to be located at metal towers shall not share the strength that such towers must have in accordance with the provisions of 24 (2) and (4) or Approved Model Specifications 3 (2) related to Article 46.

27 Overhead contact lines for trackless electric vehicle shall be installed as follows:

(1) The interval between support points for overhead contact lines shall be not more than 15 meters.

(2) A tension value for which maximum sag of not more than 50 mm occurs when the interval between

support points is 15 meters shall apply to overhead contact lines.

(3) The interval between pairs of overhead contact lines shall be not less than 600 millimeters and not more than 800 millimeters.

(4) The distance between the centers of two pairs of overhead contact lines in parallel shall be not less than 1.4 meters.

(5) The inclination with respect to the road surface of overhead contact lines for trackless electric vehicle shall be not more than 10/1,000. However, the value for overhead contact lines in siding areas may be not more than 20/1,000.

28 Overhead contact lines on cable railways shall be installed as follows:

(1) Overhead contact lines shall be hard-drawn copper round wire with a diameter of not less than 9 millimeters, and shall conform to the Japanese Industrial Standards for hard-drawn copper round trolley wires or equivalent.

(2) Overhead contact lines shall be suspended so that current collectors maintain smooth contact with no contact break.

29 Where overhead contact lines with different nominal voltages, etc., are connected, a dead section shall be provided to prevent issues related to cross-faults.

30 The nominal voltage of contact lines shall be determined.

31 The nominal voltage of overhead contact lines as determined in 30 shall be maintained at the value necessary to secure train operation.

32 The following table gives nominal voltages for overhead contact lines based on railway types by way of example:

Railway type	Installation method	Nominal voltage of overhead contact line
Railway	Single overhead contact line system	DC 1,500 volt DC 750 volt DC 600 volt single-phase AC 20,000 volts (single-phase AC 25,000 volt for Shinkansen railways)
	Third rail	DC 750 volt DC 600 volt
Suspended railway, straddle-type monorail, levitated railway	Double rigid conductor system	DC 1,500 volt DC 750 volt DC 600 volt

Guide-rail system railway	Double rigid conductor system	DC 750 volt DC 600 volt three-phase AC 600 volt
	Single overhead contact line system	DC 1,500 volt DC 750 volt DC 600 volt
Trolley bus	Double overhead contact line system	DC 750 volt DC 600 volt
Cable railway	Single overhead contact line system or double overhead contact line system	DC 300 volt Not more than single-phase AC 300 volt

[Notice concerning applicable timing] (2004: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.125)

The provisions of Approved Model Specifications 9.2 to 9.5 related to Article 41 shall apply from December 27, 2004 (with provisos).

[Revision] Approved Model Specifications 10 and 14 related to Article 41 are revised (April 28, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.18).

[Ministerial Ordinance]

(Proximity or Crossing of Overhead Electric Lines, etc.)

Article 42 In case the voltage applied part of the overhead contact line, or feeder line is in proximity of or crossing other contact lines, manmade works, or vegetation, it shall be installed with caution to be free from chance of damaging any of the above and causing electric mixture, shock or fire.

[Approved Model Specifications]

VI-2 Related to Article 42 (Proximity or Crossing of Overhead Electric Lines)

1 The separation between voltage-applied portions of overhead contact lines and overhead feeders and other contact lines, structures, etc., (excluding plants) shall be not less than the numerical values listed in Table 42-1-1. However, in the following cases (1) to (5), they may be not less than the respective determined numerical values.

(1) Signals/signs or similar

(2) Insulated automatic barriers

(3) Overbridges, tunnels, snowsheds, bridges, etc.

(4) Platform sheds

(5) Station buildings, signal cabins, etc.

Table 42-1-1 (m)

			Voltage-applied portions of overhead contact lines			Overhead feeders		
						AC feeders (excluding negative feeders)		
			AC 25,000 volt or 20,000 volt	DC 1,500 volt	DC 750 volt or 600 volt	When cable is used	In the case of extra-high-voltage insulated wire	In the case of other electric wire types
Voltage- applied portions of overhead contact lines	AC 25,000 volt or 20,000 volt			2				
	DC 1,500 volt		2		1.2	1.2	2	2
	DC 750 volt or 600 volt			1.2				
Overhead feeders	Feeders of AC 25,000 volt or 20,000 volt(excluding negative feeders)	When cable is used		1.2				
		In the case of extra-high-voltage insulated wire		2				
		In the case of other electric wire types		2				
	AC negative feeders	When cable is used		0.4				
		When hard-drawn copper wire with a diameter of not less than 5 mm or a type with a tensile strength of not less than 8.01 kN is used, or in the case of suspension using galvanized iron wire with a diameter of not less than 4 mm or a type with a tensile strength of not less than 3.70 kN		1.2				
		When using high-voltage insulated wire		0.8				
		When using other electric wire types		1.2				
	DC 1,500 volt	When cable is used	2		0.4	0.5	1	2
		When hard-drawn copper wire with a diameter of not less than 5 mm or a type with a tensile strength of not less than 8.01 kN is used, or in the case of suspension using galvanized iron wire with a diameter of not less than 4 mm or a type with a tensile strength of not less than 3.70 kN	2		1.2	1.2	1.5	2
		When using high-voltage insulated wire	2		0.8	0.5	1	2
		When using other electric wire types	2		1.2	1.2	1.5	2
	DC 750 volt or 600 volt	When cable is used		0.4				
		When hard-drawn copper wire with a diameter of not less than 5 mm or a type with a tensile strength of not less than 8.01 kN is used, or in the case of suspension using galvanized iron wire with a diameter of not less than 4 mm or a type with a tensile strength of not less than 3.70 kN		1.2				
		When using high-voltage insulated wire		0.4				
		When using low-voltage insulated wire		0.8				
		When using other electric wire types		1.2				

Overhead contact lines, etc..												
Overhead feeders									Overhead low-current electric wires, etc.			
AC negative feeders			DC feeders						When a protective net or guard wire is set	When the consent of the party in charge of low-current electric wires, etc., is obtained	When using communication cable, hard-drawn copper wire with a diameter of not less than 5 mm or a type with a tensile strength of not less than 8.01 kN, low-voltage insulated electric wire or a type with equivalent or higher insulting properties, or optical fiber cable, or in the case of suspension using galvanized iron wire with a diameter of not less than 4 mm or a type with a tensile strength of not less than 3.70 kN	In other cases
			1,500 volt			750 volt or 600 volt						
When cable is used	When using high-voltage insulated wire	Overhead low-current electric wires, etc.	When cable is used	When using high-voltage insulated wire	Overhead low-current electric wires, etc.	When using cable or high-voltage insulated wire	When using low-voltage insulated wire	In the case of other electric wire types				
			2	2	2				Overhead low-current electric wires, etc.		Horizontal distance 3	Horizontal distance 3
0.4	0.8	1.2				0.4	0.8	1.2	1.2		6 or horizontal distance 1.2	6 or horizontal distance 1.2
			0.4	0.8	1.2				0.6		6 or horizontal distance 0.6	6 or horizontal distance 1
			0.5	0.5	1.2				0.5		0.5	0.5
			1	1	1.5				1		1	1
			2	2	2				2	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3
			0.4	0.4	0.4				0.4		0.4	0.4
			0.4	0.8	1.2				1.2		6 or horizontal distance 1.2	6 or horizontal distance 1.2
			0.4	0.8	0.8				0.8		0.8	0.8
			0.4	0.8	1.2				1.2		6 or horizontal distance 1.2	6 or horizontal distance 1.2
0.4	0.4	0.4				0.4	0.4	0.4	0.4		0.4	0.4
0.4	0.8	1.2				0.4	0.8	1.2	1.2		6 or horizontal distance 1.2	6 or horizontal distance 1.2
0.4	0.8	0.8				0.4	0.8	0.8	0.8		0.8	0.8
0.4	0.8	1.2				0.4	0.8	1.2	1.2		6 or horizontal distance 1.2	6 or horizontal distance 1.2
			0.4	0.4	0.4	0.3	0.3	0.3	0.3 (0.15)		0.3	0.3
			0.4	0.8	1.2	0.3	0.6	1	0.6		6 or horizontal distance 0.6	6 or horizontal distance 1
			0.4	0.4	0.4	0.3	0.3	0.3	0.3 (0.15)		0.3	0.3
			0.4	0.8	0.8	0.3	0.6	0.6	0.6 (0.3)		0.6	0.6
			0.4	0.8	1.2	0.3	0.6	1	1		6 or horizontal distance 0.6	6 or horizontal distance 1

Overhead contact lines, etc.											
Other electric wires											
Extra-high voltage exceeding 60,000 volt but not more than 100,000 volt					Extra-high voltage exceeding 35,000 volt but not more than 60,000 volt					Extra-high voltage of not more than 35,000 volt	
Approach or crossing when using cable	Other electric wires				Approach or crossing when using cable	When using electric wire other than cable				Approach or crossing when using cable	Approach or crossing when using extra-high voltage electric
	Crossing	Other electric wires				Crossing	Approach				
		When a protective net is set	Other electric wires	In other cases			When a protective net is set	In the case of first-class safety work	In other cases		
2+0.12E	2+0.12E	2+0.12E	2+0.12E	Horizontal distance 3	2	2	2	2	Horizontal distance 3	2	2
2+0.12E	2+0.12E	2+0.12E	2+0.12E or horizontal distance 2	Horizontal distance 3	2	2	2	Horizontal distance 2	Horizontal distance 3	1.2	1.5
2+0.12E	2+0.12E	2+0.12E	2+0.12E or horizontal distance 2	Horizontal distance 3	2	2	2	Horizontal distance 2	Horizontal distance 3	1.2	1.5
1+0.12E	2+0.12E	2+0.12E	2+0.12E	Horizontal distance 3	1	2	2	2	Horizontal distance 3	0.5	0.5
2+0.12E	2+0.12E	2+0.12E	2+0.12E	Horizontal distance 3	2	2	2	2	Horizontal distance 3	0.5	1
2+0.12E	2+0.12E	2+0.12E	2+0.12E	Horizontal distance 3	2	2	2	2	Horizontal distance 3	2	2
1+0.12E	2+0.12E	2+0.12E	2+0.12E	Horizontal distance 3	1	2	2	2	Horizontal distance 3	0.5	1
2+0.12E	2+0.12E	2+0.12E	2+0.12E	Horizontal distance 3	2	2	2	2	Horizontal distance 3	1.2	1.5
1+0.12E	2+0.12E	2+0.12E	2+0.12E or horizontal distance 2	Horizontal distance 3	1	2	2	Horizontal distance 2	Horizontal distance 3	0.5	1
2+0.12E	2+0.12E	2+0.12E	2+0.12E or horizontal distance 2	Horizontal distance 3	2	2	2	Horizontal distance 2	Horizontal distance 3	1.2	1.5
1+0.12E	2+0.12E	2+0.12E	2+0.12E	Horizontal distance 3	1	2	2	2	Horizontal distance 3	0.5	1
2+0.12E	2+0.12E	2+0.12E	2+0.12E	Horizontal distance 3	2	2	2	2	Horizontal distance 3	1.2	1.5
1+0.12E	2+0.12E	2+0.12E	2+0.12E or horizontal distance 2	Horizontal distance 3	1	2	2	Horizontal distance 2	Horizontal distance 3	0.5	1
2+0.12E	2+0.12E	2+0.12E	2+0.12E or horizontal distance 2	Horizontal distance 3	2	2	2	Horizontal distance 2	Horizontal distance 3	1.2	1.5
1+0.12E	2+0.12E	2+0.12E	2+0.12E	Horizontal distance 3	1	2	2	2	Horizontal distance 3	0.5	1
2+0.12E	2+0.12E	2+0.12E	2+0.12E	Horizontal distance 3	2	2	2	2	Horizontal distance 3	1.2	1.5
1+0.12E	2+0.12E	2+0.12E	2+0.12E or horizontal distance 2	Horizontal distance 3	1	2	2	Horizontal distance 2	Horizontal distance 3	0.5	1
1+0.12E	2+0.12E	2+0.12E	2+0.12E or horizontal distance 2	Horizontal distance 3	1	2	2	Horizontal distance 2	Horizontal distance 3	0.5	1
2+0.12E	2+0.12E	2+0.12E	2+0.12E or horizontal distance 2	Horizontal distance 3	2	2	2	Horizontal distance 2	Horizontal distance 3	1.2	1.5

Overhead contact lines, etc.													
Other electric wires													
Extra-high voltage of not more than 35,000 volt					High voltage								
When using electric wire other than cable or extra-high-voltage electric wire					When using cable			When using extra-high-insulation electric wire			When using other electric wire types		
Crossing	Approach				Above	On the side or below		Above	On the side or below		Above	On the side or below	
	When a protective net is set	In the case of second-class safety work	In the case of third-class safety work	In other cases		When a protective net is set	In other cases		When a protective net is set	In other cases		When a protective net is set	In other cases
2	2	2	2	Horizontal distance 3	Horizontal distance 3	2	Horizontal distance 2	Horizontal distance 3	2	Horizontal distance 2	Horizontal distance 3	2	Horizontal distance 2
2	2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2
2	2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2
2	2	2	2	Horizontal distance 3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2	2	2	2	Horizontal distance 3	1	1	1	1	1	1	1	1	1
2	2	2	2	Horizontal distance 3	Horizontal distance 3	2	Horizontal distance 2	Horizontal distance 3	2	Horizontal distance 2	Horizontal distance 3	2	Horizontal distance 2
2	2	2	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
2	2	2	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2
2	2	Horizontal 2 or vertical 6 distance	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.8	0.8	0.8	0.8	0.8	0.8
2	2	Horizontal 2 or vertical 6 distance	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2
2	2	2	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
2	2	2	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2
2	2	Horizontal 2 or vertical 6 distance	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.8	0.8	0.8	0.8	0.8	0.8
2	2	Horizontal 2 or vertical 6 distance	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2
2	2	2	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
2	2	2	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2
2	2	Horizontal 2 or vertical 6 distance	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
2	2	Horizontal 2 or vertical 6 distance	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.8	0.8	0.8	0.8	0.8	0.8
2	2	Horizontal 2 or vertical 6 distance	Horizontal distance 2	Horizontal distance 3	0.4	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2

Overhead contact lines, etc.										Transmission/distribution lines located on the roof, the flank or the cliff side (limited to those laid					Transmission/distribution lines located at bridges (limited to those laid through			
Other electric wires																		
Low voltage										High voltage		Low voltage			Extra-high voltage exceeding 35,000 volts but not more than 60,000 volts	Extra-high voltage of not more than 35,000 volts	High voltage	Low voltage
When using cable or high-voltage insulated electric wire			When using low-voltage insulated wire			When using other electric wire types			Supports	When using high-voltage insulated electric wire	When using other electric wire types	When using high-Voltage insulated electric wire	When using low-voltage insulated electric wire	When using other electric wire types				
Above	On the side or below		Above	On the side or below		Above	On the side or below											
	When a protective net is set	In other cases		When a protective net is set	In other cases		When a protective net is set	In other cases										
Horizontal distance 3	2	Horizontal distance 2	Horizontal distance 3	2	Horizontal distance 2	Horizontal distance 3	2	Horizontal distance 2	2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	2	1.2	1.2	1.2
0.4	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2	0.6	0.8	1.2	0.4	0.8	1.2	2	1.2	0.3	0.3
0.3	0.3	0.3	0.6	0.6	0.6	1	1	1	0.3	0.8	1.2	0.3	0.6	1	2	1.2	0.3	0.3
0.5	0.5	0.5	0.5	0.5	0.5	1.2	1.2	1.2	0.5	0.5	1.2	0.5	0.5	1.2	2	1.2	1.2	1.2
1	1	1	1	1	1	2	2	2	1	1	2	1	1	1.5	2	1.2	1.2	1.2
Horizontal distance 3	2	Horizontal distance 2	Horizontal distance 3	2	Horizontal distance 2	Horizontal distance 3	2	Horizontal distance 2	2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	2	1.2	1.2	1.2
0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.2	0.4	0.4	0.4	0.4	0.4				
0.4	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2	0.6	0.8	1.2	0.4	0.8	1.2	2	1.2	0.3	0.3
0.4	0.4	0.4	0.8	0.8	0.8	0.8	0.8	0.8	0.4	0.8	0.8	0.4	0.8	0.8	2	1.2	0.3	0.3
0.4	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2	0.6	0.8	1.2	0.4	0.8	1.2	2	1.2	0.3	0.3
0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.2	0.4	0.4	0.4	0.4	0.4				
0.4	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2	0.6	0.8	1.2	0.4	0.8	1.2	2	1.2	0.3	0.3
0.4	0.4	0.4	0.8	0.8	0.8	0.8	0.8	0.8	0.4	0.8	0.8	0.4	0.8	0.8	2	1.2	0.3	0.3
0.4	0.4	0.4	0.8	0.8	0.8	1.2	1.2	1.2	0.6	0.8	1.2	0.4	0.8	1.2	2	1.2	0.3	0.3
0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.4	0.4	0.3	0.3	0.3				
0.3	0.3	0.3	0.6	0.6	0.6	1	1	1	0.3	0.8	1.2	0.3	0.6	1	2	1.2	0.3	0.15
0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.4	0.4	0.3	0.3	0.3	2	1.2	0.3	0.15
0.3	0.3	0.3	0.6	0.6	0.6	0.6	0.6	0.6	0.2	0.8	0.8	0.3	0.6	0.6	2	1.2	0.3	0.15
0.3	0.3	0.3	0.6	0.6	0.6	1	1	1	0.3	0.8	1.2	0.3	0.6	1	2	1.2	0.3	0.15

Transmission/distribution lines located in tunnels, etc.(limited to those laid through lead-in insulator work)		Structures			Roads, footpath bridges, railways or tracks (excluding when protection facilities are set)		Cableways (excluding when protection facilities are set)		Others
		Buildings		Other Structures					
High voltage	Low voltage	In the case of presence above or on the side	In the case of presence below		In the case of presence above	In the case of presence on the side or below	In the case of presence above	In the case of presence on the the side or below	
1.2	1.2	3	3	3	3	3	Horizontal distance 3	Horizontal distance 2	2
0.3	0.3	1.2	1.2	0.8	1.2	3 or horizontal distance 2.5	Horizontal distance 2.5	1.2	
0.3	0.3	1.2	1.2	0.8	1	3 or horizontal distance 2	Horizontal distance 2	1	
1.2	1.2	0.5	1.2	0.5	0.5	Horizontal distance 1.2	Horizontal distance 3	Horizontal distance 2	1.2
1.2	1.2	1.5	2.5	1.5	1.5	Horizontal distance 1.5	Horizontal distance 3	Horizontal distance 2	2
1.2	1.2	3	3	3	3	3	Horizontal distance 3	Horizontal distance 2	2
		0.4	1	0.4	0.4	3 or horizontal distance 1.2	Horizontal distance 2.5	0.4	
0.3	0.3	1.2	2	0.8	1.2	3 or horizontal distance 2.5	Horizontal distance 2.5	1.2	
0.3	0.3	0.8	2	0.8	0.8	3 or horizontal distance 1.2	Horizontal distance 2.5	0.8	
0.3	0.3	1.2	2	0.8	1.2	3 or horizontal distance 2.5	Horizontal distance 2.5	1.2	
		0.4	1	0.4	0.4	3 or horizontal distance 1.2	Horizontal distance 2.5	0.4	
0.3	0.3	1.2	2	0.8	1.2	3 or horizontal distance 2.5	Horizontal distance 2.5	1.2	
0.3	0.3	0.8	2	0.8	0.8	3 or horizontal distance 1.2	Horizontal distance 2.5	0.8	
0.3	0.3	1.2	2	0.8	1.2	3 or horizontal distance 2.5	Horizontal distance 2.5	1.2	
		0.3	1	0.3	0.3	3 or horizontal distance 1	Horizontal distance 2	0.4	
0.3	0.15	1.2	2	0.8	1	3 or horizontal distance 2	Horizontal distance 2	1.2	
0.3	0.15	0.3	1	0.3	0.3	3 or horizontal distance 1	Horizontal distance 2	0.4	
0.3	0.15	0.6	2	0.6	0.6	3 or horizontal distance 1	Horizontal distance 2	0.8	
0.3	0.15	1.2	2	0.8	1	3 or horizontal distance 2	Horizontal distance 2	1.2	

Remarks

1 "First-class safety work" in this table refers to construction with the following characteristics:

(1) The distance between supports shall be not more than 150 meters in the case of using concrete poles or metal poles as supports, and 250 meters in the case of using metal towers.

(2) The insulator employed shall be one for which 50% of the impulse flashover voltage is not less than 110% of the value for the insulator supporting the portion adjacent to this portion, one using a suspended insulator fitted with an arc horn, a long-rod insulator or a line-post insulator, or one using not less than two strands of suspended insulators or long-rod insulators.

(3) The electric wire employed shall be hard-drawn copper stranded wire with a cross-sectional area of 55 square millimeters or stranded wire with a tensile strength of not less than 21.67 kN.

(4) The electric wire shall be fitted with a device that automatically breaks the electric circuit within three seconds in the event of a ground fault or short circuit.

(5) The electric line shall be provided with a lightning protection cable or an arc horn shall be attached to the insulator, or an armor rod shall be attached to the electric wire.

2 "Second-class safety work" in this table refers to construction with the following characteristics:

(1) The distance between supports shall be not more than 75 meters in the case of using wooden poles as supports, 150 meters in the case of using concrete poles or metal poles, and 250 meters in the case of using metal towers.

(2) The insulator employed shall be one for which 50% of the impulse flashover voltage is not less than 110% the value for the insulator supporting the portion adjacent to this portion, one using a suspended insulator fitted with an arc horn, a long-rod insulator or a line-post insulator, one using not less than two strands of suspended insulators or long-rod insulators, or one using not less than two line post insulators.

3 "Third-class safety work" in this table refers to construction in which the distance between supports is not more than 75 meters in the case of using wooden poles as supports, 150 meters in the case of using concrete poles or metal poles, and 250 meters in the case of using metal towers.

4 In this table, “low-voltage insulated wire” is an insulated wire with low voltage (750 V or less for DC and 600 V or less for AC), and refers to outdoor vinyl insulated wires, 600 V vinyl insulated wires, 600 V polyethylene insulated wires, 600 V fluororesin insulated wires, 600 V rubber insulated wires, and vinyl insulated wires for service lines.

5 E is a value obtained by calculation with the following expression:

E = (voltage used (volts) - 60,000)/10,000 (Figures after the decimal point are rounded up)

6 ( ): Indicates separation in the case of setting overhead low-current electric wires, etc., with insulating efficiency equivalent to or higher than that of insulated electric wire, or communication cables, with the consent of the party in charge.

Table 42-1-2 (m)

Voltage-applied portions of overhead contact lines and overhead feeders \ Structures, etc.			Signals/signs or similar	Insulated automatic barriers	Overbridges, tunnels, snowsheds, bridges, etc.	Platform sheds	Station buildings, signal cabins, etc .
Voltage-applied portions of overhead contact lines	AC 25,000 volt or 20,000		1.5 (※2)		0.3 (※4)	1.5 (※2, ※3)	1.5 (※2)
	DC 1500 volt		When placed in protective equipment 0.6		0.25 (※1)	0.25 (※1)	
	DC 750 volt or 600 volt		When placed in protective equipment 0.6		0.25 (※1)	0.25 (※1)	
Overhead feeders	Feeders of AC 25,000 volt or 20,000 volt (excluding negative feeders)	When cable is used			0.3 (※4)	1.5 (※2, ※3)	
		In the case of extra-high- voltage insulated wire	1.5 (※2)		0.3 (※4)	1.5 (※2, ※3)	1.5 (※2)
		In the case of other electric wire types	1.5 (※2)		0.3 (※4)	1.5 (※2, ※3)	1.5 (※2)
	AC negative feeders	When cable is used		0.1	0.15 (※5)		
		When hard-drawn copper wire with a diameter of not less than 5 mm or a type with a tensile strength of not less than 8.01 kN is used, or in the case of suspension using galvanized iron wire with a diameter of not less than 4 mm or a type with a tensile strength of not less than 3.70 kN	When placed in protective equipment 0.6	When placed in protective equipment 0.2	0.15 (※5)		
		When using high-voltage insulated wire	When placed in protective equipment 0.6	0.1	0.15 (※5)		
		In the case of other electric wire types	When placed in protective equipment 0.6	When placed in protective equipment 0.2	0.15 (※5)		
	DC 1500 volt	When cable is used		0.1	0.25 (※1)	0.25 (※1)	
		When hard-drawn copper wire with a diameter of not less than 5 mm or a type with a tensile strength of not less than 8.01 kN is used, or in the case of suspension using galvanized iron wire with a diameter of not less than 4 mm or a type with a tensile strength of not less than 3.70 kN	When placed in protective equipment 0.6	When placed in protective equipment 0.2	0.25 (※1)	0.25 (※1)	
		When using high-voltage insulated wire	When placed in protective equipment 0.6	0.1	0.25 (※1)	0.25 (※1)	
		In the case of other electric wire types	When placed in protective equipment 0.6	When placed in protective equipment 0.2	0.25 (※1)	0.25 (※1)	
	DC 750 volt or 600 volt	When cable is used		0.1	0.25 (※1)	0.25 (※1)	
		When hard-drawn copper wire with a diameter of not less than 5 mm or a type with a tensile strength of not less than 8.01 kN is used, or in the case of suspension using galvanized iron wire with a diameter of not less than 4 mm or a type with a tensile strength of not less than 3.70 kN	When placed in protective equipment 0.6	When placed in protective equipment 0.2	0.25 (※1)	0.25 (※1)	
		When using high-voltage insulated wire		0.1	0.25 (※1)	0.25 (※1)	
		When using low-voltage insulated wire		When placed in protective equipment 0.1	0.25 (※1)	0.25 (※1)	
		In the case of other electric wire types	When placed in protective equipment 0.6	When placed in protective equipment 0.2	0.25 (※1)	0.25 (※1)	

When not feasible for structural reasons	1 *1: Indicates that this can be reduced to 0.15 m when the following (1) to (3) apply (0.07 m when (1) to (5) apply). (1) Suspension is of the catenary or rigid conductor suspension types (2) Fault detection protection device or a device with equivalent or better performance is installed at the substation (3) The pantograph has countermeasures not to cut off the load current (4) Lightning arrester is installed at the substation (5) Insulating plates, etc. are installed on the overbridge (when less than 0.09 m)
When not feasible due to the facility status, etc."	2 *2: Indicates that curved sections and anchor points can be reduced to 1.2 m.
When not feasible due to the facility status, etc."	3 *3: Indicates that this can be reduced to 0.3 m when the following (1) to (3) apply. (1) Strong support and platform shed (2) Grounding work to detect accidents on the platform shed (3) Hazard indications are provided for work safety on the platform shed
When not feasible for structural reasons	4 *4: Indicates that this can be reduced to 0.25 m where the minimum height of the AC overhead contact lines or the overhead feeders needs to be secured.
When not feasible for structural reasons	5 *5: Indicates that this can be reduced to 0.07 m where the minimum height of the AC overhead negative feeders needs to be secured and the following (1) and (2) apply. (1) Lightning arrester is installed at the substation (2) Insulating plates, etc. are installed on the overbridge (when less than 0.09 m)
Low-voltage insulated wire	6 In this table, "low-voltage insulated wire" is an insulated wire with low voltage (750 V or less for DC and 600 V or less for AC), and refers to outdoor vinyl insulated wires, 600 V vinyl insulated wires, 600 V polyethylene insulated wires, 600 V fluororesin insulated wires, 600 V rubber insulated wires, and vinyl insulated wires for service lines.

2 The separation between voltage-applied portions of overhead contact lines or overhead feeders and plants shall be as listed in Table 42-2. However, this does not apply in the following cases:

(1) In cases where DC overhead feeders or AC overhead negative feeders are sheathed in a protective member that complies with the following and are used temporarily

[1] The feeder is sheathed in a protective member, and there is a structure in which this protective member applies an abrasion layer to the top of an abrasion-detecting layer with dielectric strength and abrasion resistance and covers the electric wire so that there is no external contact with it.

[2] Materials shall be those conforming to (3)A of "2.2 Protective members" in the Japan Electrotechnical Standards and Codes Committee JESC E2021 "Protective members and separation applied to temporary electric lines" or those with equal or higher performance.

[3] The insulation performance of finished products shall be capable of withstanding an AC voltage of 15,000 volts with the abrasion-detecting layer exposed, and an AC voltage of 10,000 volts applied immediately after being splashed with water according to the test method described in "14.2.3 Test for second characteristic numeral 3 with oscillating tube or spray nozzle" stipulated in Japanese Industrial Standard JIS C 0920 (2003) "Degrees of protection provided by enclosures (IP Code)," with each being applied between the inner surface contacting the charged portion and outer surface not contacting the charged portion continuously for 1 minute.

[4] Regarding the abrasion resistance performance of the abrasion-detecting layer of finished products with the abrasion-detecting layer exposed, protective members shall not have holes at a rotation number of 500 rotations when a test is conducted with a load of 24.5 N according to the abrasion test stipulated in "4.29 Abrasion" in Japanese Industrial Standard JIS C 3005 (2000) "Test methods for rubber or plastic insulated wires and cables."

[5] Regarding the abrasion resistance performance of the abrasion layer of finished products, the abrasion-detecting layer shall not be exposed at a rotation number of 24 rotations when a test is conducted with a load of 24.5 N according to the abrasion test stipulated in "4.29 Abrasion" in Japanese Industrial Standard JIS C 3005 (2000) "Test methods for rubber or plastic insulated wires and cables."

(2) In addition to the cases in (1), cases where overhead feeders with a standard voltage of DC 1,500 volts or AC overhead negative feeders using high-voltage insulated wires are used sheathed in a protective member that complies with the following

[1] The structure shall have an abrasion layer to the top of an abrasion-detecting layer with

dielectric strength and abrasion resistance and cover the electric wire so that there is no external contact with it.

[2] The insulation performance of finished products shall be capable of withstanding an AC voltage of 15,000 volts with the abrasion-detecting layer exposed, and an AC voltage of 10,000 volts applied immediately after being splashed with water according to the test method described in "14.2.3 Test for second characteristic numeral 3 with oscillating tube or spray nozzle" stipulated in Japanese Industrial Standard JIS C 0920 (2003) "Degrees of protection provided by enclosures (IP Code)," with each being applied between the inner surface contacting the charged portion and outer surface not contacting the charged portion continuously for 1 minute.

[3] Regarding the abrasion resistance performance of finished products with the abrasion-detecting layer exposed, protective members shall not have holes at a rotation number of 500 rotations when a test is conducted with a load of 24.5 N according to the abrasion test stipulated in "4.29 Abrasion" in Japanese Industrial Standard JIS C 3005 (2000) "Test methods for rubber or plastic insulated wires and cables."

(3) When using high-voltage insulated electric wire as an overhead feeder with a standard voltage of DC 1 volt or an AC overhead negative feeder, or when using insulated electric wire for low voltage (i.e., not more than DC 750 volt and not more than AC 600 volt; the same shall apply below), (hereafter referred to as "low-voltage insulated electric wire") (i.e., outdoor vinyl-insulated wire, 600-volt vinyl-insulated wire, 600-volt polyethylene-insulated wire, 600-volt fluorine-insulated wire, 600-volt rubber-insulated wire and polyvinyl chloride-insulated drop wire; the same shall apply below) sheathed in a protective member as an overhead feeder with a standard voltage of DC,750 volt, DC 600 volt or three-phase AC 600 volts the separation between the overhead feeder and insulated automatic barriers shall be 0.1 meters.

[1] The feeder is sheathed in a protective member, and there is a structure in which this protective member applies an abrasion layer to the top of an abrasion-detecting layer with dielectric strength and abrasion resistance and covers the electric wire so that there is no external contact with it.

[2] The insulation performance of finished products shall be capable of withstanding an AC voltage of 1,500 volts applied between the inner surface contacting the charged portion and outer surface not contacting the charged portion continuously for 1 minute while the abrasion-detecting layer is exposed.

[3] Regarding the abrasion resistance performance of finished products with the abrasion-

detecting layer exposed, protective members shall not have holes at a rotation number of 500 rotations when a test is conducted with a load of 24.5 N according to the abrasion test stipulated in "4.29 Abrasion" in Japanese Industrial Standard JIS C 3005 (2000) "Test methods for rubber or plastic insulated wires and cables."

(4) In cases where the high-voltage insulated wires used for DC overhead feeders or AC overhead negative feeders, or low-voltage insulated wires used for low-voltage DC overhead feeders comply with the following

[1] The feeder is sheathed in a protective member, and there is a structure in which this protective member applies an abrasion layer to the top of an abrasion-detecting layer with dielectric strength and abrasion resistance and covers the electric wire so that there is no external contact with it.

[2] The insulation performance of finished products shall be capable of withstanding an AC voltage under the next table after immersed in fresh water for 1 hour applied between conductor and ground continuously for 1 minute while the abrasion-detecting layer is exposed.

Wire type		High-voltage current
Low voltage	Those having a conductor cross-sectional area of not more than 300 square millimeters	DC 4，500 volt
	Those having a conductor cross-sectional area of more than 300 square millimeters	DC 5，000 volt
High voltage		DC 27，000 volt

[3] Regarding the abrasion resistance performance of finished products with the abrasion-detecting layer exposed, insulated wires shall not be exposed at a rotation number of 500 rotations when a test is conducted with a load of 24.5 N according to the abrasion test stipulated in "4.29 Abrasion" in Japanese Industrial Standard JIS C 3005 (2000) "Test methods for rubber or plastic insulated wires and cables."

(5) In cases where cables are used for DC overhead feeders or AC overhead negative feeders, and are installed while sheathed in a protective member that complies with "2. Technical regulations” in Japan Electrotechnical Standards and Codes Committee JESC E2020 (2010) "Structures and test methods for ‘Cable protective members’ with abrasion resistance"

Table 42-2

Other electric wires \ Overhead contact lines, etc.			Plants
Voltage-applied portions of overhead contact lines	AC 25,000 volt or 20,000 volt		2
	DC 1,500 volt		0.6
	DC 750 volt or 600 volt		0.3
Overhead contact lines, etc.	Feeders of AC 25,000 volt or 20,000 volt (excluding negative feeders)	When cable is used	*: Indicates construction designed to ordinary avoid contact as a result of wind movement, etc.
		In the case of extra-high- voltage insulated wire	*: Indicates construction designed to ordinary avoid contact as a result of wind movement, etc.
		When using other electric wire types	2
	AC negative feeders	When cable is used	*: Indicates construction designed to ordinary avoid contact as a result of wind movement, etc.
		When hard-drawn copper wire with a diameter of not less than 5 mm or a type with a tensile strength of not less than 8.01 kN is used, or in the case of suspension using galvanized iron wire with a diameter of not less than 4 mm or a type with a tensile strength of not less than 3.70 kN	0.6
		When using high-voltage insulated wire	*: Indicates construction designed to ordinary avoid contact as a result of wind movement, etc.
		When using other electric wire types	0.6
	DC 1,500 volt	When cable is used	*: Indicates construction designed to ordinary avoid contact as a result of wind movement, etc.
		When hard-drawn copper wire with a diameter of not less than 5 mm or a type with a tensile strength of not less than 8.01 kN is used, or in the case of suspension using galvanized iron wire with a diameter of not less than 4 mm or a type with a tensile strength of not less than 3.70 kN	0.6
		When using high-voltage insulated wire	*: Indicates construction designed to ordinary avoid contact as a result of wind movement, etc.
		When using other electric wire types	0.6
	DC 750 volt or 600 volt	When cable is used	*: Indicates construction designed to ordinary avoid contact as a result of wind movement, etc.
		When hard-drawn copper wire with a diameter of not less than 5 mm or a type with a tensile strength of not less than 8.01 kN is used, or in the case of suspension using galvanized iron wire with a diameter of not less than 4 mm or a type with a tensile strength of not less than 3.70 kN	0.3
		When using high-voltage insulated wire	*: Indicates construction designed to ordinary avoid contact as a result of wind movement, etc.
		When using low-voltage insulated wire	*: Indicates construction designed to ordinary avoid contact as a result of wind movement, etc.
		When using other electric wire types	0.3

Remarks

In this table, “low-voltage insulated wire” is an insulated wire with low voltage (750 V or less for DC and 600 V or less for AC), and refers to outdoor vinyl insulated wires, 600 V vinyl insulated wires, 600 V polyethylene insulated wires, 600 V fluororesin insulated wires, 600 V rubber insulated wires, and vinyl insulated wires for service lines.

3 AC overhead contact lines or overhead feeders (excluding negative feeders; the same shall apply to 3 and 4) shall be constructed to avoid crossing high-voltage or low-voltage overhead transmission/distribution lines (hereafter referred to as "overhead transmission/distribution lines," excluding those located in places other than dedicated sites; the same shall apply below), overhead low-current electric wires (hereafter referred to as "overhead low-current electric wires," excluding those located in places other than dedicated sites; the same shall apply below) or overhead optical fiber cables (hereafter referred to as "overhead optical cables," excluding those located in places other than dedicated sites; the same shall apply below) (hereafter referred to as "overhead low-current electric wires, etc."). However, in cases where this is not feasible due to conditions, etc., of installation, and when high-voltage or low-voltage transmission/distribution lines, overhead low-current electric wires or the like are laid as outlined below, this does not apply.

(1) High-voltage overhead transmission/distribution lines are cable, or hard-drawn copper stranded wire with a cross-sectional area of not less than 38 square millimeters, or electric wire with a tensile strength of not less than 14.51 kN.

(2) Low-voltage overhead transmission/distribution lines shall be cable.

(3) Overhead low current electric wire shall be communication cable sheathed in polyethylene-insulated vinyl.

(4) The distance between the supports of overhead transmission/distribution lines, overhead-low current electric wires, etc., shall be not more than 60 meters in the case of using wooden poles as supports, and 120 meters in the case of using concrete poles or metal poles.

(5) The separation between voltage-applied portions of contact lines or overhead feeders and overhead transmission/distribution lines or overhead low-current electric wires shall be not less than 2 meters. However, in cases where overhead feeders are cables, the value may be not less than 0.5 meters. In cases where overhead feeders are insulated electric wire for extra-high voltage (i.e., voltage exceeding 7,000 volts; the same shall apply below) (hereafter referred to as "extra-high-voltage insulated electric wire"), the value may be not less than 1 meter.

4 AC overhead contact lines or overhead feeders shall be installed to avoid crossing cableways. However, in cases where this is not feasible due to conditions of installation, etc., and construction is implemented as outlined below, this does not apply.

(1) The separation between voltage-applied portions of contact lines or overhead feeders and

cableways is not less than 2 meters. However, in cases where overhead feeders are cables, the value may be not less than 0.5 meters. In cases where overhead feeders are extra-high-voltage insulated electric wire, the value may be not less than 1 meter.

(2) Voltage-applied portions of contact lines or overhead feeders shall be fitted with sturdy protection equipment, and their metal portions shall be grounde

[Ministerial Ordinance]

(Division of Insulation of Contact Lines)

Article 43 In order to avoid breakage or electric shock, a contact line shall not be sectionalized in the area where electric locomotives or electric trains usually make stops. This rule does not apply, however, when an appropriate measure is taken to either prevent any electric locomotive or train from approaching the sectionalized area, or install a proper measure to prevent any trouble from happening when an electric locomotive or a train has stopped at the sectionalized area.

[Approved Model Specifications]

VI-3 Related to Article 43 (Division of Insulation of Contact Lines)

1 Overhead contact lines shall not be divided in the sections outlined below. However, if a section switchgear is located at a point of division causing it to be in a closed circuit at all times, and measures are taken to prevent trains, etc. from approaching this point of division when the section switchgear is brought in an open circuit in the event of an accident, etc., this does not apply.

(1) Sections where electric locomotives or electric trains stop constantly

(2) Outward of a home signal, starting signal, or block signal, or shunting signal or ground signal (shunting signals and ground signals are limited to those installed at divided locations where a failure may occur with the feeding system of the main line) in a section within a distance defined by adding 50 meters to the maximum distance between this signal and the current collector that is the last portion from the front end of a moving train, etc., as the buffer distance in consideration of the stop position outward of the relevant signal

(3) Sections of cab signal block system execution or of operation using devices to secure intervals between trains (limited to automatic train controllers according to the provisions of Approved Model Specifications 2 (1) and (2) related to Article 54), being sections within the maximum distances outward of the starting end of a signal display section (i.e., sections in which control information is indicated with devices to secure intervals between trains; the same

shall apply to 1 (3)) between this starting end and a current collector that is the last portion from the front end of a moving train, etc., and a section within the distance in which a train, etc., can stop by the aspect of the signal indicating the need to stop inward of the starting end of this signal display section

(4) Sections of operation using devices to secure intervals between trains (limited to automatic train controllers according to the provisions of Approved Model Specifications 2 (3) related to Article 54), being sections within the maximum distance outward of the termination end of a section where a train, etc., is allowed to enter the control information indicated by an automatic train controller between its starting end and a current collector that is the last portion from the front end of a moving train, etc.

2 Notwithstanding the provisions of 1, in cases where these provisions are technically not feasible, and when a point dividing an overhead contact line is in a state of open circuit at all times, as well as when measures are taken to prevent the occurrence of problems when electric trains stop at this point, overhead contact lines may be divided in the sections listed in 1 (2) to (4).

[Ministerial Ordinance]

(Prevention of Troubles at Over bridge, etc.)

Article 44 For such cases when overhead contact, as well as feeder lines are to be installed underneath an over bridge, a building over platform, a bridge or any other similar facility, and are likely to cause some harm to people, etc., preventive measures or facilities shall be installed.

[Approved Model Specifications]

VI-4 Related to Article 44 (Prevention of Troubles at Over bridge, etc.)

1 In cases where contact lines and feeder lines are installed below over bridges, road bridges or similar, and when there is a risk of hazard to people, etc., facilities preventing the occurrence of problems shall be provided.

2 In cases where AC overhead contact lines and overhead feeders (excluding negative feeders) are installed below over bridges, road bridges or similar, construction shall be as outlined below in addition to the provisions of 1.

(1) Metal portions of bridges, etc., shall be grounded.

(2) Danger markings shall be posted at points necessary for safety.

3 In cases where voltage-applied portions of DC contact lines are supported using steel materials, etc., of platform sheds, bridges, etc., an insulator with sufficient insulating efficiency

shall be provided, or other measures necessary for safety shall be taken for the purpose of avoiding danger related to high-voltage operation.

[Ministerial Ordinance]

(Installation of Return Current Rail)

Article 45 Rail for return trace (current) shall be installed in such a manner as to configure the sufficient electric circuit for return current and also to minimize the leaky current from the rail to the ground.

2. Rail for return trace to be installed at a grade crossing or walkways, etc., shall be appropriately installed so that the difference of electric potential with the ground would not provide any danger to pedestrians, etc.

[Approved Model Specifications]

VI-5 Related to Article 45 (Installation of Return Current Rail)

1 Return circuit rails shall be electrically connected at joints using bonding or similar.

2 The joints of return circuit rails for DC overhead contact lines shall have not more than 5 meters of electrical resistance (value converted into rail length).

3 If there is a risk of danger to people, etc., in places accessible to members of the public (such as level crossings, crossing passages and the like) due to potential differences generated between return circuit rails and the ground, rails laid in such portions shall be insulated from other rails, or such portions shall be paved.

[Ministerial Ordinance]

(Transmission and Distribution Line Routes)

Article 46 Transmission and distribution lines (except those installed outside the exclusive right of way. the same shall apply hereinafter.) shall be strong enough to withstand both the anticipated maximum wind load and the tensile load of electric wires, and at the same time, need to be installed in such a manner as to be free from current mixture, electric shock and fire, depending upon the location, installation method and voltage.

2. Overhead transmission line and overhead distribution line shall be installed at an appropriate height to eliminate the possibility of electrocution and other impediment to traffic.

3. Transmission line and distribution line that are located in the proximity of, or cross over other electric lines, structures or vegetation shall be installed in the manner not to damage those electric lines or structures and to be free from the danger of electrocution and fire.

[Approved Model Specifications]

VI-6 Related to Article 46 (Transmission and Distribution Line Routes)

1 Overhead transmission/distribution lines, excluding cases in which cables are used, with respect to the voltages listed in the left column of the table below, shall employ the respective electric wires listed in the middle column. However, except for where extra-high voltage is used, cases where there is no risk of damage to other overhead contact lines, structures, etc., due to disconnection fault on overhead transmission/distribution lines, the collapse of supports for overhead transmission/distribution lines, etc., overhead transmission/distribution lines may employ the electric wires listed in the right column.

Voltage used	Electric wire	
Extra-high voltage	Hard-drawn copper stranded wire with a cross-sectional area of 22 square millimeters, or stranded wire with a tensile strength of not less than 8.7 kN	
High voltage and low voltage exceeding 300 volts	Hard-drawn copper wire with a diameter of not less than 5 millimeters, or electric wire with a tensile strength of not less than 8.01 kN	Hard-drawn copper wire with a diameter of not less than 4 millimeters, or electric wire with a tensile strength of not less than 5.27 kN
Low voltage of not more than 300 volts	Hard-drawn copper wire with a diameter of not less than 4 millimeters or electric wire with a tensile strength of not less than 5.27 kN, or low-voltage insulated electric wire with a diameter of not less than 2.6 millimeters or low-voltage insulated electric wire with a tensile strength of not less than 2.30 kN	Hard-drawn copper wire with a diameter of not less than 3.2 millimeters, or electric wire with a tensile strength of not less than 3.44 kN, or low-voltage insulated electric wire with a diameter of not less than 2.6 millimeters, or low-voltage insulated electric wire with a tensile strength of not less than 2.30 kN

2 Notwithstanding the provisions of 1, overhead transmission/distribution lines in which the voltage used exceeds 300 volts shall not employ lead-in vinyl insulated wire or multi-core-type electric wire.

3 Supports for overhead transmission/distribution lines shall be constructed as follows:

(1) The distance between supports shall be not more than 100 meters in cases where wooden poles are used as supports, not more than 150 meters for concrete poles or metal poles, and not more than 400 meters for metal towers (not more than 600 meters in cases using hard-drawn copper stranded wire with a cross-sectional area of 55 square millimeters or electric wire with a tensile strength of not less than 21.67 kN as an extra-high-voltage overhead transmission/distribution line, hard-drawn copper stranded wire with a cross-sectional area of 38 square millimeters or electric wire with a tensile strength of not less than 14.51 kN as a high-voltage overhead transmission/distribution line, and hard-drawn copper stranded wire with a cross-sectional area of not less than 22 square millimeters or electric wire with a tensile strength of not less than 8.71 kN as a low-voltage overhead transmission/distribution line).

(2) Supports for extra-high-voltage or high-voltage overhead transmission/distribution lines shall be constructed in accordance with the provisions of Approved Model Specifications 24 (2) to (5) related to Article 41.

(3) In cases where branch lines are constructed at a support, such construction shall conform to the provisions of Approved Model Specifications 26 related to Article 41.

4 Metal fittings for cross-arms or insulators to support extra-high overhead transmission/distribution lines shall be grounded.

5 Overhead transmission/distribution lines shall have a safety factor of not less than 2.5 (2.2 when using hard-drawn copper wire or heat-resistant copper alloy wire) with respect to tensile force.

6 Overhead transmission/distribution lines shall be branched at their support points. However, this does not apply in the following cases:

(1) Branching so that no tension is applied to an overhead transmission/distribution line at a branch point

(2) Branching using cables installed in accordance with the provisions of 9

7 Overhead transmission/distribution lines in the same circuit shall be separated from each other with sufficient consideration of the voltage used, the intervals between supports, wind-related electric wire oscillation, and sag or recovery of electric wires due to the adhesion or detachment of snow or ice.

8 Cables used for overhead transmission/distribution lines shall be suspended using a messenger wire (galvanized-iron stranded wire with a cross-sectional area of not less than 22 square millimeters, or a type with a tensile strength of not less than 5.93 kN (for extra-high voltage, galvanized-steel stranded wire with a cross-sectional area of 22 square millimeters or a type with a tensile strength of not less than 13.93 kN)).

9 The messenger wire in 8 shall have a safety factor of not less than 2.5 (2.2 in the case of hard-drawn copper wire or heat-resistant copper alloy wire) with respect to tensile force.

10 Transmission/distribution lines to be located on roofs (hereafter referred to as "rooftop transmission/distribution lines") shall be installed using cables or lead-in insulators.

11 Installation of rooftop transmission/distribution lines through construction using a lead-in insulator shall be conducted as follows:

(1) The interval between supports shall be not more than 15 meters.

(2) With respect to the voltages listed in the first column of the table below, the respective core wires listed in the second column shall be used, as well as the insulated electric wires listed in the third column. However, in the case of installation so that people cannot easily approach, the electric wires listed in the fourth column may be used.

Voltage used	Core wire	Insulated electric wire	Electric wire
High voltage	Hard-drawn copper wire with a diameter of 4 millimeters, or a type with a tensile strength of not less than 5.27 kN	High-voltage insulated electric wire	Hard-drawn copper wire with a diameter of 5 millimeters, or a type with a tensile strength of not less than 8.01 kN
Low voltage	Hard-drawn copper wire with a diameter of 2.6 millimeters, or a type with a tensile strength of not less than 2.30 kN	Low-voltage insulated electric wire	Hard-drawn copper wire with a diameter of 4 millimeters, or a type with a tensile strength of not less than 5.27 kN

12 In the case of locating a low-voltage rooftop transmission/distribution line through bus duct work, the conductor shall be a copper belt with a cross-sectional area of 20 square millimeters, a copper tube or round rod with a diameter of not less than 5 millimeters, or an

aluminum belt with a cross-sectional area of 30 square millimeters.

13 Rooftop transmission/distribution lines shall not use extra-high voltage.

14 Transmission/distribution lines to be located on the flank (hereafter referred to as "flank transmission/distribution lines"), with respect to the voltages listed in the left column of the table below, shall employ the respective cables or electric wires listed in the middle column, and shall be made so that there is no risk of people easily touching them through the installation methods listed in the right column.

Voltage used	Cable or electric wire	Installation method
Extra-high voltage (limited to 100,000 volts)	Extra-high-voltage cable (excluding metal-sheathed cable in the case of installation on wooden buildings)	Cable work
High voltage	High-voltage cable (excluding metal-sheathed cable in the case of installation on wooden buildings)	Cable work
	High-voltage insulated hard-drawn copper electric wire with a diameter of not less than 4 millimeters, or high-voltage insulated electric wire with a tensile strength of not less than 5.27 kN	Lead-in insulator work
Low voltage	Low-voltage cable (excluding metal-sheathed cable in the case of installation on wooden buildings)	Cable work
	Soft-drawn copper wire with a diameter of not less than 2 millimeters, or low-voltage insulated electric wire with equivalent or higher strength	Lead-in insulator work
	Low-voltage insulated electric wire (excluding outdoor vinyl-insulated electric wire)	Metal tube work (excluding the case of installation on wooden buildings), synthetic resin tube work

	Conductors consisting of a copper belt with a cross-sectional area of not less than 20 square millimeters, a copper tube or round rod with a diameter of not less than 5 millimeters, or an aluminum belt with a cross-sectional area of not less than 30 square millimeters	Bus duct work

15 Transmission/distribution lines to be located on the ground (hereafter referred to as "ground transmission/distribution lines") shall be installed as follows:

(1) With respect to the voltages listed in the left column of the table below, the respective cables or cab tire cables listed in the right column shall be used.

Voltage used	Cable or cab tire cable
Extra-high voltage (limited to not more than 100,000 volts)	Extra-high-voltage cable
High voltage	High-voltage cable, high-voltage chloroprene cab tire cable or high-voltage polyethylene cab tire cable
Low voltage	Cable, chloroprene cab tire cable or polyethylene cab tire cable

(2) Lines shall be housed in a sturdy tube, trough or open conduit.

(3) The use of cab tire cable shall be as follows:

[1] No connection points shall be located at midpoints of electric wires.

[2] Dedicated switchgears or circuit breakers shall be located on the side of power sources for overhead contact lines.

[3] Overhead contact lines with a voltage exceeding 300 volts shall be fitted with a device that automatically breaks the electric circuit in the event of a ground fault.

16 Extra-high-voltage ground transmission/distribution lines shall be installed in places where people cannot easily enter.

17 Transmission/distribution lines to be located under the ground (hereafter referred to as "underground transmission/distribution lines") shall be installed as follows:

(1) Electric wires for use shall be made of cable based on the voltage used.

(2) In the case of directly embedding underground transmission/distribution lines, each depth thereof, with respect to the installation locations listed in the left column of the table below, shall be not less than the respective numerical values in the right column. However, in cases where the kind of cable for use, the installation conditions, etc., are taken into consideration, and cables are located so as to be sufficiently resistant to the pressure that will act upon them, this does not apply.

Installation location	Depth (unit: meters)
Places where there is a possibility of pressure application from automobiles or other heavy articles	1.2 (0.8 in cases where high or low voltage is used)
Other places	0.6

(3) In the case of laying underground transmission/distribution lines using a closed conduit, the conduit shall be one that is resistant to pressure from automobiles or other heavy articles, and shall undergo any of the flame-resistance processing measures outlined in Approved Model Specifications 9.2 (2) related to Article 41.

18 Devices applying pressure to cables using compressed gas (hereafter referred to as "pressure devices," excluding those located in places other than dedicated sites; the same shall apply below) shall be equipped as follows:

(1) Pipes through which compressed gas or pressurized oil is carried (hereafter referred to as "pressure pipes"), compressed gas tanks or pressurized-oil tanks (hereafter referred to as "pressure tanks") and compressors, under test conditions in which oil pressure or water pressure 1.5 times the value of the maximum working pressure (in cases where it is difficult to test with oil pressure or water pressure, an atmospheric pressure of 1.25 times the value of the maximum working pressure) is continuously applied for 10 minutes, shall be resistant thereto and demonstrate no leakage.

(2) Pressure tanks and pressure pipes shall be arranged so that no residual stress is generated by welding and no unreasonable load is exerted by the fastening of screws.

(3) Pressure devices shall be equipped with a means to measure the pressure of compressed gas or pressurized oil.

(4) Compressed gas shall not have properties of combustibility or corrosiveness.

(5) Pressure devices automatically supplying compressed gas for which pressure is likely to rise in the event of a pressure-reducing valve fault shall be as follows:

[1] The material and structure of pressure pipes with a maximum working pressure of not less than 300 kPa and pressure tanks shall be as follows:

(A) Types made of a material other than nonferrous metal shall conform to "2.1 Materials" and "2.2 Restrictions on use of carbon steel materials," "2.10 Restrictions on use of cast iron" or "2.15 Restrictions on use of carbon steel materials for piping" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969).

(B) Types made of nonferrous metal shall conform to the Japanese Industrial Standards listed in the table below, or shall have a chemical composition and mechanical strength equivalent to or higher than the requirements of these standards and "2.16 Restrictions on use of copper and copper alloy" or "2.18 Restrictions on use of aluminum and aluminum alloy" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969).

Type	Japanese Industrial Standards
Copper and copper alloy	JIS H 3101 (1966) "Copper plate" (limited to type 1), JIS H 3104 (1966) "Deoxidized copper plate" (limited to type 1), JIS H 3203 (1969) "Naval brass plate," JIS H 3603 (1969) "Phosphorous-deoxidized copper seamless pipe," JIS H 3606 (1969) "Tough pitch copper seamless pipe," JIS H 3631 (1963) "Seamless brass pipe" (limited to type 3), or JIS H 5111 (1966) "Bronze castings" (limited to type 2, 3 or 6)
Aluminum and aluminum alloy	JIS H 4101 (1963) "Aluminum plate and disk" (limited to type 1 Designated, type 2 Designated or types 1 or 3), JIS H 4101 (1963) "Corrosion-resistant aluminum alloy plate" (limited to types 1, 3, 4 or 9) or JIS H 4143 (1963) “Corrosion-resistant aluminum alloy seamless pipe" (limited to types 3, 4 or 5)
Titanium	JIS H 4600 (1964) "Titanium plate" (limited to types 2 or 3), JIS H 4630 (1964) “Titanium pipe for piping" (limited to types 2 or 3) or JIS H 4650 (1964) "Titanium rod" (limited to types 2 or 3)
Lead pipe and hard-drawn lead pipe	JIS H 4311 (1955) "Lead pipe" or JIS H 4313 (1956) "Hard-drawn lead pipe"

(C) The body thereof shall be cylindrical, and its roundness shall meet the requirements of "12.8 Roundness of body" in "Structure of unfired pressure vessels" of the Japanese

Industrial Standards JIS B 8243 (1969).

(D) The thickness of shell plates shall meet the requirements of "5.1 Restrictions on shape of plates" and "12.10 Shape of heads" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969).

(E) The shape of heads shall meet the requirements of "6.2 Restrictions on shape of heads" and "12.10 Shape of heads" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969).

(F) The thickness of heads shall meet the requirements of "6.1 Restrictions on thickness of heads," "6.3 Strength of heads under pressure at the inside bottom," "6.5 Strength of conical heads" and "6.6 Flange dish-type covers under pressure at the inside bottom" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969).

(G) The thickness of flat plates shall meet the requirements of "6.10 Flat plates not supported by stays" and "6.11 Flat heads with large holes and no stays" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969).

(H) Holes shall meet the requirements of "6.4 Holes without reinforcement in heads," "9.6 Holes requiring no reinforcement," "9.7 Reinforcement calculations for holes in body and shell plate," "9.8 Reinforcement calculations for holes in flat plate," "9.11 Effective range of reinforcement," "9.12 Area of portion that can be calculated as reinforcing material of thickness of shell plate and head," "9.14 Reinforcement for two or more holes in proximity," "9.15 Reinforcement for holes turned into flanges," "9.16 Strength of reinforcing materials," "9.17 Minimum thickness of reinforcing materials" and "12.7 Holes without reinforcement in weld portions" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969).

(I) The efficiency of welded joints shall meet the requirements of "13.7 Efficiency of welded joints" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969).

(J) The tolerance on dimensions for principal members shall meet the requirements of "2.4 Tolerances on dimensions for principal members" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969).

[2] Allowable tensile stress values are as follows:

Material	Allowable tensile stress
Steel material, steel plate, forged copper pipe or copper rod	Value 0.25 times that specified in "2.5 Tensile strength of steel materials for use in

		calculation" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969)
Cast iron		Value specified in "2.12 Allowable stress of casting for use in calculation (excluding (2) and (3)) in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969)
Steel castings		Value specified in "2.13 Allowable tensile stress of steel castings" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969)
Copper and copper alloy	Copper plate, deoxidized copper plate, seamless brass pipe and bronze casting	Value specified in "2.17 Allowable tensile stress of copper and copper alloy for use in calculation" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969)
	Naval brass plate, phosphorous-deoxidized copper seamless pipe, tough pitch copper seamless pipe	Value specified in JIS H 3100 (1992) "Copper and copper alloy plate and ribbon" or JIS H 3300 (1992) "Copper and copper alloy seamless pipe"
Aluminum and aluminum alloy		Value specified in "2.19 Allowable tensile stress of aluminum and aluminum alloy for use in calculation" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969)
Titanium		Value specified in "2.20 allowable tensile stress of titanium for use in calculation" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969)
Lead pipe and hard lead pipe		Value specified in "2.21 Allowable tensile stress of lead pipe and hard lead pipe for use in calculation" in "Structure of unfired pressure

	vessels" of the Japanese Industrial Standards JIS B 8243 (1969)

Remarks

1. When using pipes treated with electric resistance welding, the allowable tensile stress shall be 0.85 times the value of each seamless pipe. When using forge-welded pipes, it shall be 0.65 times the value of each seamless pipe.
2. The allowable tensile stress for nonferrous metals shall be the minimum (2/3 times this value in cast steel or foundry steel) of the following values for each material:

(1) 0.25 times the tensile strength

(2) 2/3 times the yield point

(3) Average stress level to generate a 0.1% creep ratio over 10,000 hours

(4) Stress to generate rupture over 10, 000 hours

[3] The allowable compression pressure and allowable shear stress shall be 100% and 85% of the value of allowable tensile stress in accordance with the provisions of [2].

[4] For pressure tanks or at points proximate thereto of pressurized-oil pipes, and at the final stage of compressors or at points proximate thereto of pressurized-oil pipes, a safety valve shall be provided operating under a pressure level not more than the maximum working pressure and meeting the requirements of "16.3 Structure of safety valves" and "16.4 Capacity of safety valves" in "Structure of unfired pressure vessels" of the Japanese Industrial Standards JIS B 8243 (1969). Compressors operating at a pressure of less than 1,000 kPa, however, may alternatively be equipped with a safety device designed to operate at not more than the maximum working pressure.

19 Underground boxes for use with underground transmission lines (excluding those located in places other than dedicated sites; the same shall apply below) shall have a sturdy structure, and shall be provided with a lid that cannot be easily opened.

20 Ground transmission/distribution lines or underground transmission/distribution lines made to rise in places other than substations, power-distribution stations and switching stations shall be installed as follows:

(1) In cases where such lines are made to rise in places where there is a risk of them being easily touched by unauthorized people or in places where there is a possibility that electric wires may be damaged, appropriate protection facilities shall be provided.

(2) Porcelain tubes of cable terminal boxes shall be located so that there is no risk of unauthorized people easily touching them.

(3) The rise portion of ground transmission/distribution lines or underground transmission/distribution lines of extra-high voltage shall be installed in dedicated sites that unauthorized people cannot easily enter.

21 The provisions of 14 shall apply mutatis mutandis to transmission/distribution lines to be located on cliff sides (hereafter referred to as "cliff-side transmission/distribution lines"), excluding cases where extra-high voltage is used.

22 Extra-high voltage shall not be used for cliff-side transmission/distribution lines.

23 Transmission/distribution lines to be located at bridges shall be constructed as follows:

(1) Extra-high-voltage transmission/distribution lines located above or on the side of bridge girders shall be installed as outlined below. However, this does not apply for instances of installation in accordance with the provisions of 15.

[1] In cases where cable is used, installation shall be in accordance with the provisions of 8 and 9.

[2] Excluding cases where cable is used, hard-drawn copper stranded wire with a cross-sectional area of not less than 55 square millimeters or electric wire with a tensile strength of not less than 21.67 kN installed through lead-in insulator work shall be used.

[3] Transmission/distribution lines shall be not less than 6 meters in height above the rail top.

(2) Extra-high-voltage transmission/distribution lines located below bridge girders shall be installed in accordance with the provisions of 15.

(3) High- or low-voltage transmission/distribution lines, with respect to the voltages listed in the left column of the table below, shall employ the respective cables or electric wires listed in the middle column, and shall be installed through the construction methods listed in the right column.

Working voltage	Cable or electric wire	Installation method
High voltage	High-voltage cable	Cable work
	Hard-drawn copper wire with a diameter of not less than 5 millimeters, or electric wire with a tensile strength of not less than 8.01 kN	Lead-in insulator work
Low voltage	Low-voltage cable	Cable work

	Hard-drawn copper wire with a diameter of not less than 4 millimeters or electric wire with a tensile strength of not less than 5.27 kN, or low-voltage insulated electric wire of hard-drawn copper with a diameter of not less than 2.6 millimeters or low-voltage insulated electric wire with a tensile strength of not less than 2.30 kN	Lead-in insulator work
	Low-voltage insulated electric wire (excluding outdoor vinyl-insulated electric wire)	Metal tube, synthetic resin tube or flexible electric wire tube work
	Conductors consisting of a copper belt with a cross-sectional area of not less than 20 square millimeters, a copper tube or round rod with a diameter of not less than 5 millimeters, or an aluminum belt with a cross-sectional area of not less than 30 square millimeters	Bus duct work (limited to cases of installation on the side of bridges)

24 Transmission/distribution lines to be located in tunnels, etc., shall be installed as follows:

(1) Extra-high-voltage transmission/distribution lines shall be installed as follows:

[1] Extra-high-voltage cables shall be used.

[2] Lines shall be encased in a sturdy trough or an open conduit covered with sturdy plates, or located on a sturdy support mounted on the wall surface of the tunnel, etc. However, in cases where steel-tape armored cable is installed at supports mounted on the wall surface of the tunnel, etc., the same does not apply.

(2) High- or low-voltage transmission/distribution lines shall be installed as follows:

[1] With respect to the working voltages listed in the left column of the table below, lines shall employ the respective cables or electric wires listed in the middle column, and shall

be installed through the installation methods listed in the right column.

(3) Cables used as transmission/distribution lines to be located in long tunnels, etc., shall undergo flame-resistance processing as outlined in Approved Model Specifications 9.2 (2) related to Article 41.

Working voltage	Cable or electric wire	Installation method
High voltage	High-voltage cable	Cable work
	High-voltage insulated electric wire consisting of hard-drawn copper wire with a diameter of not less than 4 millimeters, or high-voltage insulated electric wire with a tensile strength of not less than 5.27 kN	Lead-in insulator work
Low voltage	Low-voltage cable	Cable work
	Low-voltage insulated electric wire consisting of hard-drawn copper wire with a diameter of not less than 2.6 millimeters, or low-voltage insulated electric wire with a tensile strength of not less than 2.30 kN	Lead-in insulator work
	Low-voltage insulated electric wire (excluding outdoor vinyl-insulated electric wire)	Metal tube, synthetic resin tube or flexible electric wire tube work

[2] The height of transmission/distribution lines in the case of installation through lead-in insulator work shall be 3 meters above the rail top for high-voltage lines, and not less than 2.5 meters above the rail top for low-voltage lines.

25 Supports for overhead electric wires (hereafter referred to as "overhead electric wires," excluding those located in places other than dedicated sites; the same shall apply below) shall not pass between electric wires of other overhead electric lines. However, if the consent of the party in charge of the other overhead electric lines is obtained, the same does not apply.

26 Electric wires of overhead electric lines shall not pass through supports for other overhead electric wires. However, if the consent of the party in charge of the other overhead electric lines is obtained, the same does not apply.

27 Installation of overhead electric wires at the same support need not conform to the provisions of 25 and 26.

28 In the case of installing an AC overhead negative feeder and a DC overhead contact line or overhead feeder together at the same support, the separation between the AC overhead negative feeder and the voltage-applied portion of the DC overhead contact line or overhead feeder, shall be not less than 35 centimeters in the case of installation on the side and not less than 50 centimeters in the case of installation above or below, notwithstanding Approved Model Specifications 1 related to Article 42.

29 High- or low-voltage overhead transmission/distribution lines for different circuits fitted together at the same support shall be installed as follows:

(1) High-voltage overhead transmission/distribution lines placed above low-voltage overhead transmission/distribution lines using an arm or a metal supporting arm shall be installed on different arms or metal supporting arms. However, in the following cases, the same does not apply:

[1] Cable is used as the high-voltage overhead transmission/distribution line, and the lines are installed so as to be easily distinguishable from each other.

[2] A low-voltage overhead transmission/distribution line is rigidly attached to an arm or a metal supporting arm supporting a high-voltage overhead transmission/distribution line for the purpose of branching the former.

(2) The separation between overhead transmission/distribution lines of different circuits (notwithstanding the provisions of 46), with respect to the working voltages listed in the left column of the table below, shall be not less than the respective numerical values listed in the middle and right columns. However, in cases of using a line spacer, or in case of using high-voltage cable as a high-voltage overhead transmission/distribution line and using cable or high-voltage insulated electric wire as a low-voltage overhead transmission/distribution line, or in the case where a jumper wire or a drop wire is located so that there is no risk of cross-fault, the same does not apply.

Working voltage	Separation (unit: centimeters)

	In the case of installation on the side	In the case of installation above or below
High voltage and high voltage or low voltage	35	50
Low voltage and low voltage	30 (20 when both are low-voltage insulated electric wire)	30

30 The provisions of 29 (2) shall apply mutatis mutandis to the separation between an AC overhead negative feeder (or the voltage-applied portion of a DC overhead contact line or overhead feeder) and a high- or low-voltage overhead transmission/distribution line in the case where an AC overhead negative feeder (or a DC overhead contact line or overhead feeder) and a high- or low-voltage overhead transmission/distribution line are installed at the same support. In this case, the wording of 46 in 29 (2) shall be read as outlined in Approved Model Specifications 1 related to Article 42.

31 AC overhead contact lines and high- or low-voltage overhead transmission/distribution lines at the same support shall be installed as follows:

(1) Low-voltage overhead transmission/distribution lines, excluding those where cable is used, notwithstanding the provisions of 1, shall employ hard-drawn copper wire with a diameter of not less than 5 millimeters or electric wire with a tensile strength of not less than 8.01 kN (hard-drawn copper wire with a diameter of not less than 4 millimeters or electric wire with a tensile strength of not less than 5.27 kN in cases where the distance between supports is not more than 50 meters), or copper-clad steel wire with a diameter of not less than 3.5 millimeters.

(2) In cases where an overhead contact line and an overhead transmission/distribution line are installed on the same side of the same support, or in cases where an overhead transmission/distribution line is installed at a support provided with an overhead contact line on both sides in a station or similar, overhead transmission/distribution lines, notwithstanding the provisions of 1 and 31 (1), shall employ hard-drawn copper stranded wire with a cross-sectional area of not less than 22 square millimeters or electric wire with a tensile strength of not less than 8.71 kN. However, in cases where a low-voltage overhead transmission/distribution line is installed below the voltage-applied portion of a contact line, the low-voltage overhead transmission/distribution line may employ hard-

drawn copper wire with a diameter of not less than 5 millimeters or electric wire with a tensile strength of not less than 8.01 kN (hard-drawn copper wire with a diameter of not less than 4 millimeters or electric wire with a tensile strength of not less than 5.27 kN in cases where the distance between supports is not more than 30 meters), or copper-clad steel wire with a diameter of not less than 3.5 millimeters.

(3) The separation between the voltage-applied portion of a contact line and an overhead transmission/distribution line, notwithstanding the provisions of Approved Model Specifications 1 related to Article 42, shall be not less than 1.2 meters and not less than 1 meter in horizontal distance. In such cases, if an overhead transmission/distribution line is installed above the voltage-applied portion of a contact line, the vertical distance shall be not more than 1.5 times the horizontal distance.

(4) Substations and power-distribution stations to be connected to overhead transmission/distribution lines shall be installed with precautionary measures as follows:

[1] A discharge device or lightning arrestor shall be provided for discharging at a voltage of not more than three times the working voltage at one electrode on the high-voltage side of transformers to be connected to high-voltage overhead transmission/distribution lines. In such cases, the discharge device shall be grounded.

[2] Transformers to be connected to low-voltage overhead transmission/distribution lines shall be grounded at a neutral point. However, in cases of low voltage not exceeding 300 volts, if it is difficult to ground a neutral point of the transformer, one terminal on the low-voltage side of the transformer may be grounded.

32 AC overhead feeders (excluding negative feeders) and DC overhead contact lines or DC overhead feeders (or high- or low-voltage overhead transmission/distribution lines) at the same support shall be installed as follows:

(1) The low-voltage overhead transmission/distribution line shall employ electric wire as outlined in 31 (1).

(2) The separation between an AC overhead feeder and the voltage-applied portion of a DC overhead contact line or DC overhead feeder (or a high- or low-voltage overhead transmission/distribution line), notwithstanding the provisions of Approved Model Specifications 1 related to Article 42, shall not be less than 1.2 meters. However, in the case of using cable as an AC overhead feeder, and when using cable or high-voltage insulated electric wire as a high-voltage overhead transmission/distribution line or in the case of using cable or low-voltage insulated electric wire as a low-voltage overhead transmission/distribution line, this value may be reduced to 0.5 meters.

(3) Substations and power-distribution stations to be connected to overhead transmission/distribution lines shall be installed with the precautionary measures outlined in 31 (4).

33 Overhead contact lines, overhead feeders or high- or low-voltage overhead transmission/distribution lines and extra-high-voltage overhead transmission/distribution lines installed at the same support shall be installed as follows:

(1) Overhead transmission/distribution lines using extra-high voltage exceeding 35,000 volts, notwithstanding the provisions of 1, shall employ hard-drawn copper stranded wire with a cross-sectional area of not less than 55 square millimeters or electric wire with a tensile strength of not less than 21.67 kN.

(2) Low-voltage overhead transmission/distribution lines shall employ electric wire as outlined in 31 (1).

(3) Extra-high-voltage overhead transmission/distribution lines shall be installed above overhead contact lines, overhead feeders or high- or low-voltage overhead transmission/distribution lines, and shall be located at different arms. However, in the case of using cable as an overhead transmission/distribution line with extra-high voltage not exceeding 35,000 volts, and using cable or insulated electric wire as an overhead feeder or a high- or low-voltage overhead transmission/distribution line, the same does not apply.

(4) The separation between the voltage-applied portion of an overhead contact line, an overhead feeder or a high- or low-voltage overhead transmission/distribution line and an extra-high-voltage overhead transmission/distribution line (notwithstanding the provisions of Approved Model Specifications 1 or 46 related to Article 42) shall be 2 meters in cases where the working voltage of an overhead transmission/distribution line using extra-high voltage exceeds 35,000 volts and is less than 100,000 volts, and not less than 1.2 meters in cases where it is not more than 35,000 volts. However, in the case of using cable as an extra-high-voltage overhead transmission/distribution line, and when using cable or high-voltage insulated electric wire as an AC overhead negative feeder, a DC high-voltage overhead feeder or a high-voltage overhead transmission/distribution line, or in the case of using cable or low-voltage insulated electric wire as a DC low-voltage overhead feeder or a low-voltage overhead transmission/distribution line, this value may be reduced to 0.5 meters.

(5) Substations and power-distribution stations to be connected to high- or low-voltage overhead transmission/distribution lines shall be subject to the precautionary measures

outlined in 31 (4). However, in the case of using cable as an overhead transmission/distribution line with extra-high voltage not exceeding 35,000 volts, the same does not apply.

34 AC overhead contact lines or overhead feeders (excluding negative feeders) and overhead low-current electric wires, etc., at the same support shall be installed as follows:

(1) Overhead low-current electric wire shall employ communication cable with a metal electrical shielding layer.

(2) The separation between the voltage-applied portion of a contact line or an overhead feeder and an overhead low-current electric wire, etc., notwithstanding the provisions of Approved Model Specifications 1 related to Article 42, shall be not less than 2 meters. However, in the case of using cable as an AC overhead feeder, this value may be reduced to 0.5 meters.

(3) Grounding electric wire for contact lines or overhead feeders and grounding electric wire for overhead low-current contact lines or overhead optical fiber cable lines shall be installed at different supports and connected to different grounding electrodes.

(4) Grounding electric wire for contact lines or overhead feeder lines shall employ cable or low-voltage insulated electric wire.

35 AC overhead negative feeders, DC overhead contact lines or overhead feeders (or high- or low-voltage overhead transmission/distribution lines) and overhead low-current electric wires, etc., at the same support shall be installed as follows:

(1) An overhead feeder or an overhead transmission/distribution line should be installed above an overhead low-current electric wire, etc., and where an arm or a metal supporting arm is used, they shall be installed at different arms. However, in the case of using high-voltage cable as a high-voltage overhead feeder or an overhead transmission/distribution line and using cable or high-voltage insulated electric wire as a low-voltage overhead feeder or overhead transmission/distribution line, and where these are installed so as to be easily distinguishable from overhead low-current electric wires, etc., the same does not apply.

(2) The separation between an AC overhead negative feeder, the voltage-applied portion of a DC overhead contact line or overhead feeder, or a high- or low-voltage overhead transmission/distribution line and an overhead low-current electric wire (notwithstanding the provisions of Approved Model Specifications 1 or 48 related to Article 42), with respect to the types of electric wires listed in the left column of the table below, in the case of using high-voltage cable as an AC overhead negative feeder, a DC

high-voltage overhead feeder or a high-voltage overhead transmission/distribution line, and using cable or high-voltage insulated electric wire as a low-voltage overhead feeder or overhead transmission/distribution line, and when using communication cable or low-voltage insulated electric wire (or electric wire with an equivalent or higher insulating effect) or installing optical fiber cable as an overhead low-current electric wire, shall be not less than the respective numerical values listed in the middle column; in other cases, it shall be not less than the respective values listed in the right column. However, in cases where a jumper wire, a drop wire, etc., is installed so that there is no risk of cross-fault, the same does not apply.

Type of electric wire	Separation (unit: centimeters)	
AC overhead negative feeders	50 (When optical fiber cable is used for overhead low-current electric wires, etc., 30)	100 (When communication lines are used for overhead low-current electric wires, 60)
Voltage-applied portion of DC high-voltage overhead contact lines		100 (When communication lines are used for overhead low-current electric wires, 60)
Voltage-applied portion of DC low-voltage overhead contact lines		60
DC high-voltage overhead feeders or high-voltage overhead transmission/distribution lines	50 (When optical fiber cable is used for overhead low-current electric wires, etc., 30)	100 (When communication lines are used for overhead low-current electric wires, 60)
DC low-voltage overhead feeders or low-voltage overhead transmission/distribution lines	30	60

(3) Grounding electric wires of AC overhead negative feeder lines, DC overhead contact lines or overhead feeder lines, or overhead transmission/distribution lines and grounding electric wires of overhead low-current contact lines or overhead optical fiber cable lines shall be installed at different supports, and shall be connected to different grounding electrodes.

36 Extra-high-voltage overhead transmission/distribution lines and overhead low-current electric wires, etc., at the same support shall be installed in conformity with the provisions of 35 (1) and (3), and as follows:

(1) Overhead transmission/distribution lines, excluding those where cable is used, shall employ hard-drawn copper stranded wire with a cross-sectional area of not less than 38 square millimeters or stranded wire with a tensile strength of not less than 14.51 kN, and insulators supporting them shall be any of those itemized in Approved Model Specifications 40 (1) [1] to [4] related to Article 46.

(2) Overhead low-current electric wires shall employ cable or electric wire as itemized below. However, in the case of using cable as an overhead transmission/distribution line, and when overhead low-current electric wire is for use in radio communications other than inductive radio, the same does not apply.

[1] Cable used as an overhead transmission/distribution line, or overhead low-current electric wire for use other than in wire-based communications, shall be cable or electric wire as follows:

(A) Communication cable

(B) Hard-drawn copper wire with a diameter of not less than 2.6 millimeters or electric wire with a tensile strength of not less than 2.3 kN

(C) Low-voltage insulated electric wire or electric wire with an equivalent or higher insulating effect

[2] Cables other than those used for overhead transmission/distribution lines and overhead low-current electric wire used in wire communication shall be communication cable with a metal electrical shielding layer.

(3) The separation between an overhead transmission/distribution line and an overhead low-current electric wire, etc., notwithstanding the provisions of Approved Model Specifications 46 related to Article 46, shall be not less than 2 meters (0.5 meters in the case of using cable as an overhead transmission/distribution line with not more than 35,000 volts, and when using cable or low-voltage insulated electric wire (or electric wire with an equivalent or higher insulating effect) or installing optical fiber cable as an

overhead low-current electric wire, etc.).

(4) The grounding electric wire of overhead transmission/distribution lines shall employ cable or low-voltage insulated electric wire.

37 The height of overhead transmission/distribution lines shall be as follows:

(1) In the case of spanning a railway or track, the height shall be not less than 6 meters (5.5 meters when the working voltage is not more than 35,000 volts) above the rail top.

(2) In the case of spanning a road (excluding level crossings), the height shall be not less than 6 meters above the road surface.

(3) In the case of spanning a level crossing, the height shall be not less than 6 meters above the level crossing surface. However, in the case of location at a level crossing in an AC electrified section and when the working voltage is not more than 20,000 volts, or in the case of location at a level crossing in a DC electrified section and when the working voltage is not more than 600 volts, this value may be reduced to the height of overhead contact lines (or 5 meters if the overhead contact line height is less than 5 meters).

(4) In the case of installation above a pedestrian bridge, with respect to the working voltages listed in the left column of the table below, the value shall be not less than the respective numerical values listed in the right column. However, this does not apply when a roof or other protective facilities are provided between overhead transmission/distribution lines and pedestrian bridges.

Working voltage	Height above footpath surface (unit: meters)
Extra-high voltage exceeding 35,000 volts and not more than 160,000 volts	6 (When cable is used, 5)
Extra-high voltage not exceeding 35,000 volts	5(When cable or extra-high-voltage insulated electric wire is used, 4)
High voltage	4(When cable or high-voltage insulated electric wire is used, 3.5)
Low voltage	3.5(When cable or low-voltage insulated electric wire is used, 3)

(5) In cases other than (1) to (4), with respect to the working voltages listed in the left column of the table below, the height shall be not less than the respective numerical values listed in the right column.

Working voltage	Height above footpath surface (unit: meters)
Extra-high voltage exceeding 35,000 volts and not more than 160,000 volts	6 (In the case of installation in a mountain district where unauthorized people cannot easily enter, 5)
Extra-high voltage not exceeding 35,000 volts	5
High voltage	5 (In the case of installation in dedicated facilities where unauthorized parties cannot easily enter in order to avoid injury to people, and when using cable or high-voltage insulated electric wire, 3.5)
Low voltage exceeding 300 volts	4 (In the case of installation in dedicated facilities where unauthorized parties cannot easily enter to avoid injury to people, and when using cable or low-voltage insulated electric wire, 3.5)
Low voltage not exceeding 300 volts	4 (In the case of installation in dedicated facilities where unauthorized parties cannot easily enter to avoid injury to people, 2.5)

38 In the case of installing overhead transmission/distribution lines in snowy areas, the height of such lines above the snow level shall be maintained so as to avoid hindering the flow, etc., of people, automobiles and the like.

39 Foothold metal fittings used for climbing up and down by operators shall be located not less than 1.8 meters above the platform at supports for overhead transmission/distribution lines above the platform. However, this does not apply in the following cases:

(1) The support has a structure in which foothold metal fittings can be contained internally.

(2) Equipment to prevent unauthorized ascent is fitted to the support.

(3) Fences, surroundings, etc., are constructed around the support to ensure that only the operator can enter.

(4) Unauthorized ascent is prevented by the presence of a shed or similar on the platform.

40 In cases where extra-high-voltage overhead transmission/distribution lines and overhead electric wires with non-extra-high voltage are crossed, the extra-high-voltage overhead transmission/distribution lines shall be installed as follows:

(1) The insulator supporting the portion crossing the overhead electric wire shall be any one of the following:

[1] In cases where the extra-high-voltage overhead transmission/distribution line uses not more than 130,000 volts, an insulator for which 50% of the impulse flashover voltage is not less than 110% the value for the insulator supporting other portions adjacent to the crossing portion

[2] One using a suspended insulator fitted with an arc horn, a long-rod insulator or a line-post insulator

[3] One using not less than two strands of suspended insulators or long-rod insulators

[4] One using not less than two line-post insulators

(2) The length of portions within a horizontal distance of 3 meters from the overhead electric wire shall be not more than 50 meters.

(3) The extra-high-voltage overhead transmission/distribution line shall be installed above overhead electric wires except in the case of using cables as an overhead transmission/distribution line with extra-high voltage of less than 100,000 volts.

41 In cases where extra-high-voltage overhead transmission/distribution lines and overhead electric wires using non-extra-high voltage (excluding overhead contact lines; the same shall apply to 41) are crossed, a guard wire or guard net shall be provided between them. However, the same does not apply in the following cases:

(1) Cable or hard-drawn copper wire with a diameter of not less than 5 millimeters or electric wire with a tensile strength of not less than 8.01 kN is used as an overhead electric wire with a voltage other than extra-high voltage.

(2) An overhead electric wire with a voltage other than extra-high voltage is suspended with galvanized iron wire having a diameter of not less than 4 millimeters or a type with a tensile strength of not less than 3.7 kN.

(3) An overhead electric wire with a voltage other than extra-high voltage is a service line and the distance between its support points is not more than 15 meters.

(4) The separation between an extra-high-voltage overhead transmission/distribution line and an overhead electric wire with a voltage other than extra-high voltage is not less than 6 meters in vertical distance.

(5) Cable is used as an overhead transmission/distribution line with extra-high voltage of less than 100,000 volts, or extra-high-voltage insulated electric wire is used as an overhead transmission/distribution line with extra-high voltage of not more than 35,000 volts.

42 In cases where high- or low-voltage overhead transmission/distribution lines and overhead low-current electric wires are crossed, a guard wire or guard net shall be provided between them. However, this does not apply in the following cases:

(1) An overhead transmission/distribution line is located above an overhead low-current electric wire, and any of the following apply:

[1] The separation between the overhead transmission/distribution line and the overhead low-current electric wire is not less than 6 meters in vertical distance.

[2] Cable or high-voltage insulated electric wire is used as a high-voltage overhead transmission/distribution line.

[3] Cable or electric wire other than naked electric wire is used as a low-voltage overhead transmission/distribution line.

[4] The consent of the party in charge of the overhead low-current electric wire is obtained for the installation of a low-voltage overhead transmission/distribution line without a guard wire or guard net.

[5] Communication cable is used as an overhead low-current electric wire.

[6] Hard-drawn copper wire with a diameter of not less than 4 millimeters, or electric wire with a tensile strength of not less than 5.27 kN, or low-voltage insulated electric wire or electric wire with an equivalent or higher insulating effect is used as an overhead low-current electric wire.

[7] An overhead electric wire is suspended with galvanized iron wire having a diameter of not less than 4 millimeters or a type with a tensile strength of not less than 3.7 kN.

(2) In cases where high-voltage overhead transmission/distribution lines are installed below overhead low-current electric wires, and any of the following apply:

[1] Cable or electric wire as outlined in (1) [2] is used as a high-voltage overhead transmission/distribution line.

[2] Communication cable or hard-drawn copper wire with a diameter of not less than 5 millimeters or a type with a tensile strength of not less than 8.01 kN is used as an overhead low-current electric wire.

[3] An overhead low-current electric wire suspended as outlined in (1) [7] is installed.

(3) In cases where low-voltage overhead transmission/distribution lines are located below overhead low-current electric wires, and when any of the following apply:

[1] Cable or low-voltage insulated electric wire is used as a low-voltage overhead transmission/distribution line.

[2] Communication cable or electric wire as outlined in (1) [6] is used as an overhead low-

current electric wire.

[3] An overhead low-current electric wire suspended as outlined in (1) [7] is installed.

43 Extra-high-voltage overhead transmission/distribution lines spanning roads, pedestrian bridges, railways or tracks shall be installed as follows:

(1) In the case of spanning a railway or track, the insulator supporting the crossing portion shall be any of those outlined in 40 (1).

(2) The length at the portion within 3 meters in horizontal distance from the outside of the road, pedestrian bridge, railway or track shall be not more than 100 meters.

44 The provisions of 40 (1) and (2) shall apply mutatis mutandis to cases where an extra-high-voltage overhead transmission/distribution line crosses above a cable.

45 In cases where an overhead transmission/distribution line crosses below a cable, sturdy protection facilities shall be provided between them, and its metal portion shall be grounded.

46 The separation between overhead transmission/distribution lines and other electric lines (excluding contact lines and feeders), buildings, etc., shall be not less than the numerical values listed in the following table

<table>
<tr><td colspan="5" rowspan="4">Other overhead contact lines (excluding contact lines and feeders) , structures, etc.
Other overhead contact lines, structures, etc.</td><td colspan="3">Overhead electric lines, etc.</td></tr>
<tr><td colspan="3">Overhead low-current electric wires, etc.</td></tr>
<tr><td rowspan="2">When using hard-drawn copper wire with a diameter of not less than 5 mm or a type with a tensile strength of not less than 8.01 kN, or in the case of suspension with galvanized iron wire having a diameter of not less than 4 mm or a type with a tensile strength of not less than 3.70 kN</td><td colspan="2">When using communication cable or optical fiber cable</td></tr>
<tr><td>When the consent of the party in charge of low-current electric wires is obtained</td><td>In other cases</td></tr>
<tr><td rowspan="5">Extra-high voltage exceeding 60,000 volts but less than 100,000 volts</td><td colspan="4">When cable is used</td><td>1+0.12E</td><td>1+0.12E</td><td>1+0.12E</td></tr>
<tr><td colspan="4">In the case of crossings</td><td>2+0.12E</td><td>2+0.12E</td><td>2+0.12E</td></tr>
<tr><td rowspan="3">In other cases</td><td colspan="3">When a guard net is used</td><td>2+0.12E</td><td>2+0.12E</td><td>2+0.12E</td></tr>
<tr><td rowspan="2">In other cases</td><td colspan="2">In the case of first-class safety work</td><td>2+0.12E</td><td>2+0.12E</td><td>2+0.12E</td></tr>
<tr><td colspan="2">In other cases</td><td>Horizontal distance 3</td><td>Horizontal distance 3</td><td>Horizontal distance 3</td></tr>
<tr><td rowspan="5">Extra-high voltage exceeding 35,000 volts but not more than 60,000 volts</td><td colspan="4">When cable is used</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td colspan="4">In the case of crossings</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td rowspan="3">In other cases</td><td colspan="3">When a guard net is used</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td rowspan="2">In other cases</td><td colspan="2">In the case of first-class safety work</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td colspan="2">In other cases</td><td>Horizontal distance 3</td><td>Horizontal distance 3</td><td>Horizontal distance 3</td></tr>
<tr><td rowspan="7">Extra-high voltage exceeding 35,000 volts but not more than 60,000 volts</td><td colspan="4">When cable is used</td><td>0.5</td><td>0.5</td><td>0.5</td></tr>
<tr><td colspan="4">When using extra-high voltage insulated electric wire</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td rowspan="5">In other cases</td><td colspan="3">In the case of crossings</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td rowspan="4">In other cases</td><td colspan="2">When a guard net is used</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td rowspan="3">In other cases</td><td>In the case of second-class safety work</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td>In the case of third-class safety work</td><td>Horizontal distance 2</td><td>Horizontal distance 2</td><td>Horizontal distance 2</td></tr>
<tr><td>In other cases</td><td>Horizontal distance 3</td><td>Horizontal distance 3</td><td>Horizontal distance 3</td></tr>
<tr><td rowspan="3">High voltage</td><td colspan="2" rowspan="3">In the case of crossings</td><td colspan="2">When cable is used</td><td>0.4</td><td>0.4</td><td>0.4</td></tr>
<tr><td colspan="2">When using high-voltage insulated electric wire</td><td>0.8</td><td>0.8</td><td>0.8</td></tr>
<tr><td colspan="2">When using other electric wire</td><td>1.2</td><td>1.2</td><td>1.2</td></tr>
</table>

		When using other electric wire	1.2	1.2	1.2
	In other cases	When cable is used	0.4	0.4	0.4
		When using high-voltage insulated electric wire	0.8	0.8	0.8
		When using other electric wire	6 or horizontal distance 1.2	1.2	6 or horizontal distance1.2
Low voltage	In the case of crossings	When using cable or high-voltage insulated electric wire	0.3	0.15	0.3
		When using low-voltage insulated electric wire	0.6	0.3	0.6
		When using other electric wire	1	0.6	0.6
	In other cases	When using cable or high-voltage insulated electric wire	0.3	0.15	0.3
		When using low-voltage insulated electric wire	0.6	0.3	0.6
		When using other electric wire	6 or horizontal distance 1	0.6	6 or horizontal distance 0.6

Overhead electric lines, etc.			
Overhead low-current electric wires, etc.			
When using low-voltage insulated electric wire or electric wire with an equivalent or higher insulating effect		In other cases	
When the consent of the party in charge of low-current	In other cases	When the consent of the party in charge of low-current	In other cases

electric wires is obtained		electric wires is obtained	
1+0.12E	1+0.12E	1+0.12E	1+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E
2+0.12E as well as horizontal distance 2	2+0.12E as well as horizontal distance 2	2+0.12E as well as horizontal distance 2	2+0.12E as well as horizontal distance 2
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3
1	1	1	1
2	2	2	2
2	2	2	2
Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3
0.5	0.5	0.5	0.5
1	1	1	1
2	2	2	2
2	2	2	2
Vertical distance 6 or horizontal distance 2	Vertical distance 6 or horizontal distance 2	Vertical distance 6 or horizontal distance 2	Vertical distance 6 or horizontal distance 2
Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3
0.4	0.4	0.4	0.4
0.8	0.8	0.8	0.8
1.2	1.2	1.2	1.2

0.4	0.4	0.4	0.4
0.8	0.8	0.8	0.8
1.2	6 or horizontal distance 1.2	1.2	6 or horizontal distance 1.2
0.15	0.3	0.3	0.3
0.3	0.6	0.6	0.6
0.6	0.6	0.6	1
0.15	0.3	0.3	0.3
0.3	0.6	0.6	0.6
0.6	6 or horizontal distance 0.6	1	6 or horizontal distance 1

Overhead electric lines, etc.						
Other electric wires						
Extra-high voltage						
Exceeding 60,000 volts but less than 100,000 volts		Exceeding 35,000 volts but not more than 60,000 volts		Not more than 35,000 volts		
When cable is used	When using other electric wire	When cable is used	When using other electric wire	When cable is used	When using extra-high voltage insulated electric wire	When using other electric wire
1+0.12E	2+0.12E	1+0.12E	2+0.12E	1+0.12E	2+0.12E	2+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E
1+0.12E	2+0.12E	1	2	1	2	2
2+0.12E	2+0.12E	2	2	2	2	2
2+0.12E	2+0.12E	2	2	2	2	2

2+0.12E	2+0.12E	2	2	2	2	2
2+0.12E	2+0.12E	2	2	2	2	2
1+0.12E	2+0.12E	1	2			2
2+0.12E	2+0.12E	2	2			2
2+0.12E	2+0.12E	2	2	2	2	2
2+0.12E	2+0.12E	2	2	2	2	2
2+0.12E	2+0.12E	2	2	2	2	2
2+0.12E	2+0.12E	2	2	2	2	2
2+0.12E	2+0.12E	2	2	2	2	2
1+0.12E	2+0.12E	1	2	0.5	1	2
1+0.12E	2+0.12E	1	2	0.5	1	2
2+0.12E	2+0.12E	2	2	1.2	2	2
1+0.12E	Horizontal distance 3	1	Horizontal distance 3	0.5	1	Horizontal distance 3
1+0.12E	Horizontal distance 3	1	Horizontal distance 3	0.5	1	Horizontal distance 3
2+0.12E	Horizontal distance 3	2	Horizontal distance 3	1.2	2	Horizontal distance 3
1+0.12E	2+0.12E	1	2	0.5	1	2
1+0.12E	2+0.12E	1	2	0.5	1	2
2+0.12E	2+0.12E	2	2	1.2	2	2
1+0.12E	Horizontal distance 3	1	Horizontal distance 3	0.5	1	Horizontal distance 3
1+0.12E	Horizontal distance 3	1	Horizontal distance 3	0.5	1	Horizontal distance 3
2+0.12E	Horizontal distance 3	2	Horizontal distance 3	1.2	2	Horizontal distance 3

Overhead electric lines, etc.
Other electric wires
High voltage

When cable is used	When using high-voltage insulated electric wire	When using hard-drawn copper wire with a diameter of not less than 5 mm or a type with a tensile strength of not less than 8.01 kN, or in the case of suspension with galvanized iron wire having a diameter of not less than 4 mm or a type with a tensile strength of not less than 3.70 kN	When using other electric wire
1+0.12E	1+0.12E	2+0.12E	2+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E as well as horizontal distance 2
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3
1	1	2	2
2	2	2	2
2	2	2	2
2	2	2	Horizontal distance 2
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3
0.5	0.5	1.2	1.2
1	1	2	2
2	2	2	2
2	2	2	2
2	2	2	Vertical distance 6 or horizontal distance 2
Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3
0.4	0.4	0.4	0.4
0.4	0.8	0.8	0.8

0.4	0.8	1.2	1.2
0.4	0.4	0.4	0.4
0.4	0.8	0.8	0.8
0.4	0.8	1.2	1.2
0.4	0.4	0.4	0.4
0.4	0.8	0.8	0.8
0.4	0.8	1.2	1.2
0.4	0.4	0.4	0.4
0.4	0.8	0.8	0.8
0.4	0.8	1.2	1.2

Overhead electric lines, etc.				
Other electric wires				
High voltage				Supports
When cable is used	When using low-voltage insulated electric wire	When using hard-drawn copper wire with a diameter of not less than 5 mm or a type with a tensile strength of not less than 8.01 kN, or in the case of suspension with galvanized iron wire having a diameter of not less than 4 mm or a type with a tensile strength of not less than 3.70 kN	When using other electric wire	
1+0.12E	1+0.12E	2+0.12E	2+0.12E	2+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E	
2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E as well as horizontal distance 2	2+0.12E
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	2+0.12E
1	1	2	2	2

2	2	2	2	
2	2	2	2	2
2	2	2	Horizontal distance 2	2
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	2
0.5	0.5	1.2	1.2	0.5
1	1	2	2	1
2	2	2	2	
2	2	2	2	2
2	2	2	2	2
Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	2
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	2
0.4	0.4	0.4	0.4	
0.4	0.8	0.8	0.8	
0.4	0.8	1.2	1.2	
0.4	0.4	0.4	0.4	0.2
0.4	0.8	0.8	0.8	0.4
0.4	0.8	1.2	1.2	0.6
0.3	0.3	0.3	0.3	
0.3	0.6	0.6	0.6	
0.3	0.6	1	1	
0.3	0.3	0.3	0.3	0.1
0.3	0.6	0.6	0.6	0.2
0.3	0.6	1	1	0.3

Transmission/distribution lines located on the roof, on the flank or on the cliff side (limited to those installed through lead-in insulator work)				
High voltage		Low voltage		
When using high-	When using other	When using high-	When using low-	When using other

voltage insulated electric wire	electric wire	voltage insulated electric wire	voltage insulated electric wire	electric wire
1+0.12E	2+0.12E	1+0.12E	1+0.12E	2+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E
2+0.12E as well as horizontal distance 2	2+0.12E as well as horizontal distance 2	2+0.12E as well as horizontal distance 2	2+0.12E as well as horizontal distance 2	2+0.12E as well as horizontal distance 2
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3
1	2	1	1	2
2	2	2	2	2
2	2	2	2	2
Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3
0.5	1.2	0.5	0.5	1.2
1	2	1	1	1.5
2	2	2	2	2
2	2	2	2	2
Vertical distance 6 or horizontal distance 2	Vertical distance 6 or horizontal distance 2	Vertical distance 6 or horizontal distance 2	Vertical distance 6 or horizontal distance 2	Vertical distance 6 or horizontal distance 2
Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2	Horizontal distance 2
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	Horizontal distance 3
0.4	0.4	0.4	0.4	0.4
0.8	0.8	0.4	0.8	0.8

0.8	1.2	0.4	0.8	1.2
0.4	0.4	0.4	0.4	0.4
0.8	0.8	0.4	0.8	0.8
0.8	1.2	0.4	0.8	1.2
0.4	0.4	0.3	0.3	0.3
0.8	0.8	0.3	0.6	0.6
0.8	1.2	0.3	0.6	1
0.4	0.4	0.3	0.3	0.3
0.8	0.8	0.3	0.6	0.6
0.8	1.2	0.3	0.6	1

Transmission/distribution lines located at bridges (limited to those installed through lead-in insulator work)				
Extra-high voltage			High voltage	Low voltage
Exceeding 60,000 volts but less than 100,000 volts	Exceeding 35,000 volts but not more than 60,000 volts	Not more than 35,000 volts		
2+0.12E	2+0.12E	2+0.12E	2+0.12E	2+0.12E
2+0.12E	2+0.12E	2+0.12E	2+0.12E as well as horizontal distance 2	2+0.12E as well as horizontal distance 2
2+0.12E	2+0.12E	2+0.12E	Horizontal distance 3	Horizontal distance 3
2+0.12E	2	2	2	2
2+0.12E	2	2	Horizontal distance 2	Horizontal distance 2

2+0.12E	2	2	Horizontal distance 3	Horizontal distance 3
2+0.12E	2	2	1.2	1.2
2+0.12E	2	2	1.2	1.2
2+0.12E	2	2	Vertical distance 6 or horizontal distance 2	Vertical distance 6 or horizontal distance 2
2+0.12E	2	2	Horizontal distance 2	Horizontal distance 2
2+0.12E	2	2	Horizontal distance 3	Horizontal distance 3
2+0.12E	2	2	0.4	0.4
2+0.12E	2	2	0.8	0.8
2+0.12E	2	2	1.2	1.2
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	0.4	0.4
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	0.8	0.8
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	1.2	1.2
2+0.12E	2	2	0.4	0.3
2+0.12E	2	2	0.8	0.6
2+0.12E	2	2	1.2	1
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	0.4	0.3
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	0.8	0.6
Horizontal distance 3	Horizontal distance 3	Horizontal distance 3	1.2	1

Structures			Roads, pedestrian bridges, railways or tracks (excluding cases where the working voltage is high or low voltage, and when protection facilities are installed)	
Building		Other structures		
In the case of presence above or on the side	In the case of presence below		In the case of presence above	In the case of presence on the side or below
0.5+0.15e	1.2+0.15e	1+0.12e	1.2+0.15e	3+0.15e or horizontal distance 2
3+0.15e as well as horizontal distance 3	3+0.15e as well as horizontal distance 3	2+0.12E	3+0.15e as well as horizontal distance 3	3+0.15e
3+0.15e as well as horizontal distance 3	3+0.15e as well as horizontal distance 3	2+0.12E	3+0.15e as well as horizontal distance 3	Horizontal distance 3
0.5+0.15e	1.2+0.15e	1	1.2+0.15e	3+0.15e or horizontal distance 2
3+0.15e as well as horizontal distance 3	3+0.15e as well as horizontal distance 3	2	3+0.15e as well as horizontal distance 3	Horizontal distance 3
3+0.15e as well as horizontal distance 3	3+0.15e as well as horizontal distance 3	2	3+0.15e as well as horizontal distance 3	Horizontal distance 3
0.5	1.2	0.5	0.5	Horizontal distance 1.2
1.5	2.5	1.5	1.5	Horizontal distance 1.5

3	3	2	3	3
Horizontal distance 3	3	2	Horizontal distance 3	3
Horizontal distance 3	3	2	Horizontal distance 3	3
0.4	1	0.4	0.4	3 or horizontal distance 1.2
0.8	2	0.8	0.8	3 or horizontal distance 1.2
1.2	2	1.2	1.2	3 or horizontal distance 2.5
0.3	1	0.3	0.3	3 or horizontal distance 1
0.6	2	0.6	0.6	3 or horizontal distance 1
1.2	2	1.2	1	3 or horizontal distance 2

Cable			Plants
In the case of presence above		In the case of presence on the side or below	
In cases where sturdy protection facilities are installed	In other cases		
1+0.12E	Horizontal distance 3	1+0.12E	*
2+0.12E		2+0.12E	

	Horizontal distance 3		
	Horizontal distance 3	2+0.12E	2+0.12E
	Horizontal distance 3	Horizontal distance 3	2+0.12E
1	Horizontal distance 3	1	*
2		2	
	Horizontal distance 3		
	Horizontal distance 3	2	2
	Horizontal distance 3	Horizontal distance 3	2
0.5	0.5	0.5	*
1		1	*
2		2	
	Horizontal distance 3		
	Horizontal distance 3	2	2
	Horizontal distance 3	Horizontal distance 3	2
	Horizontal distance 3	Horizontal distance 3	2
		0.4	
		0.8	
		1.2	
	Horizontal distance 2.5	0.4	*
	Horizontal distance 2.5	0.8	*
	Horizontal distance 2.5	1.2	0.6
		0.3	
		0.6	
		1	
	Horizontal distance 2	0.3	*
	Horizontal distance 2	0.6	*
	Horizontal distance 2	1	0.3

Remarks

1 The terms "first-class safety work," "second-class safety work" and "third-class safety work" in this table mean first-class safety work, second-class safety work and third-class safety work in conformity with remarks 1, 2 and 3 of the table 42-1-1 of Approved Model Specifications 1 related to Article 42, respectively.

2 E is a value obtained by calculation with the following expression:

E = (working voltage (volts) - 60,000)/10,000 (Figures after the decimal point are rounded up.)

3 e is a value obtained by calculation with the following expression:

e = (working voltage (volts) - 35,000)/10,000 (Figures after the decimal point are rounded up.)

*: Indicates construction designed to ordinary avoid contact as a result of wind movement, etc.

47 The separation between overhead transmission/distribution lines and plants need not conform to the provisions of 46 when installed as follows:

(1) High-voltage insulated electric wire is used as an overhead transmission/distribution line with extra-high voltage of not more than 35,000 volts, and the separation between the extra-high-voltage overhead transmission/distribution line and plants is not less than 0.5 meters.

(2) A low- or high-voltage overhead transmission/distribution line is installed using a method conforming to the provisions of (2) to (5) in Approved Model Specifications 2 related to Article 42.

48 The separation between an extra-high-voltage overhead transmission/distribution line (excluding cables) and its support, with respect to the working voltages in the left column of the table below, shall be not less than the respective numerical values listed in the right column. However, where such separation is technically not feasible, it may be reduced to 0.8 times the values listed in the right column at the time of installation to avoid the risk of danger.

Working voltage (unit: kilovolts)	Separation (unit: centimeters)
More than or equal 230	160
From 200 to less than 230	130
From 160 to less than 200	110
From 130 to less than 160	90
From 80 to less than 130	65

From 70 to less than 80	45
From 60 to less than 70	40
From 50 to less than 60	35
From 35 to less than 50	30
From 25 to less than 35	25
From 15 to less than 25	20
Less than 15	15

49 The separation between a flank transmission/distribution line and other flank transmission/distribution lines, low-current electric wires, structures or plants shall be not less than the numerical values listed in the table below. However, in cases where cable is used as a rooftop transmission/distribution line, and it is encased in a sturdy tube or trough, the same does not apply.

Unit: meters

Rooftop transmission/distribution lines \ Other rooftop transmission/distribution lines, low-current electric wire, etc. located on same rooftop transmission/ distribution lines, structures or plants			Rooftop transmission/distribution lines			
			High voltage		Low voltage	
			In the case of installation through overhead cable work	In the case of installation through lead-in insulator work	In the case of installation through overhead cable work	In the case of installation through lead-in insulator work
High Voltage	In the case of installation through overhead cable work		0.15	0.15	0.15	0.15
	In the case of installation through lead-in insulator work	When using high-voltage insulated electric wire	0.15	0.3	0.15	0.3
		When using naked wire	0.4	1.2	0.4	1.2
Low voltage	In the case of installation through overhead cable work		0.15	0.15	0.06	0.06
	In the case of installation through lead-in insulator work	・When using high-voltage insulated electric wire ・When low-voltage insulated electric wire is encased in a low-voltage guard	0.15	0.3	0.06	0.06
		When using low-voltage insulated electric wire	0.15	0.3	0.06	0.06
		When using naked wire	0.4	1.2	0.3	1

Low-current electric wire, etc.	Structures						Plants
	Building			Water pipes, etc., located on the same roof	Water pipes, etc., located on the same roof	Other structures	
	Buildings provided with rooftop transmission/ distribution lines	Other building					
		In the case of presence on the side	In the case of presence below				
0.15	0.6	0.3	0.3	0.15	0.3	0.3	※
0..3	1	0.6	1.4	0.3	0.8	0.6	※
1.2	2	1	2	1	1.2	1	0.6
	0.3	0.2	0.2		0.2	0.2	※
0.06	1	0.2	0.2	0.06	0.2	0.2	※
0.06	1	0.2	0.2	0.06	0.2	0.2	※
1	2	0.6	2	0.6	1	0.6	0.3

*: Indicates construction designed to ordinary avoid contact as a result of wind movement, etc.

50 In the case of installing a rooftop transmission/distribution line using a method in accordance with the provisions of Approved Model Specifications 2 (2) to (5)related to

Article 42, conformity with the provisions of 49 is not required.

51 The separation between a flank transmission/distribution line and other flank transmission/distribution lines, low-current electric wires, structures or plants shall be not less than the numerical values listed in the table below. However, this does not apply in the following cases:

(1) A partition wall is located between the flank transmission/distribution line and other flank transmission/distribution lines, low-current electric wires, structures or plants.

(2) A low-voltage flank transmission/distribution line encased in a synthetic-resin or porcelain tube is installed.

(3) Cable is used as a flank transmission/distribution line, and is encased in a sturdy tube or trough.

Unit: meters

Flank transmission/distribution lines \ Other flank transmission/distribution lines, low-current electric lines located on the same flank, structures or plants			Flank transmission/distribution lines: Extra-high voltage	Flank transmission/distribution lines: High voltage	Flank transmission/distribution lines: Low voltage
Extra-high voltage	In the case of installation through overhead cable work		0.15	0.15	0.15
High voltage	In the case of installation through overhead cable work		0.15	0.15	0.15
	In the case of installation through lead-in insulator work	When using extra-high-voltage insulated electric wire	0.3	0.3	0.3
		When using high-voltage insulated electric wire	0.3	0.3	0.3
Low voltage	In the case of installation through overhead cable work		0.15	0.15	0.06
	In the case of installation through lead-in insulator work	When using high-voltage insulated electric wire	0.3	0.3	0.06
		When using low-voltage insulated electric wire	0.3	0.3	0.06

Low-current electric wire, etc.	Structures: Building: Buildings provided with flank transmission/ distribution lines	Structures: Building: Other building: In the case of presence on the side	Structures: Building: Other building: In the case of presence below	Structures: Water pipes, gas pipes etc., located on the same roof	Structures: Antennas located on The same roof	Structures: Other structures	Plants
0.15	※	0.3	0.3	0.15	0.3	0.3	※
0.15	※	0.3	0.3	0.15	0.3	0.3	※
0.3	0.3	0.6	0.6	0.3	0.6	0.6	※
0.3	0.3	0.6	1.4	0.3	0.8	0.6	※
※	※	0.2	0.2	※	0.2	0.2	※
0.06	0.045	0.2	0.2	0.06	0.2	0.2	※
0.06	0.045	0.4	1.4	0.06	0.6	0.4	※

*: Indicates construction designed to ordinary avoid contact as a result of wind movement, etc.

52 In the case of installing a flank transmission/distribution line using a method in accordance with the provisions of Approved Model Specifications 2 (2) to (5) related to Article 42, conformity with the provisions of 51 is not required.

53 The separation in cases where an above-ground transmission/distribution line (limited to 100 kV; the same shall apply below) or an underground transmission/distribution line comes close to or crosses other above-ground transmission/distribution lines, other underground transmission/distribution lines, low-current electric wires, water pipes or pipes containing flammable or poisonous liquids (hereafter referred to as "gas pipes") shall be not less than the numerical values listed in the table below. However, this does not apply in the following cases:

(1) A sturdy, fire-resistant partition wall is located between the above-ground transmission/distribution line or underground transmission/distribution line and other electric wires, water pipes or gas pipes.

(2) In cases where an above-ground transmission/distribution line or an underground transmission/distribution line comes close to or crosses low-current electric wires or gas pipes located on or in the ground, it is encased in a sturdy tube or trough with non-inflammability or self-extinguishing incombustibility properties at the time of installation, and this tube or trough shall not come into direct contact with the low-current electric wires, etc., or gas pipes located on or in the ground.

(3) In cases where an above-ground transmission/distribution line or an underground transmission/distribution line comes close to or crosses low-current electric wires, these low-current electric wires, etc., are optical fiber cable sheathed with materials having non-inflammability or self-extinguishing incombustibility properties, or are optical fiber cable encased in a tube or trough with the same properties.

Unit: meters

Other electric wires, water pipes or gas pipes / Above-ground transmission/ distribution lines or underground transmission/ distribution lines	Above-ground transmission/ distribution lines or underground transmission/ distribution lines		Low-current electric wires located on or in the ground		Water pipes located in the ground	Gas pipes located in the ground
	High voltage	Low voltage	General cases	Cases with a voltage of less than 170 kV and the consent of the party in charge of the low-current electric wires, etc.		
Extra-high voltage	0.3	0.3	0.6	0.1	0.3	1
High voltage		0.15	0.3	0.1		
Low voltage	0.15		0.3	0.1		

(4) In cases where an above-ground transmission/distribution line or an underground transmission/distribution line comes close to or crosses low-current electric wires located on or in the ground, this line is a type with low voltage and the low-current electric wire, etc., has flame-resistance characteristics in conformity with the provisions of 2 (2) of Approved Model Specifications 9 related to Article 41.

(5) In cases where an above-ground transmission/distribution line or an underground transmission/distribution line comes close to or crosses low-current electric wires located on or in the ground, the high-voltage or extra-high-voltage above-ground transmission/distribution line or underground transmission/distribution line and the low-current electric wire, etc., located on or in the ground (having flame-resistance characteristics in conformity with the provisions of 2 (2) of Approved Model Specifications 9 related to Article 41) are installed so as not to be brought into direct contact.

(6) In cases where an above-ground transmission/distribution line or an underground transmission/distribution line comes close to or crosses a water pipe located on or in the ground, when this line is encased in a tube or trough with non-inflammability or self-extinguishing incombustibility properties.

(7) In cases where an above-ground transmission/distribution line or an underground transmission/distribution line comes close to or crosses other above-ground transmission/distribution lines or underground transmission/distribution lines, when the

followings are applied to any of both wires:

[1] The line has a sheath with self-extinguishing incombustibility properties.

[2] The line is encased in a sturdy tube or trough with self-extinguishing incombustibility properties

(8) In cases where an above-ground transmission/distribution line or an underground transmission/distribution line comes close to or crosses other above-ground transmission/distribution lines or underground transmission/distribution lines, when any of these has a sheath with non-inflammability properties.

(9) In cases where an above-ground transmission/distribution line or an underground transmission/distribution line comes close to or crosses other above-ground transmission/distribution lines or underground transmission/distribution lines, when any of these is encased in a sturdy tube or trough with non-inflammability properties.

53.2 The provisions of 5 in Approved Model Specifications 9 related to Article 41 shall apply mutatis mutandis to the non-inflammability and self-extinguishing incombustibility properties stipulated in 53.

54 The separation between cliff-side transmission/distribution lines and other cliff-side transmission/distribution lines, low-current electric wires, structures, etc., shall be not less than the numerical values listed in the table below. However, this does not apply in the following cases:

(1) A partition wall is located between the cliff-side transmission/distribution line and other cliff-side transmission/distribution lines, low-current electric wires, structures, etc.

(2) A low-voltage cliff-side transmission/distribution line encased in a synthetic resin or porcelain tube is installed.

(3) A cable encased in a sturdy tube or trough is used as the cliff-side transmission/distribution line.

Unit: meters

Other cliff-side transmission/distribution lines, low-current electric wires located on cliff sides, structures / Cliff-side transmission/distribution lines			Cliff-side transmission/distribution		Low-current electric wire, etc.	Structures					Plants
			High voltage	Low voltage		Buildings		Water pipes etc., located on the cliff side	Other structures	On a cliff side provided with cliff-side transmission/ distribution lines	
						In the case of presence on the side	In the case of presence below				
High voltage	In the case of installation through overhead cable work		0.15	0.15	0.15	0.3	0.3	0.15	0.3	0.3	Construction designed to avoid contact as a result of usual wind movement, etc.
	In the case of installation through lead-in insulator work	When using extra-high-voltage insulated electric wires	0.3	0.3	0.3	0.6	0.6	0.3	0.6	0.6	
		When using high-voltage insulated electric wire	0.3	0.3	0.3	0.6	1.4	0.3	0.8	0.6	
Low voltage	In the case of installation through overhead cable work		0.15	0.06		0.2	0.2		0.2	0.3	
	In the case of installation through lead-in insulator work	When using high-voltage insulated electric wire	0.3	0.06	0.06	0.2	0.2	0.06	0.2	0.06	
		When using low-voltage insulated electric wire	0.3	0.06	0.06	0.4	1.4	0.06	0.4	0.06	

55 In the case of installing a cliff-side transmission/distribution line using a method in accordance with the provisions of Approved Model Specifications 2 (2) to (5) related to Article 42, conformity with the provisions of 54 is not required.

56 The separation between transmission/distribution lines to be located at bridges (limited to those constructed through lead-in insulator work) and other transmission/distribution lines to be located at bridges (limited to those constructed through lead-in insulator work) or bridge girders shall be not less than the numerical values listed in the following table:

Unit: meters

Transmission/distribution lines to be located at bridges (limited to those constructed through lead-in insulator work) \ Other transmission/distribution lines to be located at bridges (limited to those constructed through lead-in insulator work) or bridge girders	Transmission/distribution lines to be located at bridges		Bridge girders
	High voltage	Low voltage	
Extra-high voltage more than or equal 70,000 volts	2	2	0.8
Extra-high voltage from 60,000 to less than 70,000 volts	2	2	0.7
Extra-high voltage from 50,000 to less than 60,000 volts	2	2	0.6
Extra-high voltage from 35,000 to less than 50,000 volts	2	2	0.5
Extra-high voltage from 25,000 to less than 35,000 volts	1.2	1.2	0.4
Extra-high voltage less than 25,000 volts	1.2	1.2	0.3
High voltage	0.3	0.3	0.2
Low voltage	0.3	0.3	0.1

57 The separation between transmission/distribution lines (limited to those constructed through lead-in insulator work) to be located in tunnels, etc., and other transmission/distribution lines (limited to those constructed through lead-in insulator work), low-current electric wires, water pipes, etc., to be located in tunnels, etc., shall be not less than the numerical values listed in the table below. However, in cases where an insulating partition wall is provided between low-voltage transmission/distribution lines located in tunnels, etc., and other low-voltage transmission/distribution lines located in tunnels, etc., the same does not apply.

Unit: meters

Other transmission/distribution lines located in tunnels, etc. (limited to those constructed through lead-in insulator work), low-current electric wires, water pipes, etc. / Transmission/distribution lines Located in tunnels, etc. (limited to those constructed through lead-in insulator work)	Transmission/distribution lines located in tunnels, etc.		Low-current electric wires located in tunnels, etc.	Water pipes, etc., located in tunnels, etc.
	High voltage	Low voltage		
High voltage	0.15	0.15	0.15	0.15
Low voltage	0.15	0.06	0.1	0.1

58 The separation in cases where transmission/distribution lines (limited to those constructed through cable work, referred to as "transmission/distribution lines" in 58) to be located in long tunnels, etc., come close to or cross other transmission/distribution lines, low-current electric wires or water pipes, shall be not less than the numerical values listed in the table below. However, this does not apply in the following cases:

(1) A sturdy fire-resistant partition wall is provided between the transmission/distribution line and other transmission/distribution lines, low-current electric wires and water pipes.

(2) In cases where a transmission/distribution line comes close to or crosses a low-current electric wire, etc., this transmission/distribution line is encased in a sturdy tube or trough with non-inflammability or self-extinguishing incombustibility properties to avoid direct contact with the low-current electric wire, etc.

(3) In cases where a transmission/distribution line comes close to or crosses a low-current electric wire, etc., this low-current electric wire, etc., is an optical fiber cable sheathed with materials having non-inflammability or self-extinguishing incombustibility properties or is an optical fiber cable encased in a tube or trough with non-inflammability or self-extinguishing incombustibility properties.

(4) In cases where a transmission/distribution line comes close to or crosses a low-current electric wire, etc., this transmission/distribution line is a type with low voltage, and the low-current electric wire, etc., is a type with fire-resistant properties in accordance with the provisions of 2 (2) of Approved Model Specifications 9 related to Article 41.

(5) In cases where a transmission/distribution line comes close to or crosses a low-current electric wire, etc., a high-voltage or extra-high-voltage transmission/distribution line and a low-current electric wire, etc., with fire-resistant properties in accordance with the provisions of 2 (2) of Approved Model Specifications 9 related to Article 41 are installed

so as not to be brought into direct contact.

(6) In cases where a transmission/distribution line comes close to or crosses a water pipe, this line is encased in a sturdy tube or trough with non-inflammability or self-extinguishing incombustibility properties.

(7) In cases where a transmission/distribution line comes close to or crosses other transmission/distribution lines, any of the following apply to each one:

[1] A sheath with self-extinguishing incombustibility properties is used.

[2] The line is encased in a sturdy tube or trough with self-extinguishing incombustibility properties.

(8) In cases where a transmission/distribution line comes close to or crosses another transmission/distribution line, either one of these lines has a sheath with non-inflammability properties.

(9) In cases where a transmission/distribution line comes close to or crosses another transmission/distribution line, either one of these lines is encased in a sturdy tube or trough with non-inflammability properties.

Other electric lines, water pipes / Transmission/ distribution lines	Transmission/distribution lines located in tunnels, etc.			Low-current electric wires located in tunnels, etc.		Water pipes located in tunnels, etc.
	Extra-high voltage	High voltage	Low voltage	General cases	Cases with a voltage of less than 170 kV and the consent of the party in charge of the low-current electric wires, etc.	
Extra-high voltage		0.15	0.15	0.15	0.1	0.15
High voltage	0.15		0.15	0.15	0.1	0.15
Low voltage	0.15	0.15		No contact	No contact	No contact

59 The provisions of 5 of Approved Model Specifications 9 related to Article 41 shall apply mutatis mutandis to the non-inflammability and self-extinguishing incombustibility properties stipulated in 58.

[Notice concerning the timing of application] (MLIT Report No. 125, 2004)

The provisions of items 17 (3), 24 (3), 53, 53.2, 58 and 59 in the Approved Model Specifications related to Article 46 shall apply from December 27, 2004 (with provisos).

[Ministerial Ordinance]

(Measures to Prevent Lightening Damages, etc.)

Article 47 Protective measures and equipment against lightening damages shall be installed to those vulnerable locations deemed necessary from the security standpoint, such as at contact line and feeder line together with their accessories, as well as overhead transmission and distribution lines. This rule does not apply, however, to the area that are less susceptible of lightning damages.

2. Electric lines connected by transformers to accommodate different voltages shall be installed appropriately to protect themselves and their equipment from electric mixture and be free from electrocution and fire.

[Approved Model Specifications]

VI-7 Article 47 (Measures to Prevent Lightening Damages, etc.)

1 Lightning guards such as lightning arrestors shall be located at the points outlined below in relation to contact lines, feeder lines, transmission/distribution line or points proximate to them. However, in cases where lightning problems are less likely to occur, the same does not apply.

(1) For DC contact lines or feeder lines, in each electrical division of overhead contact lines

(2) On the primary side of autotransformers in autotransformer feeding systems

(3) On the primary and secondary sides of booster transformers in booster transformer feeding systems

(4) On power-receiving terminals and power-transmitting terminals of overhead transmission/distribution lines of substations and switching stations, and on feeding terminals of overhead feeders

2 Lightning guards such as lighting arrestors shall be fitted on contact lines of cable railways. However, at points where lighting problems are less likely to occur, the same does not apply.

3 At high-voltage electric lines to be connected to extra-high-voltage electric lines using a transformer (excluding feeding transformers and signal transformers with a grounded metal plate preventing cross-fault and electrical snow-melter transformers; the same shall apply in 3 and 4), a discharger or lightning arrestor shall be fitted to discharge at a voltage not more than three times the working voltage at one electrode close to the terminal of the transformer.

4 The neutral point on the low-voltage side of a transformer providing a connection between an extra-high-voltage or high-voltage electric line and a low-voltage electric line shall be grounded. However, in cases of low voltage not exceeding 300 volts, if it is difficult to ground a neutral point of the transformer, one terminal on the low-voltage side of the transformer may be grounded.

[Ministerial Ordinance]

(Prevention of Induction Damage)

Article 48 When contact line, feeder line, transmission line and distribution line ("contact line, etc." in Article 51-2(1)) are installed, distance among each other shall be increased, or protective devices shall be installed in order to seclude the influence of inductive interference from them.

Section 2 Substation and Other Facilities

[Ministerial Ordinance]

(Equipment at Substations, etc.)

Article 49 Substation, distributing station and switching station (hereinafter referred to as "substation, etc.") shall be constructed in the manner to exclude unauthorized persons.

2. Substations, etc. shall be equipped with appropriate devices and fire extinguishers to protect equipment, contact lines and other facilities at a time of emergency. It is not necessary, however, to install any fire extinguisher at those substations, etc. where there is no risk for fire.
3. The capacity for transformers to be used for train operation shall be sufficient to withstand the anticipated load.
4. Monitored substations (meaning automated, remotely controlled and monitored substations, and portable substations without stationary operators) and switching stations shall be provided with a control post with the surveillance and control equipment, and shall be able to deal with any accident, disaster and failure.

[Approved Model Specifications]

VI-8 Related to Article 49 (Equipment at Substations, etc.)

1 Substations, etc., shall be provided with fences, walls or the like designed to prevent unauthorized people, i.e., parties excluding the operator, from entering the site, and shall be provided with a sign at the entrance prohibiting access. However, at substations, etc., where it is difficult for unauthorized people to enter for reasons of geographical situation, this does not apply.

2 Substations, etc., shall be provided with the safety devices listed below according to the construction conditions.

(1) At substations and distribution stations, automatic circuit breakers protecting transformers on extra-high-voltage or high-voltage AC-side electric lines shall be fitted.

(2) At substations and switching stations, automatic circuit breakers on the feed side with respect to fault current on feeder lines (at switching stations, excepting breakers of the switching station to be protected using an automatic circuit breaker of a substation) shall be fitted.

(3) At substations and distribution stations, protection devices with respect to overload shall be fitted.

(4) At substations, protection devices with respect to power source errors shall be fitted.

(5) At DC substations, the protection devices listed below shall be fitted with respect to semi-conductor rectifiers for feeding.

[1] Protection devices with respect to increased temperatures in device bodies

[2] Protection devices with respect to cooler faults

[3] Protection devices with respect to abnormal voltage

(6) At substations equipped with power converters, the following protection devices shall be fitted with respect to semiconductor power converters for feeding.

1) Protection devices with respect to the temperature increase in the device bodies

2) Protection devices with respect to the failures in the cooling equipment

3) Protection devices with respect to abnormal voltages

(7) At substations, protection devices with respect to increased temperatures in receiving transformers and feeding transformers (excluding those with a capacity of not more than 3,000 kVA and those other than separately cooled types) shall be fitted.

3 Automatic circuit breakers to be located on the feed side in accordance with the provisions of 2 (2) shall be high-speed types that can select between operation electric current and fault electric current or types with similar performance. However, for railways with load situations in which fault electric current can be cut out without error, this does not apply.

4 Monitored substations and switching stations (hereafter referred to as "monitored substations, etc.") shall conform to the following standards:

(1) A control room with monitoring staff permanently stationed shall be provided.

(2) Such rooms shall be located in a position that is easily reachable by the relevant staff once an alarm has been received.

(3) The building shall have a fire-resistant or fireproof structure.

(4) The monitored substation, etc., shall also be manually operated and stopped in operation.

(5) Transformer stations excluding the fully outdoor type shall be provided with an automatic circuit breaker on the receiving side to automatically break electric circuits in the event of a fire, or a device that sounds an alarm to the control room.

5 The control room stipulated in 4 (1) shall be provided with the following:

(1) Facilities to display whether the monitored substation, etc., is in operation or not

(2) Facilities to sound an alarm if an automatic circuit breaker in the main circuit of a monitored substation, etc., is automatically activated

(3) For control rooms not provided with a device that can display the cause of the alarm in (2), facilities preventing the closure of the electric circuit for the automatic circuit breaker in the control room where the alarm in (2) is sounded

(4) Facilities that can stop the operation of monitored substations, etc.

(5) Facilities preventing control from the control room during manual operation of monitored substations, etc.

(6) Facilities for monitoring monitored substations, etc., and for sounding an alarm in the event of a control device fault or detecting such faults

Section 3 Electrical Equipment and Other Facilities

[Ministerial Ordinance]

(Electrical Equipment, Power Distribution Board and Others)

Article 50 Electric equipment, power distribution board and other relevant equipment ("(Installation of Electrical Equipment, Power Distribution Board and Others" in Article 51-2(1)) shall be installed to be free from the risk of electric shock and fire.

[Approved Model Specifications]

VI-9 Related to Article 50 (Electrical Equipment, Power Distribution Board and Others)

1 In the case of installing an autotransformer for an autotransformer feeding system (excluding those located at substations) close to houses, a partition wall or fire-extinguishing equipment shall be provided.

2 Oil-filled devices at substations, etc., shall be provided with partition walls to prevent the spread of fire, or shall be sufficiently separated from other devices.

3 For switches and distribution cubicles where the charged portion is exposed, and electrical devices provided outdoors shall be located so that unauthorized people cannot easily touch the charged portion.

4 Switches, automatic circuit breakers, lightning arrestors and similar electrical devices used at voltages exceeding 600 volts and not more than 7,000 volts, which generate arcing in operation, shall be situated not less than 1 meter away from combustible materials, and those used at voltages exceeding 7,000 volts shall be not less than 2 meters away (those used at voltages of not more than 35,000 volts, in cases where the direction and length of arcing in operation is restricted to avoid the risk of fire, shall be not less than 1 meter away). In cases, however, where both are separated using fire-resistant materials, this does not apply.

5 Regarding power storage devices (excluding flywheels) connected to a primary side circuit breaker for feeding at a DC substation or a bus at a DC switchgear location, a device that automatically breaks the electric circuit from the primary side circuit or the bus shall be installed in the cases listed below.

(1) In cases where an overcurrent occurred with the power storage device

(2) In cases where an overvoltage occurred with the power storage device

(3) In cases where an overcharge or overdischarge occurred with the power storage device (excluding those that manage charge or discharge using a control device)

(4) In cases where an abnormality occurred with the control device of the power storage device

(5) In cases where the temperature of the power storage device increased significantly

(6) In cases where an abnormality was detected with other transformer equipment, etc., and feeding stopped (excluding DC switchgear locations)

6 Regarding power storage devices (excluding flywheels) that connect to DC feeders, rigid electric train wires or a third rail (called a "feeder, etc." in 6 and 7), a device that automatically breaks the electric circuit from the feeder, etc., shall be installed in the cases listed below.

(1) In cases where an overcurrent occurred with the power storage device

(2) In cases where an overvoltage occurred with the power storage device

(3) In cases where an overcharge or overdischarge occurred with the power storage device (excluding those that manage charge or discharge using a control device)

(4) In cases where an abnormality occurred with the control device of the power storage device

(5) In cases where the temperature of the power storage device increased significantly

(6) In cases where an abnormality occurs with the feeder circuit such as the feeder stopping due to interlinked breaking at a nearby substation

7 Regarding flywheels that connect to feeders, etc., a device that automatically breaks the electric circuit from the feeder, etc., shall be installed in the cases listed below.

(1) In cases where an abnormality occurred with the flywheel control device

(2) In cases where an abnormality occurred with a device that allows the flywheel to rotate

(3) In cases where the rotation number of the flywheel increased significantly

(4) In cases where an abnormality occurs with the feeder circuit such as the feeder stopping due to interlinked breaking at a nearby substation

[Ministerial Ordinance]

(Lead and Distribution Line, etc.)

Article 51 Lead line (excluding the line to be installed outside the exclusive right of way) and distributing line shall be installed in the manner to be free from electric shock and fire, impediment to other traffic and damage to other structures, depending upon the location and type of installation, and the voltage.

2. Appropriate devices shall be installed to the critical locations from the safety and security need, to protect the electric line and equipment from grounding or short circuit faults.

3. Overhead ground wires to be installed to the contact line as protection for lightning or for other purposes shall have the strength to withstand the anticipated maximum wind load and the tensile strength of the electric line.

[Approved Model Specifications]

VI-10 Related to Article 51 (Lead and Distribution Line, etc.)

1 Lead line (hereafter referred to as "lead line," excluding those located in places other than dedicated sites; this shall apply below), except for those where cable is used, with respect to the working voltages listed in the left column of the table below, shall employ the respective electric wires listed in the right column.

Working Voltage	Electric wire
High-voltage	High-voltage insulated electric wire of hard-drawn copper with a diameter of not less than 5 millimeters, or high-voltage insulated electric wire with a tensile strength of not less than 8.01 kN
Low-voltage	Low-voltage insulated electric wire of hard-drawn copper with a

	diameter of not less than 2.6 millimeters, or low-voltage insulated electric wire with a tensile strength of not less than 2.30 kN (low-voltage insulated electric wire of hard-drawn copper with a diameter of not less than 2 millimeters, or low-voltage insulated electric wire with a tensile strength of not less than 1.38 kN in cases where the distance between support points is not more than 15 meters)

2 The provisions of Approved Model Specifications 37 and 38 related to Article 46 shall apply mutatis mutandis to the height of lead line. However, this height may be reduced to each specified numerical value in the following cases:

(1) In the case of low-voltage lead line (excluding level crossings), the height shall be 5 meters (in cases where this is not feasible due to the conditions of installation, and where there is no obstruction to traffic, a value of 3 meters may be used).

(2) In the case of installation to avoid injury to people at dedicated sites where unauthorized parties cannot easily enter:

[1] High-voltage lead line: 3.5 meters

[2] Low-voltage lead line: 2.5 meters

3 The provisions of Approved Model Specifications 46, 47 and 48 related to Article 46 shall apply mutatis mutandis to the separation of lead line. However, where these provisions are not feasible due to the conditions of installation, and where low-voltage lead line adopts cable or low-voltage insulated electric wire (outdoor vinyl-insulated electric wire is limited to the case of installation so that there is no risk of touching by unauthorized people), this does not apply to separation between low-voltage lead line and the side and lower portions of buildings.

4 The separation between low-voltage lead line and the upper portions of a building, in cases where it not feasible to observe these stipulations due to the conditions of installation, and when installation is performed so that there is no risk of touching by unauthorized people, notwithstanding the provisions of 3, may be reduced to the numerical values outlined below.

(1) 1 meter in the case of using low-voltage insulated electric wire (excluding outdoor vinyl-insulated electric wire) as a lead line

(2) 0.5 meters in the case of using cable or high-voltage insulated electric wire as a lead line

5 The provisions of Approved Model Specifications 8 and 9 related to Article 46 shall apply mutatis mutandis to cases where cable is used (excluding cases in which the length is less than 1 meter) as a lead line.

6 The provisions of Approved Model Specifications 10 to 13 and 49 and 50 related to Article 46 shall apply mutatis mutandis to cases where industrial tracks are located on a roof, and the provisions of Approved Model Specifications 14, 51 and 52 related to Article 46 shall apply mutatis mutandis to cases where industrial tracks are located on flanks.

7 Autotransformers in autotransformer feeding systems (excluding those located at substations) in cases where the capacity exceeds 2,000 kVA shall be provided with switchgear. In such cases, excluding when an autotransformer is located in a position that is easily reachable, it should be possible to implement control from a substation or a control room.

8 Where necessary for safety on electric lines, protection devices such as circuit breakers or fuses that can cut out fault electric currents shall be provided for the purpose of protecting electric lines and electrical devices from ground fault, short-circuit fault, etc..

9 Overhead ground wires to be installed on overhead transmission/distribution lines for use as lightning arrestors or for other purposes shall employ naked hard-drawn copper wire with a diameter of not less than 5 millimeters or naked wire with a tensile strength of not less than 8.01 kN for extra-high-voltage overhead transmission/distribution lines, and naked hard-drawn copper wire with a diameter of not less than 4 millimeters or a type with a tensile strength of not less than 5.27 kN for high-voltage overhead transmission/distribution lines.

10 The provisions of Approved Model Specifications 9 related to Article 46 shall apply mutatis mutandis to overhead ground wires.

Section 4 Miscellaneous Provision (Article 51-2 to Article 53)

[Ministerial Ordinance]

(Preventing the influence of electromagnetic induction on human health)

Article 51-2 In the case of installing equipment such as contact lines, and return lines and electrical equipment, power distribution board and others (excluding generators) at locations other than substations, etc., in normal use conditions, installation must be performed in such a way that there is no risk of impact on human health due to electromagnetic induction by the magnetic field of the commercial-use frequency generated from the relevant equipment in the area near the relevant equipment. However, this shall not apply in cases where installation is performed in such a way that there is no danger of harm to the human body at locations with little human traffic including agricultural fields and forests.

2 Substations, etc., must be installed such that, in normal use conditions, there is no risk of impact on human health due to electromagnetic induction by the magnetic field of the commercial-use frequency generated from the relevant substation, etc., in the area near each

relevant substation, etc. However, this shall not apply in cases where installation is performed in such a way that there is no danger of harm to the human body at locations with little human traffic including agricultural fields and forests.

[Approved Model Specifications]

VI-10-2 Article 51-2 (Prevention of influence on human health by electromagnetic induction effect) Relationship

1 Equipment facility located at a location other than the substation or the like at a facility such as a train line and return line and electrical equipment (excluding a generator, the same in 1 and 3), substations and the like, Facilities should be installed so that the measured value (effective value) of the magnetic flux density obtained by the measurement method listed in the item is 200 μ T or less at the commercial frequency.

Provided, however, that this shall not apply in cases where there is no possibility of affecting human health or where facilities such as fields, forests and other people are less likely to cause harm to the human body.

2 Measuring device shall be of three axes conforming to the Japanese Industrial Standards JIS C 1910 (2004) "Measurement of low frequency magnetic field and electric field considering human body exposure - Measuring instrument special requirements and measurement manual".

3 Measurement shall be made under normal use conditions according to any of the following items. The application example of the measurement method for each example of the measurement place is shown in the following table.

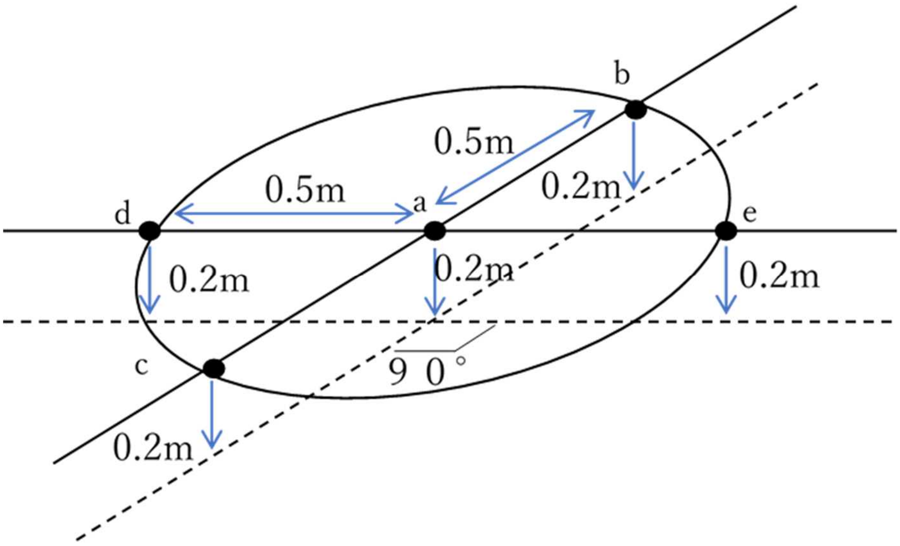
However, if it can not be measured under normal use conditions, the value obtained by calculation or the like can be used as the measured value.

1) When one magnetic field is considered to be uniform, the measured value at the height of 1 m from the ground surface, road surface or floor (hereinafter referred to as "ground surface, etc.") at the measurement point shall be taken as the measured value.

2) In the case where the two magnetic fields are considered to be nonuniform (excluding the case of item 3), measurements are made at the height of 0.5 m, 1 m, and 1.5 m from the surface of the measurement point etc., and the average value of the three points Shall be measured values. However, if the height of a facility installed in a place other than a substation or the like in equipment such as electrical equipment is less than 1.5 m, measure it at 1/3, 2/3, and 1 times the height, The average value of 3 points should be measured value.

3) Magnetic fields are considered to be uneven, and facilities that are installed at places other

than substations etc. in facilities such as electric train lines and return lines and electrical equipment, and substations etc. are located under the ground surface etc., When a person lies on the surface of the earth or the like, as shown in the following figure, measure it at the point A where the height of the magnetic flux density is 0.2 m from the ground surface etc. of the measurement point and the maximum value of the magnetic flux density, Measure it at the point b where the magnetic flux density becomes the maximum value on the circumference with a radius of 0.5 m as the center and measure at the point c symmetrical to the point b with respect to the point a and then measure the point a, b And the straight line passing through the point a intersects with the circle and further measures the average of the three highest values among the measured values at these five points The value should be measured value.



<table>
<tr><td colspan="3">Measurement location</td><td>Measuring method</td></tr>
<tr><td rowspan="2">Train lines etc. and retrace</td><td rowspan="2">(1) Overhead lines and the like and ground surface under the return line</td><td>Along wayside etc.</td><td>At a point 0.2 m in the horizontal direction from the point where a person can approach (in the case where it can not be measured at a point of 0.2 m, at a point where the person can approach most, at a point more than 0.2 m away) Measure according to paragraph 3 item 1 or item 2.</td></tr>
<tr><td>Railroad crossing road</td><td>Measure at the center of the orbit by the third item item 1.</td></tr>
</table>

	etc.	platform	At the point 0.3 m horizontally from the edge of the platform (provided, however, that it can not be measured at a point of 0.3 m, where the person can approach most, at a point 0.3 m or more away from the platform), item 3, item 2 Measure with.
	(2) Buildings etc. around overhead lines and return lines, etc.	General buildings etc.	At the point 0.2 m in the horizontal direction from the point where a person can approach, such as the wall of a building (However, if it can not be measured at the point of 0.2 m, it is 0.2 m Measured according to item (i) or (ii) of paragraph (3) at a point distant from the point of departure.
		overpass	Measure at the orbit center or the point where the strength of the magnetic field becomes maximum according to item 3 of item 3.
	(3) Around the area where underground train lines, etc. and return lines and other electric lines are located on the ground along the workpiece		At a point 0.2 m in the horizontal direction from the point where a person can approach (in the case where it can not be measured at a point of 0.2 m, at a point where the person can approach most, at a point more than 0.2 m away) Measure according to paragraph 3 item 1 or item 2.
	(4) Dwelling etc. on the directly above floor of a room that features train lines and return lines		Measure according to item 3 of paragraph 3.
Electrical equipment etc. Facilities (those	(1) Earthquake etc. below the facility such as electrical equipment installed on the pillar		At a point 0.2 m in the horizontal direction from the point where a person can approach (in the case where it can not be measured at a point of 0.2 m, at a point where the person can approach most, at a point more than 0.2 m away) Measure according to paragraph 3 item 1 or item 2.
	(2) Buildings surrounding facilities such as electrical equipment to be installed on pillars		At the point 0.2 m in the horizontal direction from the point where a person can approach, such as the wall of a building (However, if it can not be measured at the point of 0.2 m, it is 0.2 m Measured according to item (i) or (ii) of paragraph (3) at a point distant from the point of departure.

	(3) Around the facility such as electric equipments on the ground	A point at a distance of 0.2 m in the horizontal direction from the point where a person can approach (such as the surface of a facility such as electrical equipment or the like) (However, if it can not be measured at a point of 0.2 m, Measured according to item (i) or (ii) of paragraph 3 at a point more than 2 m away).
	(4) Dwellings etc. on the upper floor of the room where facilities such as electrical equipment are installed	Measure according to item 3 of paragraph 3.
Substation etc.	(1) Around substations etc. that are located on the ground	A facility such as a substation should be installed so that people do not enter it, a point 0.2 m horizontally away from a fence etc. (However, if it can not be measured at a point of 0.2 m, Measured according to item (i) or (ii) of paragraph 3 at a point more than 2 m away).
	(2) Dwellings and other existing on substations etc. that are located in the basement	Measure according to item 3 of paragraph 3.

Section 4 Miscellaneous Provision

[Ministerial Ordinance]

(Insulation of Electric Route, etc.)

Article 52 Insulating performance of the electric line and equipment shall be able to withstand the danger from the insulation damage, taking the abnormal voltage at the time of fault into consideration.

[Approved Model Specifications]

VI-11 Related to Article 52 (Insulation of Electric Line, etc.)

1 Electric lines and electrical devices shall be tested using the methods listed in the table below, and shall demonstrate a satisfactory level of resistance. However, where extra-high-voltage or high-voltage transmission/distribution lines and AC feeder lines using cable with dielectric strength between the core wires and the ground (in multi-core cable, between the core wires and between core wires and the ground) at the DC voltages listed below are tested, and demonstrate a satisfactory level of resistance continuously for 10 minutes, this does not apply.

(1) For neutral point-grounded systems of extra-high voltage in which the maximum working voltage exceeds 60,000 volts, a value 2.2 times the maximum working voltage (in cases where the voltage is less than 150,000 volts, 150,000 volts).

(2) In cases where the maximum working voltage is extra-high, and cases excluding those in (1), a value 2.5 times the maximum working voltage (in cases where the voltage is less than 21,000 volts, 21,000 volts).

(3) In cases where the maximum working voltage is high, a value 3 times the maximum working voltage.

Electric line and electrical device type	Test method
Single-phase AC contact lines and feeder lines (excluding negative feeder lines)	An AC voltage 1.25 times the maximum working voltage is continuously applied for ten minutes between an electric wire and the ground (in the case of cables, between the core wires and between the core wires and the ground).
Low-voltage three-phase AC contact lines and feeder lines	A voltage 1.5 times the maximum working voltage is continuously applied for ten minutes between an electric wire and the ground (in the case of cables, between the core wires and

		between the core wires and the ground).
DC feeder lines		A voltage 1.5 times the maximum working voltage is continuously applied for ten minutes between an electric wire and the ground (in the case of cables, between the core wires and between the core wires and the ground).
Transmission lines, distribution lines and industrial tracks	Types exceeding 60,000 volts	An AC voltage 1.1 times the maximum working voltage for neutral-point-grounded electric lines (75,000 volts in cases where this voltage is less than 75,000 volts) and an AC voltage 1.25 times the maximum working voltage for neutral-point non-grounded electric lines are continuously applied for ten minutes between an electric wire and the ground (in the case of multi-core cables, between the core wires and between the core wires and the ground).
	Types exceeding 7,000 volts and not more than 60,000 volts	An AC voltage 1.25 times the maximum working voltage (in cases where this voltage is less than 10,500 volts, 10,500 volts) is continuously applied for ten minutes between an electric wire and the ground (in the case of multi-core cables, between the core wires and between the core wires and the ground).
	Types exceeding 600 volts and not more than 7,000 volts	An AC voltage 1.5 times the maximum working voltage is continuously applied for ten minutes between an electric wire and the ground (in the case of multi-core cables, between the core wires and between the core wires and the ground).

Bus lines or other electrical devices	Types exceeding 60,000 volts	An AC voltage 1.1 times the maximum working voltage for neutral-point-grounded electric lines (75,000 volts in cases where this voltage is less than 75,000 volts) and an AC voltage 1.25 times the maximum working voltage for neutral-point non-grounded electric lines are continuously applied for ten minutes between the voltage-applied portion and the ground.
	Types exceeding 7,000 volts and not more than 60,000 volts	An AC voltage 1.25 times the maximum working voltage (in cases where this voltage is less than 10,500 volts, 10,500 volts) is continuously applied for ten minutes between the voltage-applied portion and the ground.
	Types not exceeding 7,000 volts	An AC voltage 1.5 times the maximum working voltage (when electrical devices are tested, and in cases where this voltage is less than 500 volts, 500 volts) is continuously applied for ten minutes between the voltage-applied portion and the ground. However, bus lines of less than 600 volts are excluded.
Electric rotating machines (excluding electric rotary converters)	Types exceeding 7,000 volts	An AC voltage 1.25 times the maximum working voltage (in cases where this voltage is less than 10,500 volts, 10,500 volts) is continuously applied for ten minutes between the windings and the ground.
	Types not exceeding 7,000 volts	An AC voltage 1.5 times the maximum working voltage (in cases where this voltage is less than 500 volts, 500 volts) is continuously applied for ten minutes between the windings and the ground.
	In cases where the above tests are conducted at DC voltages, values 1.6 times the above voltage figures are continuously applied for ten minutes between the windings and the ground.	

Rectifiers		An AC voltage of 100% of the maximum working voltage on the DC side (in cases where this voltage is less than 500 volts, 500 volts) is continuously applied for ten minutes between the voltage-applied portion and the outer casing.
Transformers	Types exceeding 60,000 volts	An AC voltage 1.1 times the maximum working voltage for neutral point-grounded electric lines (in cases where this voltage is less than 75,000 volts, 75,000 volts) and an AC voltage 1.25 times the maximum working voltage for neutral-point non-grounded electric lines are continuously applied for ten minutes between windings and other windings, between the windings and the iron core and between the windings and the ground.
	Types exceeding 7,000 volts and not more than 60,000 volts	An AC voltage 1.25 times the maximum working voltage (in cases where this voltage is less than 10,500 volts, 10,500 volts) is continuously applied for ten minutes between windings and other windings, between the windings and the iron core and between the windings and the ground.
	Types not exceeding 7,000 volts	An AC voltage 1.5 times the maximum working voltage (in cases where this voltage is less than 500 volts, 500 volts) is continuously applied for ten minutes between windings and other windings, between the windings and the iron core and between the windings and the ground.

2 The insulation resistance between a DC contact line and the ground shall be arranged so that the leakage current with respect to the working voltage is not more than 10 mA (100 mA in cases where an overhead contact line is suspended by overhead rigid conductor equipment or where the suspension system of an overhead contact line is a double-rigid conductor system or a third-rail system) per kilometer of the extension of the contact line.

3 The insulation resistance between a low-voltage electric line to be located outdoors

(excluding contact lines and feeder lines) and the ground shall be arranged so that the leakage current with respect to the working voltage is not more than 1/2,000 the maximum supply current.

4 The insulation resistance between the electric wires of a low-voltage electric line to be located indoors (excluding contact lines and feeder lines; the same shall apply in 4) or between this electric line and the ground (in the case of using multi-core cable, drop vinyl-insulated electric wire or multi-core-type electric wire, between the core wires and between the core wires and the ground), in each circuit that can be sectioned using a switchgear or over-current circuit breaker, based on the working voltages listed in the left column of the table below, shall be not less than the respective numerical values listed in the right column. However, in cases where a connection is provided between this electric line and the electric line to be located outdoors, and when the extension of the electric wire (or core wire in the case of using cable) of the electric line to be located outdoors exceeds 100 meters, this insulation resistance may be reduced to a figure obtained by multiplying the following numerical value and coefficient obtained using the following expression together:

Working voltage	Insulation resistance (unit: megohms)
Low voltage exceeding 300 volts	0.4
Low voltage exceeding 150 volts and not more than 300 volts	0.2
Low voltage exceeding 50 volts and not more than 150 volts	0.1

Coefficient = 100 per meter of electric wire extension

5 In the case of a low-voltage electric line (excluding contact lines and feeder lines) where the insulation resistance is difficult to measure, based on the range of working voltages in the left column listed in 4, the respective leakage currents shall be maintained to be not more than 1 mA.

6 Extra-high-voltage electric lines need not conform to the provisions of 1 in cases where dielectric strength is confirmed in accordance with "3.1 Confirmation method for dielectric strength in extra-high-voltage electric lines" in "Confirmation methods for dielectric strength in electric lines" of the Japan Electrotechnical Standards and Codes Committee JESC E 7001 (1998).

7 The electric lines of transformers need not conform to the provisions of 1 in cases where dielectric strength is confirmed in accordance with "3.2 Confirmation method for dielectric strength in electric lines of transformers" in "Confirmation methods for dielectric strength in

electric lines" of the Japan Electrotechnical Standards and Codes Committee JESC E 7001 (1998).

8 The electric lines of equipment, etc., need not conform to the provisions of 1 in cases where dielectric strength is confirmed in accordance with "3.3 Confirmation method for dielectric strength in the electric lines of equipment" in "Confirmation methods for dielectric strength in electric lines" of the Japan Electro technical Standards and Codes Committee JESC E 7001 (1998).

[Ministerial Ordinance]

(Grounding of Electric Facilities)

Article 53 At critical locations of electric facilities, effective grounding shall be provided to prevent electrocution and fire caused by the abnormal elevation of electric power and invasion of high voltage, etc.

[Approved Model Specifications]

VI-12 Related to Article 53 (Grounding of Electric Facilities)

1 The supports of AC overhead contact lines and metal fittings between insulators and supports shall be grounded. However, this does not apply in the following cases:

(1) In the case of connecting the negative side (limited to portions insulated from supports) of an insulator to a negative feeder

(2) In the case of connecting metal fittings between insulators and supports or the negative side of an insulator to an AT protective wire

(3) In the case of connecting metal fittings between insulators and supports to a negative feeder or an AT protective wire through a proper discharge gap

2 Messenger wires of cables, metal portions of closed conduits and tubes encasing cable, metal sheaths of cable, attached articles, electric wire joint boxes and protection facilities shall be grounded. However, this does not apply in the following cases:

(1) In the case of using corrosion-resistant cable

(2) In the case of using cable as a low-voltage overhead electric line and using insulated electric wire or a type with an equivalent or higher insulating effect as a messenger wire

(3) In cases where there is an electric wire joint box in accordance with the provisions of 3

(4) In cases where indoor wiring with a working voltage of not more than 300 volts is installed in a dry environment, and where the metal portion of the protection device is not more than 4 meters in length

(5) In cases where indoor wiring with a working voltage of not more than DC 300 volts or a voltage to the ground of not more than AC 150 volts is installed so that there is no risk of touching by unauthorized people or installed in a dry environment, and where the metal portion of the protection device is not more than 8 meters in length

3 Iron stands and metal casings of electrical devices and iron cores of transformers without casings shall be grounded. However, this does not apply in the following cases:

(1) In cases where there is an insulating stand around an iron stand or a casing

(2) In the case of sheathing a measuring transformer without a casing using an insulating article and installing it so that there is no risk of unauthorized people easily touching it

(3) In the case of installing high- or low-voltage electrical devices at insulating poles or similar so that there is no risk of unauthorized people easily touching them

(4) In the case of installing low-voltage electrical devices to enable handling from the insulating floor

(5) In cases where there are electrical devices of not more than AC 150 V on the ground, and not more than DC 300 V, in a dry place

(6) In cases where there are electrical devices to be used by charging casings

(7) In cases where there are electrical devices with a working voltage of not more than 300 volts AC and a double-insulation structure

(8) In cases where there is an insulating transformer with a capacity of not more than 3 kVA AC and a secondary voltage of not more than 300 volts (limited to those where the electric line on the load side is not grounded) on the power source side of electrical devices

(9) In cases where there is an automatic circuit breaker for current operation with a level of current sensitivity of 15 mA to break an electric circuit within 0.1 seconds in the event of a ground fault for low-voltage electrical devices located in dry places

4 The grounding resistance in the case of grounding in accordance with the provisions of 1 shall be a numerical value that enables automatic breaking of an electric circuit at a substation in the event of a ground fault.

5 The grounding resistance value shall be not more than 10 ohm in the case of grounding in conformity with the provisions of the proviso in 1 42-1-2 table 3 remarks of the Approved Model Specifications 1 related to Article 42 and Approved Model Specifications 31 (4) [2] related to Article 46, in the case of grounding a metal cross-fault prevention plate for a transformer for signaling device (excluding those providing a connection between a high-voltage electric line and a low-voltage electric line), and in the case of grounding in

conformity with the provisions of Approved Model Specifications 3 and 4 related to Article 47 (excluding those providing a connection between a high-voltage electric line and a low-voltage electric line) and 3 (excluding electrical devices with a low voltage of not more than 300 volts). And the grounding resistance of lightning arrestors also shall be not more than 10 ohms. However, in the cases listed below, the grounding resistance value may be not more than each specified numerical value.

(1) In the case of grounding in accordance with the provisions of 3 (limited to electrical devices of low voltage exceeding 300 volts), and in cases where there is a device to automatically break an electric line within 0.5 seconds in the event of a ground fault on the electric line, the value shall be 500 ohms.

(2) In cases where the grounding electrode of a lightning arrestor (excluding those located in accordance with the provisions of Approved Model Specifications 1 (4) related to Article 47) is located not less than 1 meter from the grounding electrode of a transformer, the value shall be 30 ohms.

6 The grounding resistance value in the case of grounding a metal cross-fault prevention plate for a transformer for signaling device (limited to those providing a connection between a high-voltage electric line and a low-voltage electric line) and a transformer for electric switch heater, and in the case of grounding in accordance with the provisions of Approved Model Specifications 4 related to Article 47 (limited to cases of providing a connection between a high-voltage electric line and a low-voltage electric line) shall be such that the voltage to the ground is not more than 150 volts (300 volts when there is a device to automatically break a circuit on a high-voltage electric line within two seconds in the case of exceeding 150 volts, and 600 volts when there is a device to automatically break a circuit on a high-voltage electric line within one second) when single-line ground fault current flows on the high-voltage side.

7 In the case of grounding in accordance with the provisions of Approved Model Specifications 4 (2) related to Article 42, Approved Model Specifications 2 (1) related to Article 44 and Approved Model Specifications 4 and 45, and Approved Model Specifications 2 related to Article 46 as well as in the case of grounding in accordance with the provisions of 3*, the grounding resistance shall be not more than 100 ohms**.

* limited to electrical devices with a low voltage of not more than 300 volts

**500 ohms when there is a device to automatically break an electric line within 0.5 seconds in the event of a ground fault on a low-voltage electric line

Chapter 7 Operation Safety Facilities

Section 1 Railway Signaling Facilities

[Ministerial Ordinance]

(Devices to Ensure Block, etc.)

Article 54 Devices to ensure a block shall be capable of providing the signal aspect that complies with the condition of the block sections on the route or assuring the block.

2. The devices to ensure the interval between trains shall be capable of retarding or stopping the speed of the relevant train, by continuously controlling it according to the intervals with other trains/cars and track conditions on the route.

3. If the aforementioned devices (in paragraph 1 or paragraph 2) are used on a single line, they shall be able to prevent two opposite trains coming into the relevant section at the same time.

[Approved Model Specifications]

VII-1 Article 54 Related to (Devices to Ensure Block, etc.)

1 Block security devices (hereafter referred to as "block devices") shall be as follows:

(1) Automatic block systems using train-detecting devices, etc., located within protected sections of home signals, start signals or block signals shall be a type that automatically controls the aspect of signals and indicates stop information with respect to these signals in the following cases:

[1] When there is a train, etc., in a block section or an overlap section

[2] When a point machine in a block section or an overlap section is not opened in the right direction

[3] When a train, etc., on other tracks obstructs a block section or an overlap section at a junction point or a crossing point

[4] When a fault occurs at a block device

(2) Cab signal block systems shall be a type that automatically manages control information for sections (hereafter referred to as "signal indication sections"), indicating such information for use in activating cab signals using train detectors, etc., located in the section to be protected by such signals, and the type that indicates cab stop signals in the sections listed below (in the case of [3] or [5], this is limited to cases where a signal

indication section is not shared between two or more routes).

[1] Block sections where trains, etc., are present

[2] Block sections outward of overlap sections in the case where trains, etc., are present

[3] Block sections where there is a point machine that is not opened in the right direction

[4] Block sections outward of overlap sections in cases where a point machine in such overlap sections is not opened in the right direction

[5] Block sections obstructed at junction points or crossing points by trains, etc., present on other tracks

[6] Block sections outward of overlap sections in cases where an overlap section is obstructed at a junction point or a crossing point by a train, etc., present on other tracks

[7] Sections where a fault occurs at a block device

[8] Sections from the beginning of those listed in [1] to [7] to points outward thereof with a distance over which a train can stop at the beginning of the section in consideration of required train braking distances

(3) Stop signals to be indicated in the sections outlined in (2) [8] shall have a system of aspect different from those of the stop signals indicated in the sections outlined in (2) [1] to [7].

(4) Notwithstanding the provisions outlined in (2), stop signals may not be indicated in these sections in cases where there is no service entering the sections outlined in (2) [1] to [7] by the method of the person in charge operating a traction unit or doing so in response to the instruction of a director, etc.

(5) Semi-automatic block systems shall be types that use train detectors, etc., located in the protection section of home signals that automatically cause the aspect of such signals, or the aspect of start signals using a device, etc., to detect incoming and outgoing trains, etc., that is located at both ends of the protection section of this start signal, to act automatically as a stop signal in the following cases:

[1] With a start signal, when a train, etc., comes into a block section but does not exit

[2] With a home signal, when a train, etc., is present in a block section

[3] When a point machine present in a block section is not opened in the right direction

[4] When a train, etc., present on other tracks obstructs a block section at a junction point or a crossing point of tracks

[5] When a block device fault occurs

(6) Block devices of automatic block systems and semi-automatic block systems depending on signals working in response to the aspect of signals inward thereof shall be a type that, after the inward signal indicates a signal, causes the signal outward of this signal to indicate a

signal in response.

(7) Block devices of cab signal block systems shall be a type that, after control to cause a cab signal in an inward signal indication section to indicate signals, causes cab signals present in the signal indication section outward of this signal indication section to indicate signals in response.

(8) Controlled manual block systems shall be as follows:

[1] Stations at both ends of a block section shall be provided with a pair of interlocked blocking levers, start signals to be interlocked with the blocking levers and dedicated telephones.

[2] Train detectors shall be provided in block sections, and block devices shall be the type that automatically indicates a stop signal at a start signal when a train, etc., is present in this block section or when a fault occurs in the block device and the start signal makes a stick indication.

[3] Block devices shall be a type with which a pair of blocking levers is locked while a train, etc., is present in a block section.

(9) Tokenless block systems shall be as follows:

[1] A display light shall be provided for each station at both ends of the block section indicating that a train is present in the block section as well as a pair of interlocked blocking levers, start signals to be interlocked with the blocking levers, electric bells and dedicated telephones.

[2] A device detecting incoming and outgoing trains, etc., shall be provided at both ends of block sections, and block devices shall be a type that automatically indicates a stop signal at a start signal when a train, etc., enters the block section or when a fault occurs in the block device and the start signal makes a stick indication.

[3] Block devices shall be a type with which a pair of blocking levers is locked from the entry to the departure of trains, etc., in block sections.

(10) Tablet instrument block systems shall be as follows:

[1] One set of tablet instrument block devices, electric bells and dedicated telephones shall be provided for stations at both ends of the block section.

[2] Once set, a tablet cannot be taken out unless the stations at both ends of the block section handle the tablet instrument block devices in association.

[3] The number of tablets that can be taken out from the tablet instrument block device at the stations at both ends of a block section shall be limited to one.

[4] Unless a tablet taken out is set in the tablet instrument block device, other tablets cannot

be taken out.

[5] Tablets of different types cannot be set in the tablet instrument block device.

[6] Tablets in adjacent block sections shall be of different types.

2 Devices ensuring the interval between trains shall be as follows:

(1) Automatic train controllers (excluding those for brake control on continuous curves and those defined in (4)) shall be a type that meets the following requirements:

[1] Ground facilities with respect to trains shall be a type that continuously shows control information indicating train operation speeds based on distances with respect to trains, etc., present on the same route and track conditions.

[2] On-train facilities shall be as follows:

[A] The system shall perform examination by referencing the operation speed instructed by the control information outlined in [1] and the actual speed of the train, etc.

[B] In sections indicating the control information outlined in [1], facilities shall activate a brake device to automatically reduce the train speed to the operation level indicated by this control information. However, in cases where the control information outlined in [1] is a type indicating the stopping of a train, the brake device shall be activated to stop the train before the end of the section indicating this control information.

[3] The length of the section indicating the control information outlined in [1] shall be sufficient to allow trains entering the section to reduce their speed or stop depending on the operation level indicated by the control information in the section.

(2) Automatic train controllers for brake control on continuous curves (excluding the system type outlined in (3)) shall be a type that meets the following requirements:

[1] Ground facilities with respect to trains shall be a type that continuously indicates control information showing the operation speed at which a train can reduce its speed, before the point at which train operation speeds are restricted, based on track conditions, to the level indicated by the control information for the section, as well as the speed at which a train can stop before the end of the relevant section.

[2] On-train facilities shall be as follows:

[A] The system shall perform examination by referencing the operation speed instructed by the control information outlined in [1] and the actual speed of the train.

[B] The system shall be one with which a train can automatically reduce its speed, before the point at which train operation speeds are restricted, to the operation level indicated by the control information for the section, and shall activate a brake device to stop the train before the end of the relevant section.

(3) Automatic train controllers in systems providing control information that indicates train operation speeds depending on train positions using on-train facilities shall be a type that meets the following requirements:

[1] Ground facilities shall be a type that meets the following requirements:

[A] The system shall, with respect to trains, continuously indicate control information indicating the final section that the train will reach.

[B] The section outlined in [A] shall be one other than sections in which trains, etc., are present on the route of the aforementioned train and sections where the route of this train is not opened.

[2] On-train facilities shall be as follows:

[A] The system shall be a type that provides control information indicating train operation speeds depending on train positions based on the control information outlined in [1] and track conditions.

[B] The system shall be a type that perform examination by referencing the operation speed indicated by the control information outlined in [A] and the actual train speed.

[C] The system shall be a type with which a train can automatically reduce its speed to the restricted operation level before the point at which operation speed is restricted based on track conditions, and shall also activate a brake device so that the train can stop before the end of the relevant section.

[D] The system shall be a type that recognizes the on-track position of trains.

(4) The automatic train controller for superconducting magnetic levitation railways shall conform to the next criteria.

1) The system shall continuously indicate control information to the automatic train operation apparatuses to ensure that the train can automatically reduce its speed to the restricted operation level before the point at which operation speed is restricted based on track conditions, and to ensure that the train can stop before the end of the final section that the train will reach.

2) The final section outlined in 1) shall exclude any sections in which trains, etc., are present on the route of the aforementioned train and sections where the route of this train is not opened.

3) The system shall be a type that performs examination by referencing the actual train speed and the operation speed indicated by the control information outlined in 1).

4) The system shall be a type with which a train can automatically reduce train speed to the restricted operation level before the point at which operation speed is restricted based on track conditions, and shall also activate a brake device so that the train can stop before the end of the final section that the train will reach.

5) The system shall be a type that recognizes the on-track position and velocity of trains.

3 In addition to the devices outlined in 2, other necessary devices shall be provided as follows:

(1) Devices that can change control information issued on a main line outside a station to information specifying an operation speed lower than this control information indicates

(2) Devices that can change control information issued on a main line to information indicating a stop in emergency situations

4 Block devices of automatic block systems and semi-automatic block systems in sections of single-line operation shall be a type that creates interlocking between start signals for which routes are in opposition.

5 Block devices of cab signal block systems in sections of single-line operation shall be a type that creates interlocking between cab signals for which routes are in opposition.

6 Devices ensuring the interval between trains in sections of single-line operation shall be a type that creates interlocking between control information to be issued based on the open conditions of routes in opposition.

7 Devices ensuring the interval between trains on magnetic guidance systems may be automatic train controllers conforming to the following requirements in addition to those outlined in 2:

(1) Ground facilities shall be as follows:

[1] The system shall be a type, with respect to trains, etc., that issues control information indicating that trains, etc., should stop or proceed based on the distance with respect to other trains, etc., present on the same route.

[2] The control information issued outward of sections where a train, etc., is present and sections where the route of this train, etc., is not opened shall be a type indicating that a train shall stop, and shall enable the train, etc., to stop before the beginning of the relevant section.

(2) On-train facilities shall be as follows:

[1] The system shall be a type that issues control information indicating train operation speeds, etc., depending on train positions based on the control information outlined in (1) and track conditions.

[2] The system shall be a type that performs examination by referencing the operation speed instructed by the control information outlined in [1] and the actual speed of the train.

[3] The system shall be a type with which a train, etc., can automatically reduce its speed to the restricted operation level before the point at which speed is restricted based on track conditions, and shall activate a brake device to stop the train, etc., at the point of ground facilities where control information indicating the need to stop is issued.

[4] The system shall be a type that recognizes the on-track position of trains.

[Ministerial Ordinance]

(Railway signal devices , etc.)

Article 55 Structure, providing method, and installation of railway signals shall be free from the chance of misrecognition.

2. Signal device shall be appropriately installed to let the train/car decelerate or stop according to the speed instructed by its aspect, before it comes to the front end of the section to be protected by the signal.

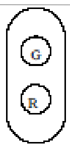
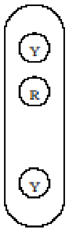
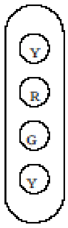
3. To secure safe train/car operation, signal indication devices shall be installed at intersections or junctions or other vulnerable locations that could cause collision or derailment.

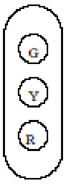
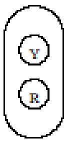
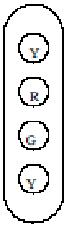
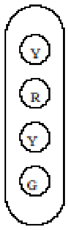
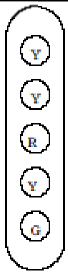
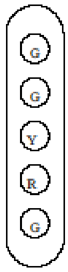
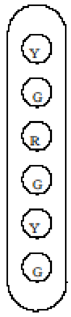
[Approved Model Specifications]

VII-2 Article 55 Related to (Railway signal devices, etc.)

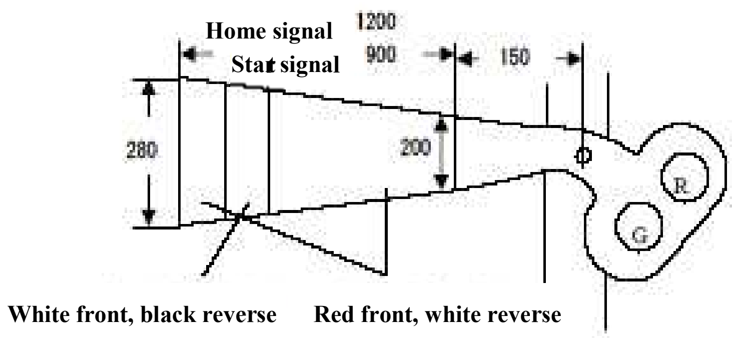
1 The structure of fixed signal indicators shall conform to the following standards:

(1) Home signals, start signals and block signals shall have the shapes and dimensions illustrated in the following diagrams, and a type that can indicate the signals listed in the table of Approved Model Specifications 1 (4) [1] related to Article 117.

Two position color light signals		
A type indicating stp signals and proceed signals	A type indicating stop signals and speed restriction signals	A type indicating stop signals, speed restriction signals and proceed signals
		

Three position color light signals						
A type indicating stop signals, caution signals and proceed signals	A type indicating stopsignals and caution signals	A type indicating stop signals, speed restriction signals, caution signals and proceed signals	A type indicating stop signals, caution signals, reducedspeed signals,less-reduced speed signalsand proceedsignals	A type indicating stop signals,speed restriction signals, caution signals, reducedspeed signals, less-reduced speed signals and proceed signals	A type indicating stop signals, caution signals, proceed signals and high-speed proceed signals	A type indicating stop signals, caution signals, reduced speed signals, proceed signals and high-speed proceed signals
						

Two-position semaphore signal



Remarks

1 Unit: millimeters

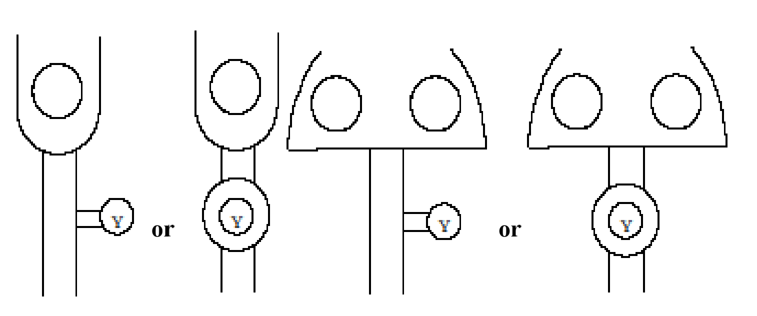
2 G = green light, Y = yellow light, R = red light

3 The diameter of lights shall be not less than 100 millimeters.

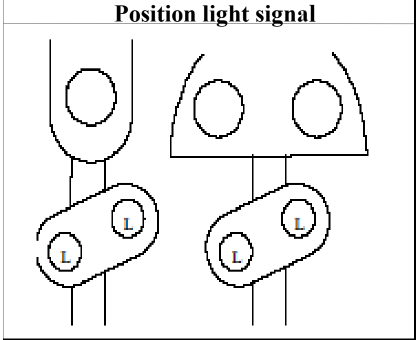
4 The distance between the centers of lights shall be not less than 200 millimeters (180 millimeters in tunnels).

(2) Call-on signals shall have the shapes and dimensions illustrated in the following diagrams, and shall be able to indicate the signals listed in the table of Approved Model Specifications 1 (4) [2] related to Article 117.

Color light signals



Position light signal



Remarks

1 Y = yellow light, L = white light or light of a color that may not be mistaken for signals of other color light signals

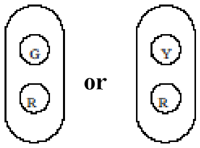
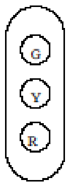
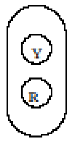
2 The diameter of lights shall be not less than 90 millimeters.

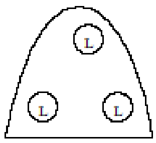
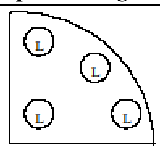
3 The distance between the centers of lights in position light systems shall be not less than 250 millimeters (150 millimeters in tunnels).

(3) The distance between the centers of lights for call-on signals and the lowermost lights of home signals shall be not less than 600 millimeters.

(4) The distance between the centers of lights for call-on signals and the lowermost lights of shunting signals shall be not less than 250 millimeters.

(5) Shunting signals and wayside signals shall have the shapes and dimensions illustrated in the following diagrams, and shall be able to indicate the signals listed in the table of Approved Model Specifications 1 (4) [3] related to Article 117.

Two-position color light signals	Three-position color light signals	
	A type indicating stop signals, caution signals and proceed signals	A type indicating stop signals and caution signals
		

Two-position light signal	Three-position light signal
	

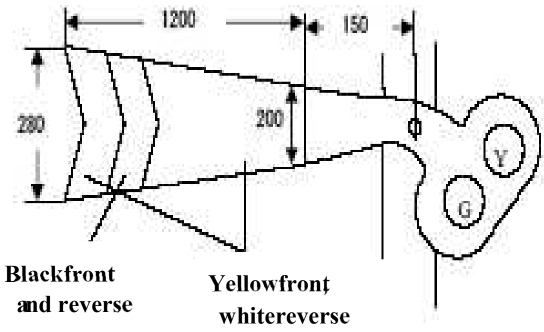
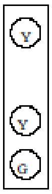
Remarks

1 G = green light, Y = yellow light, R = red light, L = white light or a color of light that may not be mistaken for signals of other color light systems

2 The diameter of lights shall be not less than 100 millimeters in color light signals and not less than 90 millimeters in position light signals (not less than 60 millimeters in tunnels).

3 The distance between the centers of lights for position light signals shall be not less than 250 millimeters (150 millimeters in tunnels).

(6) Distant signals shall have the shapes and dimensions illustrated in the following diagrams, and shall be able to indicate the signals listed in the table of Approved Model Specifications 1 (6) [1] related to Article 117.

Color light signal		Semaphore signal
A type indicating caution signals and proceed signals	A type indicating caution signals, reduced speed signals and proceed signals	
		

Remarks

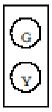
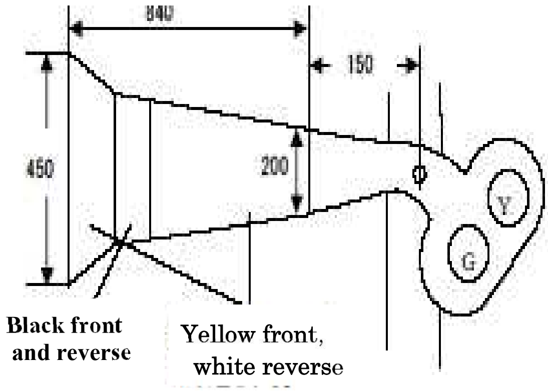
1 Unit: millimeters

2 G = green light, Y = yellow light

3 The diameter of lights shall be not less than 100 millimeters.

4 The distance between the centers of lights shall be not less than 200 millimeters (180 millimeters in tunnels).

(7) Passing signals shall have the shapes and dimensions illustrated in the following diagrams, and shall be able to indicate the signals listed in the table of Approved Model Specifications 1 (6) [2] related to Article 117.

Color light signal	Semaphore signal
	

Remarks

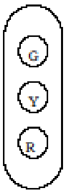
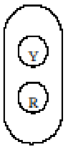
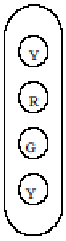
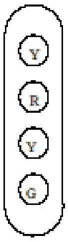
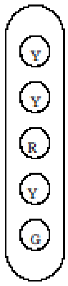
1 Unit: millimeters

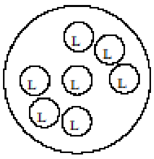
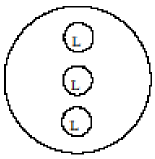
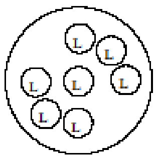
2 G = green light, Y = yellow light

3 The diameter of lights shall be not less than 100 millimeters.

4 The distance between the centers of lights shall be not less than 200 millimeters (180 millimeters in tunnels).

(8) Repeating signals shall have the shapes and dimensions illustrated in the following diagrams, and shall be able to indicate the signals listed in the table of Approved Model Specifications 1 (6) [3] related to Article 117.

Colorlight signals				
A type indicating repeating stop signals, repeating restriction signals (limited to those for which the main signal indicates caution) and repeating proceed signals	A type indicating repeating stop signals and repeating restriction signals (limited to those for which the main signal indicates caution)	A type indicating repeating stop signals, repeating restriction signals (limited to those for which the main signal indicates Speed restriction and caution) and repeating proceed signal	A type indicating repeating stop signals, repeating restriction signals (limited to those for which the main signal indicates caution, reduced speed and less-reduced speed) and repeating proceed signals	A type indicating repeating stop signals, repeating restriction signals and repeating proceed signals
				

Position light signals	
A type indicating repeating stop signals, repeating restriction signals and repeating proceed signals	A type indicating repeating stop signals, repeating restriction signals, repeating proceed signals and repeating high-speed proceed signals
	

Remarks

1 G = green light, Y = yellow light, R = red light, L = white light or light of a color that may not be mistaken for signals of other color light systems

2 The diameter of lights shall be not less than 100 millimeters in color light signals and not less

than 90 millimeters in position light signals (not less than 40 millimeters in tunnels).

3 The distance between the centers of lights shall be not less than 200 millimeters in color light signals (not less than 180 millimeters in tunnels) and not less than 250 millimeters in position light signals (150 millimeters in tunnels).

(9) The distance between lights of passing signals and the lowermost lights of home signals shall be not less than 800 millimeters.

(10) The front of backboards for color light signals and position light signals shall be black.

(11) The distance between the centers of two lights indicating a speed restriction signal, a reduced speed signal and a less-reduced speed signal shall be not less than 600 millimeters (540 millimeters for types located in tunnels) and not more than 700 millimeters, and the distance between the centers of two lights indicating a high-speed proceed signal shall be not less than 800 millimeters and not more than 900 millimeters. In addition, both lights shall be turned on at the same time; if one is turned off due to a fault, the other shall be turned off at the same time.

(12) Route indicators and preliminary route indicators shall determine the method of light aspects and use them accordingly.

2 In cases where not less than two fixed signals of the same type are provided at the same point, they shall be as follows:

(1) In the case of location in parallel, the signal with respect to the track on the leftmost side shall be located on the leftmost side, and signals shall be located with respect to tracks rightward thereof one after another.

(2) In the case outlined in (1), the signal with respect to the principal track shall be located in a position higher than other signals.

3 Two or more color light signals (excluding passing signals and call-on signals) shall not be located vertically.

4 Home signals and passing signals shall be located vertically.

5 In cases where home signals are present, when two or more train routes are allowed to enter from the same track in a station, such signals shall be located on each individual route. However, this does not apply in the following cases:

(1) Location at a junction point of adjacent tracks for which operating safety conditions are equivalent

(2) Attachment of a route indicator that can indicate the route according to the aspect indicated by this signal using position lights, numerical values or simple signs or characters, and with

respect to the home signal sections listed in the left column of the following table, use on the respective routes listed in the right column of the table:

Home signal	Route
Home signal fitted with LED-type route indicator	All routes
Home signal type other than the one listed above	Routes as follows: ・For tracks of terminals, all routes ・For tracks of stations where there are no passing trains, or tracks other than those on which passing trains run in stations where such trains are present, routes within three tracks ・ For tracks on which passing trains run in stations where such trains are present, routes within two tracks (three tracks in cases where there is a passing signal with respect to a start signal or a preliminary route indicator for a fixed signal in the outer direction)

6 When two or more train routes start from the same track, start signals shall be located on each route. However, for tracks of stations where there are no passing trains, or tracks other than those on which passing trains run in stations where such trains are present, a start signal fitted with a route indicator may be used in common between two or more routes.

7 In sections protected by home signals and shunting signals where trains, etc., are present, and at points where other trains, etc., are allowed to enter in response to no sign, a call-on signal shall be located in a position lower than the home signal or shunting signal (in cases where there is a signal appendix, in a position lower than this signal).

8 Call-on signals shall be located with respect to individual home signals or shunting signals. In such cases, when two or more home signals or shunting signals are provided at the same point, a call-on signal fitted with a route indicator may be shared between two or more routes.

9 Call-on signals in a position lower than home signals and those in a position lower than

shunting signals shall not be shared.

10 Call-on signals shall not be activated after the train, etc., to be called on is temporarily stopped outward of a home signal or a shunting signal. However, when a device is provided that can ensure a level of safety equivalent to that in the case of indication of a call-on signal after the train, etc., is stopped to indicate a call-on signal, the same does not apply.

11 Shunting signals and wayside signals shall be located on the respective routes of the vehicles to be shunted. However, in cases where two or more vehicle routes are allowed to enter from the same track, as well as in the following cases, the same does not apply:

(1) Location at a junction point of adjacent tracks for which operating safety conditions are equivalent

(2) Attachment of a route indicator

12 In cases where there is a remote signal outward of a home signal, when two or more home signals are located at the same point, one remote signal may be shared between two or more home signals.

13 Remote signals shall not indicate a proceed signal before the indication of a proceed signal at the main signal, and shall not indicate a reduced-speed signal before the indication of a speed restriction signal or a caution signal at the main signal.

14 In cases where there is a passing signal outward of a start signal, when two or more start signals are located at the same point, passing signals shall be located in relation to the respective start signals.

15 Passing signals shall not indicate a proceed signal before the indication of a proceed signal at the main signal and a home signal located on the same pole or at the same point as that of the passing signal.

16 In cases where there is a repeating signal outward of a home signal or a start signal, when two or more home signals or start signals are located at the same point, one repeating signal may be shared between two or more home signals or start signals.

17 Colored light repeating signals may mainly be located solely in railways with an underground structure.

18 Repeating signals shall not indicate a repeating high-speed proceed signal before the indication of a high-speed proceed signal at the main signal, or a repeating proceed signal before the indication of a proceed signal at the main signal, or a repeating restriction signal before the indication of a speed restriction signal, a caution signal, a reduced-speed signal or a less-reduced speed signal at the main signal.

19 Route indicators shall be located on the same pole and in a lower position than the main

signal. However, in cases where a route indicator attached to a home signal or a shunting signal is shared with a route indicator attached to a call-on signal, the same does not apply.

20 A route indicator shall not indicate a route before indicating a proceed signal with respect to the signal to which it is attached.

21 In cases where it is necessary to preliminarily indicate the route of a train for which a proceed signal is indicated by a home signal or a start signal outward thereof, preliminary route indicators in sections where automatic block systems are executed shall be located on the same pole as the fixed signal outward of this home signal or start signal, and shall have a lower position (lower than the route indicator in cases where there is a route indicator other than one attached to a call-on signal).

22 Preliminary route indicators shall not preliminarily indicate a route before the attached signal and the next signal indicate a proceed signal.

23 Cab signals shall be a type that can reliably judge control information from ground facilities and continuously indicate it.

24 Cab signals shall be a type that generates an alarm horn in the driving cab when a signal aspect changes.

25 Main signals (excluding those making indications with respect to stopped trains, etc.) shall be located in a position that can be sighted from the distance required for an approaching train, etc., to reduce speed or stop based on the indication issued. However, in cases where an subsidiary signal is provided, the same does not apply.

26 In sections other than those where an automatic block system or semi-automatic block system is executed (excluding block sections inward of two-position-type signals), a distant signal shall be located outward of any home signal that does not have a sighting distance equivalent to or greater than the emergency braking distance of an approaching train due to geographical or other circumstances.

27 Distant signals shall be located so that the distance from the position where they can be sighted to the main home signal is not less than the emergency braking distance of an approaching train.

28 In sections other than those where an automatic block system or semi-automatic block system is executed (excluding block sections inward of two-position-type signals), in cases where the start signal of a track on which a passing train is allowed to run (for stations where passing trains are present) has a sighting distance less than the emergency braking distance of an approaching train due to geographical or other circumstances, a passing signal shall be located in a position lower than the home signal outward of this start signal. However, in

cases where such a home signal is provided with aspect facilities of a caution signal or a speed restriction signal, the same does not apply.

29 In sections where an automatic block system or semi-automatic block system is executed (excluding block sections inward of two-position-type signals), a repeating signal shall be located outward of home signals, start signals (limited to those located on tracks where passing trains are allowed to run for stations where such trains are present) or block signals with a sighting distance less than the distance over which an approaching train can reduce its speed or stop in response to the indicated signal due to geographical or other circumstances.

30 Repeating signals shall be located so that the distance from the position at which they can be sighted to the main signal is not less than the distance over which a train approaching the main signal can reduce its speed or stop in response to the indicated signal.

31 The ground facilities of cab signals, with respect to trains, etc., shall be a type that continuously indicates a signal based on distances with respect to trains, etc., on the same route and track conditions in individual signal indication sections.

32 The section length of signal indication sections in sections using cab signals (in the case of issuing the same control information in signal indication sections outward of these sections, the section to which the outward signal indication section is added) shall be not less than the distance over which a train, etc., entering the section can reduce its speed or stop before the end in response to the aspect of a signal in this section (the beginning of the section to be protected).

33 Devices indicating fusee signals or flashing light signals shall be located in a position visible from a point not less than the distance over which an approaching train can stop before the point obstructing its route.

34 Devices indicating alarm signals shall be a type with an arrival distance not less than the distance over which an approaching train can stop before the point obstructing its route.

35 Home signals shall be installed at the points listed below (excluding sections of cab signal block system execution and those of operation using devices to ensure the interval between trains).

(1) Tracks allowing trains to enter a station (excluding those where there is no point machine and those where point machines are locked at all times)

(2) In addition to the specification outlined in (1), tracks allowing trains to enter a station located at the boundary point of a block section (excluding those where a block signal is located in the position where a home signal has to be located)

36 Home signals shall be located in the positions listed below. However, when a home signal indicates a stop signal in cases where there are facilities indicating speed restriction signals at the main signal outward thereof, or in cases where there is a device that can automatically stop a train in association with the aspect of the home signal, the same does not apply.

(1) In positions not less than 100 meters outward from the tongue rail of the facing point machine (excluding types for safety siding) located at the outermost part of the section to be protected by a home signal when such a signal is present

(2) In positions not less than 100 meters outward from the trailing point machine located at the outermost part of the section to be protected by a home signal when such a signal is present, or at the vehicle contact limit relating to the crossing of tracks

(3) In positions not less than 100 meters outward from the stop section of a train

37 With respect to the maximum speeds between stations for the trains listed in the left column of the table below, the separation specifications of 36 may be reduced to the respective separation distances listed in the right column in cases where this is unavoidable for reasons of geographical situation, etc.

Maximum speed between train stations (unit: kilometers per hour)	Separation distance (unit: meters)
Less than 65	40
65 and over but less than 85	60
85 and over but less than 100	80

38 Start signals shall be located at tracks where trains exit stations (excluding those of cab signal block system execution and those with operation using devices to ensure the interval between trains). However, this does not apply in the following cases:

(1) Tracks with no point machine

(2) Tracks for which the point machine is locked at all times

(3) Tracks for which the point machine is the trailing type provided with point machine markings or tracks where the point machine is a spring point machine (limited to those in sections executing a tablet block system, a staff and ticket block system or a staff block system)

39 Start signals shall be located in the following positions:

(1) In front of the stop position of a train

(2) Outward of the tongue rail of the facing point machine located at the outermost point of the

section protected by the start signal when such a start signal is present

(3) Outward of the trailing point machine located at the outermost point of the section protected by the start signal when such a start signal is present, or at the vehicle contact limit related to the crossing of tracks

40 In cases where a start signal cannot be located as indicated in 39, and only in cases where there is a train stop indicator at the position where a start signal has to be located in accordance with the provisions of the same item, the start signal may be located in front of this position.

41 Devices indicating speed restriction signals at main signals outward of main signals shall be located at the beginning of sections where there is a possibility of mutual obstruction owing to over-run when trains enter or exit a station. However, in the cases listed below, and where there is a device that can automatically stop trains in association with the aspect of the main signal located at the beginning of this section, the same does not apply.

(1) Where there is a safety siding inward of the main signal located at the beginning of this section

(2) Where the track length from the main signal (in cases where there is a train stop indicator, this train stop indicator) located at the beginning of this section to the vehicle contact limit or the tongue rail of a facing point (excluding those for safety siding) is not less than 100 meters

42 Block signals shall be located at the beginning of block sections where automatic block systems are executed. However, in cases where there is a home signal or a start signal at this point, the same does not apply.

43 Shunting signals, wayside signals and cab signals for use in shunting shall meet the following requirements:

(1) The system shall be a type indicating a stop signal when there is a train, etc., in the section protected by this signal.

(2) The system shall be a type that indicates a stop signal when the point located in the section outlined in (1) is not opened in the right direction.

44 At the points listed below in sections of cab signal block system execution, facilities shall be provided to indicate the beginning of a signal indication section in individually specified positions. However, for tracks with no point machine or those where the point machine is locked at all times, the same does not apply.

(1) Tracks allowing trains to enter a station

[1] In cases where there is a signal indication section, points outward of the tongue rail of a facing point machine located at the outermost point of this signal indication section

[2] In cases where there is a signal indication section, points outward of the trailing point machine located at the outermost point of this signal indication section or the vehicle contact limit related to the crossing of tracks

[3] Points outward of the stop section of a train

(2) Tracks allowing trains to exit a station

[1] In front of the stop position of a train

[2] In cases where there is a signal indication section, points outward of the tongue rail of a facing point machine located at the outermost point of this signal indication section

[3] In cases where there is a signal indication section, points outward of the trailing point machine located at the outermost point of this signal display section or the vehicle contact limit related to the crossing of tracks

45 Facilities indicating the start of signal indication sections shall be provided at the beginning of block sections in sections of cab signal block system execution.

[Ministerial Ordinance]

(Apparatus to Interlock Signals, etc.)

Article 56 At intersections or junctions or other vulnerable locations that are susceptible to collisions or derailment, interlocking apparatuses shall be installed to coordinate signals, turnouts on the route and other comparable facilities, in order to prevent collision and to secure safe train operation.

2. The remote control device to the aforementioned apparatus shall be able to display necessary information to secure safe train operations, including but not limited to where trains are located and whether the route is open or not.

[Approved Model Specifications]

VII-3 Article 56 Related to (Apparatus to Interlock Signals, etc.)

1 At crossings or junction points of tracks on main lines and siding that obstructs main lines (excluding where point machines are locked at all times), devices shall be provided for interlocking between signals, etc. (hereafter referred to as "interlocking devices"). However, in cases where measures are taken to prevent collision and derailment, the same does not apply.

2 Interlocking devices to be located in sections other than those of operation using devices to ensure the interval between trains shall be a type that conforms to the following standards:

(1) In cases of sharing part or all of a route or the safety margin for overrunning of a main signal (including shunting signals; the same shall apply in the next clause) or a cab signal, or in cases where this route or safety margin for overrunning is brought onto a grade crossing, the device shall be a type providing interlocking between these signals.

(2) The device shall be a type providing interlocking between a main signal or a cab signal and a point machine (excluding point machines that are locked at all times and spring point machines) and drawbridges on this route or in the safety margin for overrunning.

3 Interlocking devices to be located in sections of operation using devices to ensure the interval between trains shall be a type conforming to the following standards:

(1) In cases of sharing part or all of a route and in cases where routes are on grade crossings, the device shall be a type that provides interlocking between control information to be indicated based on the route-clear situations of these routes.

(2) The device shall be a type that offers interlocking between the control information to be indicated based on the route-clear situations of routes and point machines (excluding point machines that are locked at all times) on such routes.

4 Interlocking devices to be located in sections of automatic block system, cab signal block system or semi-automatic block system execution, as well as those in sections of operation using devices to ensure the interval between trains, shall have the following functions:

(1) Detector locks
(2) Route locks or sectional route locks
(3) Approach locks or stick locks
(4) Signal controls

5 Point machines on main lines and important sidings shall be capable of mechanical locking.

However, in cases where there is no risk of train derailment, such as in sections with spring points, the same does not apply.

6 Devices for remote control of interlocking devices (hereafter referred to as "remote control systems and central train control systems") shall be a type that can indicate the points outlined below and set the routes of trains or vehicles entering or exiting a station.

(1) Positions of trains, etc., on main lines

(2) Route-clear situations on main-line routes

7 Remote control systems and central train control systems that automatically set routes shall be provided with devices for reporting faults in route-setting devices to the control center.

8 Notwithstanding the provisions of 4, interlocking devices to be located in sections of operation using an automatic train control device as prescribed in Approved Model Specifications 7 related to Article 54 shall have the following:

(1) A function to prevent the switching of associated moving safety walls for trains, etc., in response to control information indicating the train proceed from the ground facilities of an automatic train control device.

(2) A function to prevent the switching of associated moving safety walls until a predetermined time has passed from the indication of control information allowing a train, etc., to enter a route or to stop after control information indicating the proceed of a train, etc., has been given

(3) A function to provide control information directing the stop of the trains, etc., when trains exist on the same train route, etc.

[Ministerial Ordinance]

(Apparatus to Automatically Decelerate or Stop Trains)

Article 57 In the case when trains are operated by the block system, apparatus to automatically decelerate or stop trains depending upon signal aspects and line conditions shall be installed. This does not apply, however, to those cases where safe train operation will not be jeopardized from the standpoint of operational and route conditions.

Revision – Article 57 of the Ministerial Ordinance was partly revised on March 24, 2006 (Ministerial Ordinance No. 13 prescribed by the Ministry of Land, Infrastructure and Transport), with the revised version coming into force on July 1. The revision involved the addition of a section called “Line conditions.”

[Approved Model Specifications]

VII-4 Article 57 (Apparatus to Automatically Decelerate or Stop Trains)

1 In the case of train operation by the block system, an automatic train stop apparatus or automatic train control apparatus shall be provided that can automatically stop or decelerate trains. However, this does not apply in the following cases:

(1) Two or more trains are not operated at the same time in a section not connected to other sections.

(2) A safety siding is provided for the purpose of preventing collisions due to over-running or errors with starting trains at stations conducting pass-by in single-track lines where the interval between stations is one block section.

(3) Measures are taken to prevent collisions due to over-running in single-track lines where the aspect of a signal cannot indicate the state of blocks between stations.

2 Automatic train stop apparatuses to be located in accordance with the provisions of 1 in a double-track line shall be a type whose basic functions meet either of the following requirements:

(1) In cases where a main signal indicates a stop signal, the device automatically stops trains outward of this signal if braking operation for such trains is not conducted at a predetermined point.

(2) In cases where a main signal indicates a stop signal, the device automatically stops trains outward of this signal (in cases where the control system of a signal is the overlap type, the terminal of the overlap section) if such trains run at a speed exceeding a certain level at a predetermined point.

3 Automatic train stop devices to be located in accordance with the provisions of 1 in a single-track line shall be a type whose basic functions meet either of the following requirements:

(1) Conformity to 2 (1) or (2).

(2) In cases where a start signal indicates a stop signal, the device shall be a type that automatically stops trains before the outermost vehicle contact limit of the section protected by this signal when a train stopped outward of the signal moves inward of it.

4 In cases of train operation by the block system, an automatic train stop apparatus or automatic train control apparatus shall be provided that can automatically slow down or stop trains based on line conditions. However, this does not apply in the following cases:

(1) Trains are operated in a section not transporting passengers.

(2) Temporary vehicle operation is implemented, and two or more persons in charge of

operating a traction unit are in the same driver's cab together and perform train operation with measures to prevent accidents resulting from delayed braking operation by the traction unit operators or from absent-mindedness.

5 In the cases listed below, automatic train stop apparatuses to be located in accordance with the provisions of 4 shall be a type that can automatically decelerate trains to a safe speed or stop them before the near side of a speed restriction point, a stop limit point, etc., when the train runs at a speed exceeding a certain level at a predetermined position.

(1) There is a risk of overturn to the outside of curves when a train intending to enter a curve comes into the section at the permitted operation speed (i.e., the maximum speed between stations. However, in cases where there is a device to restrict speed in front, or where a train starts from a place where trains necessarily stop, such as at a terminal station, this shall be a speed that can be reached by normal operation under these conditions. The same shall apply hereafter in these items.).

(2) A train intending to enter a turnout section is highly likely to overturn when entering the turnout side of a turnout at the permitted operation speed.

(3) A train intending to enter a structure section where speed is restricted is highly likely to derail, etc., due to the deformation of the structure when entering the section at the permitted operation speed.

(4) A train coming into a track terminal section is highly likely to overrun the section when entering it at the permitted operation speed (in cases where there is shock absorption-equipped car stopping and the like, where there is a risk of being unable to reduce speed to a level within the range of the performance specifications of this shock absorption function).

(5) At a level crossing where the operation starting time of an automatic barrier machine is changed depending on whether the situation is a train passing the station or a train stopping, when a train that has to stop at the station erroneously passes the station at the permitted operation speed, there is a risk that this train will enter the level crossing before the interruption operation of the automatic barrier machine has ended.

(6) There is a risk of occurrence of the preceding cases (1) to (5) as a result of a train running in a downhill section accelerating on the downslope and exceeding the speed enabling operation, or where a train moves inward of a stop signal (the terminal of an overlap section in cases where the control system of a signal is the overlap type).

6 In cases where the functions outlined in 5 are achieved by utilizing facilities at the time of execution of these provisions, notwithstanding the provisions of 5, it is sufficient to make

efforts so as to satisfy these functions as far as possible until the relevant facilities are updated. In such cases, once facilities are updated, automatic train stop apparatuses shall conform to the functions prescribed in 5.

7 The automatic train stop apparatuses prescribed in 2, 3 and 5 shall be a type provided with additional functions as necessary for safety based on train operating conditions and route conditions.

8 Automatic train control apparatuses (excluding brake control with a continuous curve) to be located in accordance with the provisions of 1 and 4 shall conform to the following standards:

(1) Ground facilities with respect to trains shall continuously show control information indicating train operation speeds based on distances with respect to trains, etc., present on same route and line conditions.

(2) On-board facilities shall be as follows:

[1] The system shall be a type that conducts verification by referencing the operation speed instructed by the control information outlined in (1) and the actual speed of the train.

[2] The system shall be a type that activates a braking device so as to automatically reduce the speed of trains to the operation level indicated by this control in the section indicating control information as outlined in (1). However, in cases where the control information outlined in (1) indicates the stopping of a train, the system shall activate a braking device so as to stop the train before the terminal (in cases where the signal is controlled by an overlap system or a half-overlap system, outward of the section where a train is present) of the section indicated by this control information.

(3) The length of the section indicated by the control information outlined in (1) shall be not less than the distance over which a train entering the section can slow down or stop in response to the operation speed indicated by the control information in this section.

9 Automatic train control apparatuses using brake control with a continuous curve to be located in accordance with the provisions of 1 and 4 shall conform to the following standards:

(1) Until the point at which train operation speeds are restricted based on track conditions, ground facilities with respect to trains shall continuously show control information indicating the operation speed at which a train can slow down to the operation speed indicated by the control information in the section including the said point, and the speed at which a train can stop before the terminal of the section providing control information indicating the stopping of a train.

(2) On-train facilities shall be as follows:

[1] The system shall be a type that conducts verification by referencing the operation speed

indicated by the control information outlined in (1) and the actual speed of the train.

[2] The system shall, before the point at which operation speed is restricted depending on line conditions, activate a braking device to automatically reduce the speed of a train to the level indicated by the control information including the said point, and to stop a train before the terminal of the section providing control information indicating the stopping of a train.

[Operation Notice]

7 Article 57 Related to (Apparatus to Automatically Decelerate or Stop Trains) (Revised on April 28, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.21)

(1) "Additional functions" in accordance with Approved Model Specifications 7 refers to functions to be added to those set forth in Approved Model Specifications 2, 3 and 5 (hereafter referred to as "main functions"). These are functions to stop or slow down trains regardless of signal aspects or track conditions (hereafter referred to as "added functions"), such as those to stop trains in conjunction with signal aspects (hereafter referred to as "supplementary functions") and those to stop trains in the event of track problems.

(2) Main, supplementary and added functions shall be stipulated specifically in the implementing standard.

Revision:

(1) The Approved Model Specifications pertaining to Article 57 underwent a full revision on April 28, 2006 (Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.18) with improved ATS functions for curves enforced through a separate notification.

(2) Article 57 of the new Ministerial Ordinance shall be made to conform by June 30, 2011 to the provisions in Article 2, Section 2 of the supplementary regulations for the amended Ministerial Ordinance to which all items in Article 2, Section 2 of the supplementary regulations are applicable (Notification: April 28, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.19)

[Ministerial Ordinance]

(Devices for automatic operation)

Article 58 Apparatus for automatic train operation to be installed for an unmanned train (without a driver) unit shall comply with the following standards.

(1) A train shall not be able to be departed until after confirming the safety of all passengers getting on and off the train.

(2) A target speed shall be set below the operating speed indicated by the control information from the apparatus that are ensuring train intervals and the train speed shall be controlled smoothly.

(3) A train shall be stopped smoothly at the location which would not interfere with passengers getting on and off.

[Approved Model Specifications]

VII-5 Article 58 Related to (Devices for automatic operation)

1 Devices for conducting automatic operation (hereafter referred to as "automatic train operation apparatuses") shall be located on railways provided with automatic train control apparatuses.

2 Automatic train operation apparatuses shall conform to the following standards:

(1) Apparatuses shall be a type that can start a train only after vehicle doors for getting on and off, etc., are closed and the safety of passengers getting on and off is confirmed.

(2) Apparatuses shall be a type that can set the target speed to not more than the operation value indicated by control information from automatic train controllers and conduct smooth speed control of trains.

(3) Apparatuses shall be a type that can smoothly stop trains at the stop position.

(4) Apparatuses shall be a type for which the automatic operation mode is released when the brake equipment is handled.

[Ministerial Ordinance]

(Apparatus to Detect Trains, etc.)

Article 59 Apparatus to detect trains (limited to those needed from a safety standpoint) shall be able to detect trains without failure, by preventing an impediment caused by inductive interference, etc.

2. If the boundary is set for the area to be detected by the aforementioned apparatus to detect, the boundary shall be drawn at the location where there is no danger for trains to collide.

[Approved Model Specifications]

VII-6 Article 59 Related to (Apparatus to Detect Trains, etc.)

1 Train detection apparatuses on track circuits shall meet the following requirements:

(1) Apparatuses shall be a type implementing detection with the shunting between rails from the wheel sets of trains, etc.;

(2) Apparatuses shall be a type with normally closed circuits. However, in cases where there are facilities to be controlled by a track circuit so as not to hinder the safety of train operation when some problems occur in the said track circuit, the same does not apply;

(3) Apparatuses shall be a type in which there is no risk of problems related to electric currents such as the electric current in adjacent track circuits or return current;

(4) The position of a boundary point located at the beginning of the protection section of a main signal shall be located so as to coincide with the position of this signal. However, in cases where there are unavoidable reasons to do so, it may be located in a position within 9 meters inward of this signal or in a position within 2 meters outward thereof;

(5) Where points present, boundary points of the track circuit shall not be installed in the ranges listed below. However, in cases where it is not possible to conform to these provisions due to geographical circumstances, measures shall be taken to prevent collisions using interlock functions, etc., for interlocking devices.

[1] It shall be the opposite direction of the tongue rail from the vehicle contact limit related to points, and the range shall be within the lengths listed below.

(A) Regarding those where the shape of the frontmost car body of the train, etc., running on that point is linear to a direction perpendicular to the rail direction with that point, the length from the front portion of that train, etc., to the first car axle

(B) Regarding those where the shape of the frontmost car body of the train, etc., running on that point is not linear to a direction perpendicular to the rail direction with , the length from the vehicle contact limit at the point where the end portion of that train, etc., contacts the vehicle limit for other lines to the first car axle

[2] Where points present, the range shall be from the tip of tongue rail to the vehicle contact limit related to this point machine and the range of within 2 meters in front or behind.

[3] Range within 2 meters from the end of the tongue rail in the turnout front end direction

(6) In cases of crossing tracks, boundary points of the track circuit shall not be installed in the ranges listed below. However, in cases where it is not possible to conform to these provisions due to geographical circumstances, measures shall be taken to prevent collisions using

interlock functions, etc., for interlocking devices.

[1] Between vehicle contact limits related to the crossing

[2] The range before and after the range of [1] and within the lengths listed below

(A) Regarding those where the shape of the frontmost car body of the train, etc., running on that crossing is linear to a direction perpendicular to the rail direction, the length from the front portion of that train, etc., to the first car axle

(B) Regarding those where the shape of the frontmost car body of the train, etc., running on that crossing is not linear to a direction perpendicular to the rail direction, the length from the vehicle contact limit at the point where the end portion of the that train, etc., contacts the vehicle limit for other lines to the first car axle

2 Cross bonds, etc., to be connected to rails shall be located so that there is no risk of creating problems with track circuit operation.

3 Train detection apparatuses which do not depend on track circuits shall conform to the following standards:

(1) Apparatuses shall be a type for which there is no risk of problems related to induction, etc., of overhead contact lines or electrical devices of vehicles.

(2) Apparatuses shall be a type with no risk of detecting trains, etc., present in other sections.

(3) Boundary points located at the beginning of protection sections of main signals shall be positioned so as to be coincident with the position of the said signals. However, where unavoidable, they may be located in the following positions:

[1] In cases inward of main signals, boundary points shall be positioned within a distance equivalent to the minimum length of running vehicles.

[2] In cases outward of the said signal, boundary points shall be positioned within a range whereby the length from the head to onboard facilities is equivalent to the minimum length of running vehicles.

(4) Apparatuses shall have a configuration in which boundary points at the beginning of protection sections of main signals, the beginning of signal indication sections in sections using cab signals, or the beginning of train routes in sections of operation using apparatuses to ensure the interval between trains, are not located in the ranges listed below. However, in cases where it is not possible to conform to these provisions due to geographical circumstances, and only in cases where additional measures are taken to prevent collisions (such as the addition of interlock functions for interlocking devices), the same does not apply.

[1] Where points present, the range shall be from this point machine to the vehicle contact

limit related to it.

[2] In cases of crossing tracks, the range shall be between the vehicle contact limits related thereto.

[3] The range shall cover the area in front of and behind the ranges specified in [1] and [2], being within the length for which the distance from the head to on-train facilities is the maximum length of running trains.

(5) Apparatuses shall be a type indicating that a train, etc., is located on the track until the said train, etc., entering the section of train detection exits the section.

4 Notwithstanding the provisions of 3, train detection apparatuses to be located in sections of operation using automatic train controllers as prescribed in Approved Model Specifications 7 related to Article 54 shall conform to the following standards:

(1) Apparatuses shall be a type for which there is no risk of problems related to induction etc., regarding electrical devices of vehicles.

(2) Apparatuses shall be a type with no risk of detecting trains, etc., present in other sections.

(3) Apparatuses shall be capable of indicating that a train, etc., is located on the track until the said train, etc., having been detected by ground facilities located at the beginning of the detection section to detect incoming trains, etc., is detected by ground facilities located at the terminal of the section to detect outgoing trains, etc.

Section 2 Safety Communication Facilities

[Ministerial Ordinance]

(Safety Communication Facilities)

Article 60 In order to communicate or exchange information quickly to each other or among themselves, safety communication facilities shall be installed at station and halt, power substations, and traffic control centers , electric power dispatching stations and other location deemed necessary from the safety and train operational standpoints.

[Approved Model Specifications]

VII-7 Article 60 Related to (Safety Communication Facilities)

1 Safety communication facilities to be located between power dispatch stations and traffic control centers, between electric power dispatch stations and power substations (excluding monitored power substations), between traffic control centers and principal stations and between stations that handle blocks or hold preliminary discussions on the direction of train operation shall have dedicated lines.

2 Dedicated safety communication facilities shall be provided between traffic control centers and Shinkansen trains.

3 For main lines chiefly on railways with an underground or elevated structure, and for suspended railways and straddle-type monorails, guide-rail-type railways and levitated railways, dedicated safety communication facilities shall be provided to enable communication and reporting to power substations, electric power dispatch stations or traffic control centers from any train, etc.

[Ministerial Ordinance]

(Installation of Overhead Communication Line)

Article 61 Overhead communication lines shall be installed with an appropriate height, so as not to impair with other transportation movement.

2. Overhead communication lines shall be installed properly not to pose a hazard to people and other equipment, and at the same time to prevent the damages caused by electric mixture and lightening hazard.

[Approved Model Specifications]

VII-8 Article 61 Related to (Installation of Overhead Communication Line)

1 The height of overhead communication lines shall meet the following requirements:

(1) In the case of spanning a railway or a track, the height shall be not less than 6 meters above the rail top.

(2) In the case of spanning a road, the height shall be not less than 5 meters above the road surface. However, in cases where there is a low likelihood of obstruction to traffic, or when there are other special circumstances, this height may be reduced to 4.5 meters (2.5 meters above the footpath of the road in cases where a roadway and a footpath are divided).

2 At points where telephones are connected to overhead communication lines, safety devices shall be provided with respect to electric mixture with other electric wires, lightning damage, etc.

Section 3 Level Crossing Protection Facilities

[Ministerial Ordinance]

(Level Crossing Protection Facilities)

Article 62. Level crossing safety facilities shall be able to warn the danger of approaching train to people going across level crossings, and to block the street traffic into the crossing to secure the safety for both train and people. However, for those exceptional cases where the traffic volumes at the crossing is minimal or where it is extremely difficult from the technological standpoint to install the device to shut the street traffic, warning device of an approaching train suffices as protection.

2. Level crossing safety facilities shall take into consideration the train speed, traffic volume of both rail and road, the type of vehicles that go across the crossing and so on. If necessary, safety facilities shall include the device to let relevant trains, etc., be informed of any automobile interfering with the crossing.

[Approved Model Specifications]

VII-9 Article 62 Related to (Level Crossing Protection Facilities)

1 Level crossing safety facilities shall provide an automatic barrier machine. However, at level crossings where trains pass at speeds of not more than 130 kilometers per hour, in cases where there is minimal amount of traffic on the railway or on the road, or where there is significant difficulty for technical reasons in locating an automatic barrier machine, a crossing warning device may be used instead.

2 an automatic barrier machines and crossing warning devices shall conform to the following provisions:

(1) Devices shall give warnings to passers-by on both sides of the track.

(2) Devices shall be located on the left side facing the level crossing. However, in cases where there are unavoidable circumstances in light of the situation, etc., of facilities, the same does not apply.

(3) Two or more red flashing lamps shall be provided.

(4) The red flashing lamps outlined in (3) shall blink alternately in operation.

(5) The red flashing lamps outlined in (3) shall have a visibility range of not less than 45 meters (not less than 22 meters at level crossings where automobiles, etc., traveling on the road cannot approach at speeds exceeding 35 kilometers per hour due to geographical circumstances.

(6) A cross mark shall be provided.

(7) Devices shall be patterned with yellow and black stripes.

(8) A device to generate warning sounds shall be provided.

(9) A train direction indicator shall be provided at level crossings with two or more tracks.

(10) For overhung-type warning devices, red flashing lamps shall be located not less than 4.5 meters in effective height above the road surface at the level crossing.

3 The barrier device of an automatic barrier machine shall meet the following requirements:

(1) It shall be able to interrupt traffic entering the level crossing over the full width on both sides of the track.

(2) It shall be located on the left side facing the level crossing. However, in cases where there are unavoidable circumstances in light of the situation, etc., of facilities, the same does not apply.

(3) Barrier bars shall be as follows:

[1] At the time of interruption, bars shall be horizontal as standard at a height of 0.8 meters above the road surface (this shall be the height of the upper barrier bar in devices with two bars, measured from the lower barrier bar).

[2] Other than at the time of interruption, bars shall be not less than 4.5 meters in effective height above the road surface.

[3] Bars shall be patterned with yellow and black stripes.

[4] Two or more red flashing lamps or red reflective materials shall be provided in a position easily visible to passers-by.

[5] Barrier bars of large-scale barrier devices shall be not less than 0.1 meters in vertical length at the portion interrupting the carriageway on a level crossing at the time of interruption.

4 Automatic barrier machines shall operate as follows:

(1) Operation shall be automatically started upon the approach of a train, etc. However, for level crossings staffed with a crossing guard or those in or adjacent to stations (hereafter referred to as "manually controlled level crossings, etc."), the same does not apply.

(2) A continuous closed circuit system or a control system with equivalent or higher performance shall be used. However, for manually controlled level crossings, etc., the same does not apply.

(3) The time period from the start of a warning to the completion of interruption operation shall be 15 seconds as standard. In all cases, this period shall be not less than 10 seconds.

(4) The time period from the start of a warning to the start of interruption operation shall be such that there is no obstruction to the traffic of passers-by. In cases where barrier bars

are provided on both sides of the road, the barrier device on the right side facing the level crossing shall basically start interruption operation after the end of that by the barrier device on the left side facing the level crossing.

(5) The time period from the end of interruption operation to the arrival of a train, etc., shall be 20 seconds as standard. In all cases, this period shall be not less than 15 seconds.

(6) The time period from the start of a warning to the arrival of the train or vehicle shall not vary significantly depending on the speed, etc., of the said train.

(7) The operation of resetting the interruption state shall start after the train, etc., has passed.

(8) At level crossings where there is a risk of problems related to the over-running of trains, etc., interruption operation shall be ended with a time allowance before such trains, etc., can reach the level crossing due to over-run.

5 Crossing warning devices shall operate as follows:

(1) Operation shall be automatically started upon the approach of a train, etc. However, for manually controlled level crossings, etc., the same does not apply.

(2) A continuous closed circuit system or a control system with equivalent or higher performance shall be used. However, for manually controlled level crossings, etc., the same does not apply.

(3) The time period from the start of a warning to the arrival of the train, etc., shall be 30 seconds as standard. In all cases, this period shall be not less than 20 seconds.

(4) The time period from the start of a warning to the arrival of the train or vehicle shall not vary significantly depending on the speed, etc., of the said train.

(5) The warning shall stop after the train, etc., has passed.

6 When a fault is recognized at an automatic barrier machine or crossing warning device located at a level crossing, a staff member in charge shall be located at the level crossing, and alternative measures to warn passers-by shall be taken.

7 Crossing warning time period control device shall conform to the following requirements:

(1) It shall automatically control the start time of automatic barrier machine or crossing warning device (hereafter referred to as "automatic barrier machines") operation by identifying the type or speed of a train, etc.

(2) Those performing control in accordance with the provisions outlined in (1) by identifying the type or speed of a train, etc., shall be as follows:

[1] Speed shall be monitored at two or more positions.

[2] Monitoring positions other than that at the point farthest outward of the automatic barrier machine, etc., (i.e., the position for monitoring train speeds; hereafter, the same shall

apply) shall be those for which the automatic barrier machine, etc., can be operated with safety even when a train, etc., passes a monitoring position outward of this recognition position without operation of the automatic barrier machine, etc., and accelerates thereafter.

(3) There shall be no risk of problems with the operation of automatic barrier machines, etc., even in the event of a malfunction in the crossing warning time period control device.

8 Obstruction warning devices for level crossing shall conform to the following requirements:

(1) Devices shall be provided to indicate fusee signals, flashing light signals and alarm signals (hereafter referred to as "indication devices"). However, with types indicating a stop signal with respect to an adjacent main signal or cab signal, or types providing control information for indicating stop signals, the same does not apply.

(2) Devices shall be a type that can operate an indication device using an operation device or an obstruction detecting device.

(3) The fuses of fusee signals and the principal portions of other indication devices shall be redundant.

(4) Obstruction warning devices for level crossing provided with devices indicating fusee signals shall be a type that can indicate a stop signal with respect to an adjacent main signal or cab signal, a type issuing control information indicating a stop signal or a type indicating a fusee signal again.

9 The operation devices outlined in 8 (2) shall conform to the following requirements:

(1) Operation switches such as press buttons or switches shall be located at both sides of the track. However, at level crossings that are narrow due to location on a single track, or at those where a dedicated crossing guard handles switch operation, the operation switch on one side of the track may be omitted.

(2) Operation switches in accordance with (1) shall conform to the following requirements:

[1] They shall be located in the vicinity of the level crossing and at a point that allows easy handling.

[2] They shall have twin contact or an equivalent or higher level of performance.

[3] They shall have a holding function.

[4] They shall be easily recognizable even at night.

[5] There shall be clearly displayed handling instructions.

(3) Reset switches shall be provided. However, with switches that automatically reset the holding state upon the passing of a train, etc., the same does not apply.

(4) The reset switches outlined in (3) shall be a type that unauthorized people, i.e., those other than the person in charge, cannot easily operate.

10 The obstruction detecting devices outlined in 8 (2) shall conform to the following requirements:

(1) They shall use a closed circuit system or a control system with an equivalent or higher level of performance.

(2) In cases where an automobile (excluding two-wheeled vehicles) obstructs a level crossing, and a train, etc., comes close to this level crossing, the situation shall be automatically detected using light, electromagnetic waves or sound waves.

(3) Basic operation shall be performed with respect to automobiles (excluding two-wheeled vehicles) within the structure gauge of tracks at level crossings.

(4) Automatic resetting of indication device operation shall be performed once problems with respect to level crossings are resolved.

(5) Operation shall not be triggered by trains, etc., passing a level crossing.

Section 4 Miscellaneous Provision

[Ministerial Ordinance]

(Securing Safety When in Troubles)

Article 63 Those facilities to secure safe train operation shall be equipped with the function, according the performance characteristics of its electric equipment and circuit, not to interfere with safe train operations even at the time of failure.

[Approved Model Specifications]

VII-10 Article 63 Related to (Securing Safety When in Troubles)

Those facilities to secure safe train operation shall be equipped with the function, according the performance characteristics of its electric equipment and circuit, not to interfere with safe train operations even at the time of failure.

Chapter 8 Rolling Stock

Section 1 Rolling Stock Gauge

[Ministerial Ordinance]

(Rolling stock gauge)

Article 64. Rolling stock shall not exceed the rolling stock gauge. However, as far as safe vehicle operations can be secured it is exempted from the rule when it is equipped with some devices that cannot be used without violating the rolling stock gauge. These devices include obstacle deflector, crane and the equivalent.

[Approved Model Specifications]

VIII-1 Relating to Article 64 (Rolling stock gauge)

(Basic Items)

1. The railway operator shall establish the rolling stock gauge; the rolling stock shall not exceed the rolling stock gauge. In addition, the standard for the rolling stock gauge on a straight track is shown in Figure 4, 5 and 6. However, in a special railway (excluding the superconducting magnetic levitation railway), the necessary dimensions for unambiguously determining the shape corresponding to that application shall be defined.
2. The "rolling stock shall not exceed the rolling stock gauge" in 1 means the rolling stock shall not exceed the rolling stock gauge in the following conditions:
   (1) On a flat and straight track, the rolling stock (including the case with the worn wheels, etc.), is in the hold state with the center line of the carbody and bogie coincident with the center line of the track;
   (2) The loaded condition is between the empty condition and the maximum loaded condition;
   (3) The carbody and bogies are not tilting due to passengers or loaded cargo.
3. The relevant devices in the following table may, within the range of each condition, exceed the rolling stock gauge.

Railway Type	Devices	Conditions
Basic	Wheels, track lubricator	When devices are within the structure gauge

	Obstacle deflector	When flexible devices are within the structure gauge
	Doors (Including drop-down side doors on open freight wagons and emergency doors)	When opened
	Track measuring wheels, rail flaw detector, rail grinding equipment and structure gauge measuring equipment	When in use within structure gauge
	Snow plow equipment, cranes and other items similar to them	When in use
Normal conducting magnetic levitation railway	Brake shoes	When in use
Superconducting magnetic levitation railway	Contact power collector	When in use

4. The rolling stock gauge on a curve shall have the adequate values corresponding to the displacement of the rolling stock added to each side of the rolling stock gauge presented in 1. However, this rule does not apply to the superconducting magnetic levitation railways.

Section 2 Weight of Rolling Stock, etc.

[Ministerial Ordinance]

(Restrictions to tracks and structures)

Article 65. Rolling stock shall not impose the load that exceeds the capacity of track and structure.

[Ministerial Ordinance]

(Stability)

Article 66. Rolling stock shall be able to maintain a safe and reliable operation under any conceivable operational conditions including the track maintenance.

2. Rolling stock shall be of the stable structure that will not cause overturn in halt on a curved track.

[Approved Model Specifications]

VIII-2 Relating to Article 66 (Stability)

(Basic Items)

1. Rolling stock shall be capable of ensuring stable running even under the conditions indicated below:

(1) Passenger loading conditions, etc. (From empty to maximum loaded capacity) ;

(2) Running conditions (Running speed, acceleration, deceleration, etc.) ;

(3) Wheel wear, etc.;

(4) Weather conditions, such as wind, rain, etc. (however, they do not include the case of disaster).

2. Passenger vehicles for regular railways, freight vehicles using bogie having truck frames with the same high torsional rigidity as passenger vehicles for regular railways, two-axle freight vehicles with the same high torsional rigidity of carbodies for regular railways and vehicles having the same structure as these cars shall determine the appropriate ratio of static wheel load unbalance (the ratio of the wheel load acquired by actual measurement divided by one-half the axle load, when the vehicle is empty) (for two-axle freight vehicles and cars having the same such structure, the ratio of difference of the diagonal average wheel load acquired by actual measurement divided by the average wheel load), and shall be managed by this ratio. In addition, the rolling stock shall have a structure by which the adjustment of ratio of static wheel load unbalance can be easily performed.

3 The rolling stock, when stopped on a curved track, shall not be overturned by forces acting toward the inside of the curved track. Moreover, the rolling stock, when passing through a curve at high speed, shall not be overturned by forces acting toward the outside of the curved track.

(Trackless electric vehicle, Magnetically guided railways)

4 These shall be as shown below, without the basic items being applied:

(1) The total of the loads on the contact section of the steering wheels when the vehicle is in the empty or loaded condition shall be 20% or more of the empty vehicle weight or the loaded vehicle weight respectively. Moreover, this requirement shall be satisfied when the rolling stock is also in the coupled condition;

(2) When in the empty condition, the rolling stock shall not overturn when tilted up to 35 degrees to the right or left side respectively.

[Operation Notice]

8 Relating to Article 66 (Stability)

In Approved Model Specifications 2, "the appropriate ratio of static wheel load unbalance " shall be within 10% as the standard. However, even when the ratio shall be within 10% is difficult to achieve for existing rolling stock, the limit shall be within 20%.

Section 3 Running Gear of Rolling Stock, etc.

[Ministerial Ordinance]

(Running gear, etc.)

Article 67. Running gear, etc., shall comply with the following standards:

(1) The wheels of a running vehicle shall not damage the track;

(2) The axles shall be arranged appropriately without imposing any problem for a train to negotiate the curve of the minimum radius of the line on which it is supposed to run;

(3) The suspension system shall have sufficient capacity to withstand the shock from the track;

(4) The front part of the leading vehicle of a train shall be equipped with the device to remove any obstacle left on the top of the rails;

(5) In addition to the paragraphs prescribed above, the running gear, etc., shall be made robust with sufficient strength and shall be able to secure safe and stable vehicle operations.

[Approved Model Specifications]

VIII-3 Relating to Article 67 (Running gear, etc.)

(Basic Items)

1 The running gear, etc., shall have a structure with sufficient strength, rigidity, etc., to withstand applied loads, vibration, etc., and shall be able to secure safety in regard to rolling stock derailment, etc., and stability towards significant hunting motion, etc. In this case, "running gear, etc.," in addition to bogie devices, includes the following: obstacle deflectors (those attached to the bogie), suspension devices, guidance devices, stability devices, etc.

2 The wheelset arrangement and wheelset mounting structure and the structure of such other rolling stock parts shall be as follows:

(1) Shall be capable of passing through the minimum curve radius on the section of track to be traveled;

(2) Rolling stock having a wheelset structure with steering characteristics shall have anti-vibration characteristics;

(3) Shall be capable of passing through turnouts, check rails and other such guard rails, etc., without causing damage;

(4) The dimensions of the wheelbase of the rolling stock, wheels, etc., shall be as shown in the following table and shall meet these numerical values even when the wheels are worn. However, this does not apply when derailment will not easily occur owing to the structure of the rolling stock, track, etc.

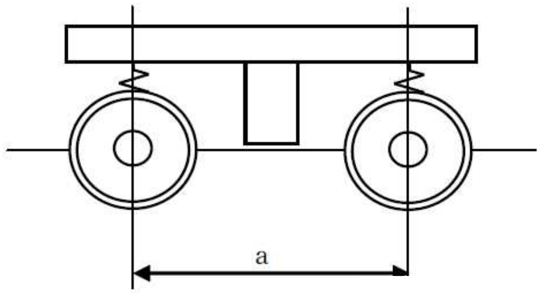
(Unit:Millimeter)

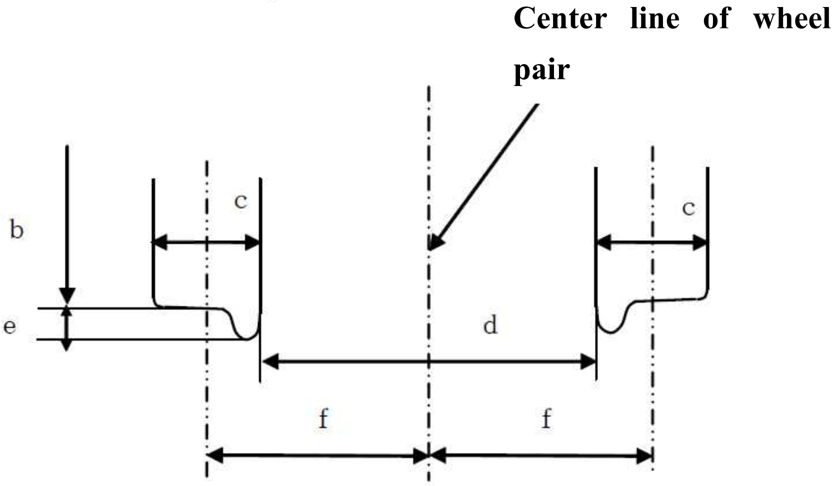
Type Type of Gauge Item	Regular Railways				Shinkansen
	762	1067	1372	1435	1435
a: Wheel base	3050 or less	4570 or less			3500 or less
b: Wheel diameter	400 or more	680 or more	680 or more	680 or more	730 or more
c: Wheel rim width	102 or more and 127 or less	120 or more and 150 or less	120 or more and 150 or less	120 or more and 150 or less	120 or more and 135 or less
d: Distance between inner surfaces of pair wheel rims	695 or more and 700 or less	989 or more and 994 or less	1296 or more and 1301 or less	1359 or more and 1364 or less	1358 or more 1363 or less
e: Tire Flange height	22 or more and 30 or less	25 or more and 35 or less			25 or more and 35 or less
f: Distance from center line of wheel pair to wheel tread	400	560	714	743	745

Note 1. On the Shinkansen, the distance from the center line of the wheel pair to the outer surface of the flange shall be 704 mm or more to 714 mm or less at 10 mm below the wheel tread at a distance of 745 mm from the center line of the wheel pair.

Note 2 The wheel diameter for linear motor propelled subway cars shall be 610 mm or more and 660 mm or less at the time of manufacture, with an operating limit of 570 mm or more.

Note 3: Refer to the following figures for details for a through f.





a: Wheel base

b: Wheel diameter

c: Wheel rim width

d: Distance between inner surfaces of pair wheel rims

e: Tire flange height

f: Distance from center line of wheel pair to wheel tread

3 The suspension devices shall have sufficient capacity and stability against shock from the track and when a suspension device with air springs is used, it shall be as follows:

(1) Air reservoirs with sufficient capacity shall be provided;

(2) The car body shall be safely supported even if an air leak of significantly affecting spring characteristics were to occur;

4 An obstacle deflector (including a snow plow, etc., that can remove an obstacle on the rail head), shall be the front part of the leading vehicle, and the gap between the bottom edge of the obstacle deflector and rail head shall be appropriate for enabling obstacles to be removed from the upper surface of the rail head.

(Suspended railways, straddle-type monorails, trackless electric vehicles, cable railways, levitation railways)

5 Shall be as shown in the Basic Items. However, the table in Basic Item 2, and Item 4 does not apply.

(Guide rail type railways)

6 Shall be as shown in the Basic Items. However, the table in Basic Item 2 does not apply.

[Superconducting magnetic levitation railways]

7 As shown in the basic items. However, basic items 1, 2 and 4 do not apply.

[Ministerial Ordinance]

(Power generation system, etc.)

Article 68. Power generation system, etc., shall conform to the facilities and shall be able to withstand the train operation.

2. The electrical equipment with electric circuits of the rolling stock shall conform to the following standards:

(1) Shall not pose any risk for insulation breakdown, electric shock caused by electric mixture, and fire;

(2) Shall not pose the obstruction caused by induction effect to other electrical equipment with electric circuits used for railway operation;

(3) Shall have the power collection equipment with the capability of following the overhead contact line;

(4) Shall be able to lower pantographs all together from the crew cabin. Can be exempted from this rule, however, for such exceptional cases like trains being hauled by multiple locomotives;

(5) Shall be free from fire hazard caused by the arcs from pantographs being lowered;

(6) Shall be free from the overheated combustion loss caused by the over current;

(7) Shall be able to maintain the safety of the circuit against the invasion of extraordinary high voltage;

(8) Shall be able to stop forcibly the power supply to the contact line in case of abnormality of the rolling stock running in the high voltage section.

3. Rolling stock engines with internal combustion and steam shall comply with the following standards:

(1) Shall be protected from the abnormal overheating by appropriate protective measures;

(2) In steam combustion, shall be able to prevent fire caused by sparks and ashes exhausted from engines;
(3) Shall have walls and floors, etc., installed to protect ignition caused by the heat of engine;
(4) Shall be equipped with fuel device capable of preventing fuel leak and ignition;
(5) Shall be equipped with exhaust pipes that has the structure capable of preventing risk to passengers and trouble to other equipment caused by the exhaust gas and heat.

[Approved Model Specifications]

VIII-4 Relating to Article 68 (Power generation system, etc.)

(Basic Items)

1 The power generation system, etc., shall conform to the facilities and shall have a structure that is capable of generating and transmitting sufficient power to satisfy operating conditions. In this case, the "power generation system" shall include all of the following devices:
(1) Devices that generate the power for travelling (in case they have electric braking device including electric braking force);
(2) Devices that transmit the power that has been generated;
(3) Devices that directly control the extent of the power to be generated;
(4) Current collection devices;
(5) Auxiliary power supply devices necessary for the generation of main power , such as auxiliary power supply equipment and auxiliary rotating equipment, etc.;
(6) Equipment electrically or mechanically connecting the above-referred devices.

2 The electrical circuits for the electric facilities for the rolling stock shall be as indicated below.
(1) The function and structure of the electric facilities (including electric wires) shall be as shown below:
[1] There shall be no risk of electrical shock or fire due to the breakdown of insulation, etc.;
[2] There shall be no risk of being easily touched by persons other than the operator;
[3] Electric wires shall be as shown below;
(a) Sections that may be damaged by sliding, vibration, etc., shall be protected.
(b) There shall be no risk of rain water entering into the service inlet ports and service outlet ports for protective piping and equipments.
(c) Wires with different voltages shall not be inserted into the same protective piping. However, this does not apply to the wiring in the said protective piping when the wires being used

have an insulating effect that is equal to or better than the standard for the insulated wire with the highest one of the voltages being applied to the said wires.

[4] There shall be no risk of other electric circuits being damaged by induction effect (limited to facilities provided for use by the railway operator and items provided on the rolling stock).

[5] The pantograph shall have the tracking performance for the contact line on the section of the electric railway where it will be used, and shall be as shown below.:

(a) On electric vehicles comprising a train, the pantograph shall be capable of being completely lowered all together by an operation from the crew cabin;

(b) The mounting part for the pantograph on passenger trains operating on sections of track electrified by direct current shall have double insulation;

(c) The pantograph on rolling stock collecting extremely high-voltage alternating current (voltage exceeding 7000 V, hereinafter the same) shall be capable of being raised by mechanical force, such as by springs. Here, mechanical force includes that generated by pneumatic pressure;

[6] Rolling stock collecting extremely high voltage alternating current shall not be capable of lowering the pantograph without turning off the main circuit. However, this does not apply to the lowering of some of the pantographs when there are multiple pantographs connected by a bus line.

(2) The following devices shall be provided on the main circuit:

[1] An automatic circuit breaker and a manually operated cut-off switch capable of maintaining the circuit in the open position shall be provided near the current collector device (the battery in the case of battery locomotives and battery railcars. However, this does not apply to rolling stock receiving its power supply by way of the said circuit from another car having a circuit provided with the automatic circuit breaker and cut-off switch. Furthermore, the cut-off switch may be eliminated from rolling stock which collects extremely high voltage alternating current;

[2] Electric locomotives, etc., equipped with pantographs (however, excluding trackless electric vehicles (trolley buses)) shall be provided with an arrestor at a location near the pantograph;

[3] Electric locomotives, etc., operating on sections of track where the electric system and/or the standard voltage used on the route differs from that on other sections of track shall be equipped with a device at a position near the current collector to protect the electrical

equipment when entering a section of track where the electric system and/or the standard voltage used on the route differs.

(3) The main circuit for rolling stock collecting extremely high voltage alternating current shall be equipped with a protective grounding switch at a position near the pantograph.

(4) The following devices shall be provided on the power supply side of electric circuits other than the main circuit:

[1] Fuses (including non-fused circuit breakers, etc., having equal or greater performance.) However, this excludes rolling stock receiving its power supply by way of the said circuit from another car having a circuit equipped a fuse;

[2] Switches on power supply circuits for electric conversion devices such as electric generators, static inverters, etc., and motors for pneumatic compressors, etc. However, excluding the power supply circuits for electric motors, etc., of air compressors receiving their power supply from electric power conversion devices equipped with switches.

3 The engines, etc., for rolling stock shall be as shown below:

(1) A device that stops the engine when the lubricating oil pressure drops shall be provided;

(2) A device that stops the engine or unloads to the engine when the coolant water temperature rises shall be provided;

(3) The fuel tank and its piping shall, as far as possible, have a structure that prevents leakage from the piping, etc. (This means a structure in which the lubricating pump is installed inside the oil pan, a structure in which the oil pressure switches and oil pressure sensors are installed directly to the engine and a structure that minimizes other external piping, etc.);

(4) The fuel pouring port and gas vent of the fuel tank shall be of a structure such that fuel will not leak due to the pitching of the rolling stock, shall be isolated from the opening of the exhaust pipe and equipment that can generate arcing, and shall not open to the inside of the vehicle.

(5) The exhaust pipe shall not be laid inside the passenger room. However, this does not apply when a protective plate or other such measures have been taken.

(6) The contact or the emission of exhaust gas etc., shall not ignite a fire in the internal combustion engine locomotive or its cargo, etc., and shall not impede the function of the brake equipment, electric equipment, etc.;

(7) Vehicles used under conditions where there is a risk that the exhaust pipe may overheat, such as vehicles that are required to idle for extended duration of time and vehicles that are used on sections with continuous gradient, etc., does be equipped with an oil bath and drain plug at the bottom of the silencer. However, this does not apply to the vehicles,

manufactured prior to April 1, 1990, that do not remodel their exhaust pipes, etc.;

(8) Vehicles in (7) above shall be provided with a device for detecting the temperature of exhaust gas. (This means that a device for indicating when the temperature of the exhaust pipe has become abnormally overheated shall be provided in the crew cabin.) However, this does not apply to the vehicles manufactured prior to April 1, 1990;

(9) Fuel devices using compressed natural gas as fuel shall be as shown below;

[1] Gas containers, excluding those mounted outside the carbody, shall be separated from a passenger room for sitting or standing passengers by an airtight bulkhead, and shall be mounted at a location well-ventilated to the outside of the carbody;

[2] Gas containers and piping shall be securely mounted so as to prevent movement and damage; sections that may be damaged shall be protected by the appropriate covering;

[3] For gas containers and piping that could be significantly affected by heat from the exhaust pipe, silencer, etc., an appropriate heat-resistant device shall be provided;

[4] The piping shall be fiber-reinforced resin piping, annealed steel piping or copper piping. However, oil-resistant rubber piping may be used for low-pressure sections;

[5] Piping fixed at both ends (excluding oil-resistant rubber piping) shall be bent at a suitable section midway, and shall be supported within every one meter of length;

[6] High-pressure gas piping shall bear 1.5 times the gas charging pressure of the gas container;

[7] The main stop valve shall be provided at a location that is easy for the crew to operate; the gas charge valve shall be located near the gas charging port;

[8] A pressure gauge indicating the input port pressure of the first reduction valve shall be provided;

[9] A safety device that can effectively prevent a substantial rise in pressure on the low-pressure side shall be provided. However, this does not apply to a final reduction valve on the low-pressure side that releases to atmospheric pressure;

[10] Safety devices shall be mounted so as to not to spout gas into the vehicle.

(Steam locomotives)

4 The items other than those shown in the Basic Items shall be as shown below:

(1) Two or more independently operating water-supply units and two or more safety valves shall be provided on the boiler;

(2) Two or more separate and independent water-level gauges shall be provided on the boiler.;

(3) A melt-activated plug shall be provided on the ceiling panel of the firebox.;

(4) A pressure gauge that indicates the maximum operating pressure shall be provided.;

(5) Braces in the firebox, except for those at the top, shall be provided with a device for which

all damages can be detected from the outside.;

(6) Devices that prevent sparks and cinders from scattering shall be provided in both the fire chamber and ash box on steam locomotives.

(Trackless electric vehicles (Trolley buses))

5 The items other than those shown in the Basic Items shall be as shown below:

(1) The mounting position of the trolley pole shall be at a height of 3.2 meters or more from the contact surface of the wheels;

(2) The trolley pole shall enable the vehicle to deviate 2.5 meters or more in horizontal distance from directly below the overhead contact line;

(3) The trolley pole shall have a safety device for the case when it separates from the contact line;

(4)The mounting section of the trolley pole shall be double insulated;

(5) The trolley pole shall have the tracking performance that corresponds to the contact line.

(Linear motor railways, Normal conducting magnetic levitation railways)

6 In addition to the Basic Items, the onboard facilities for the power generation system shall not generate the power that exceeds the maximum design power of the wayside facilities.

[Superconducting magnetic levitation railways]

7 As shown in the basic items. However, basic items 1 (only (2) and (3)), 2 ((1) 5) and 6), (2) and (3)) and 3 do not apply.

[Ministerial Ordinance]

(Brake device)

Article 69. Rolling stock shall be equipped with the brake devices that comply with the following standards:

(1) Shall be able to decelerate or stop the rolling stock without failure;

(2) Shall be applied to the consisted vehicles in conjunction with the control from the crew cabin; (This does not apply to the vehicle used exclusively for shunting and other special vehicles. The same applies to the item 5.)

(3) Shall be free from failure caused by vibration, impact and other factors;

(4) Shall be able to apply braking force continuously;

(5) Shall be applied automatically at the time when consisted vehicles are separated ;

(6) Shall be able to bring a train to a rapid stop. This does not apply, however, to special vehicles;

(7) Shall be able to prevent the vehicle from departing when the braking effort would be adversely affected without securing the braking power supply source. This does not apply, however, to a steam locomotive with a warning device, etc. installed.

2. In addition to the aforementioned devices , rolling stock shall also be equipped with the braking devices that comply with the following standards:

(1) Shall be capable of preventing rolling of the parked vehicles from moving and complying with the previous item (3). This does not apply, however, for those cases when a rolling stock is prevented from rolling by being fixedly coupled to other rolling stock;

(2) Shall be equipped with independent braking capability that can be utilized when the brake devices mentioned in the previous paragraph would fail and can also satisfy the standards of the item (1), (3) and (4) of the previous paragraph. However, locomotives, passenger car (limited to passenger coaches), freight vehicle (limited to freight wagons and baggage cars) and special vehicles are exempted from this rule.

[Approved Model Specifications]

VIII-5 Related to Article 69 (Brake device)

(Basic Items)

1. The types of rolling stock brake devices are as shown below and brake device corresponding to the type of rolling stock as shown in the following table shall be provided.

(1) "Service brake device" is the brake device usually used for braking the rolling stock during operation and it has a function that enables the rapid stopping of the rolling stock during

operation.

(2) "Parking brake device" is the brake device for preventing the parked rolling stock from rolling.

(3) "Security brake device" is the brake device usually used for braking the rolling stock during operation when the service brake device has failed.

<table>
<tr><td colspan="3" rowspan="2">Type of Rolling Stock</td><td colspan="3">Type of Brake device To be Necessarily Provided</td><td>Notes</td></tr>
<tr><td>Service</td><td>Parking</td><td>Security</td><td></td></tr>
<tr><td colspan="3">Locomotive</td><td>○</td><td>○</td><td></td><td></td></tr>
<tr><td rowspan="5">Passenger vehicle</td><td colspan="2">Shinkansen</td><td>○</td><td></td><td></td><td>1</td></tr>
<tr><td rowspan="2">Electric vehicles , Internal combustion railcars</td><td>Without cab</td><td>○</td><td></td><td>○</td><td></td></tr>
<tr><td>With cab</td><td>○</td><td>○</td><td>○</td><td>2</td></tr>
<tr><td rowspan="2">Passenger cars</td><td>Caboose</td><td>○</td><td>○</td><td></td><td></td></tr>
<tr><td>Other than above</td><td>○</td><td></td><td></td><td></td></tr>
<tr><td rowspan="5">Freight vehicles</td><td rowspan="2">Baggage cars</td><td>Without cab</td><td>○</td><td></td><td></td><td></td></tr>
<tr><td>With cab</td><td>○</td><td>○</td><td></td><td></td></tr>
<tr><td colspan="2">Freight wagons</td><td>○</td><td>○</td><td></td><td>3</td></tr>
<tr><td rowspan="2">Electric motored freight vehicles , Internal combustion freight vehicles</td><td>Without cab</td><td>○</td><td></td><td>○</td><td></td></tr>
<tr><td>With cab</td><td>○</td><td>○</td><td>○</td><td>2</td></tr>
<tr><td colspan="3">Special vehicles</td><td>○</td><td></td><td></td><td></td></tr>
</table>

Note 1: Shinkansen shall have two or more independently acting brake command systems.

Note 2: When the security brake can prevent the parked rolling stock from rolling, the parking brake can be eliminated.

Note 3: The parking brake can be eliminated on a parked freight wagon that is capable of preventing rolling by means of the parking brake device on fixed-coupled another freight wagon.

2. There shall be no risk that vibration, shock, etc., will impede the operation of the equipment, piping and braking function of the brake device on the rolling stock.

3. The function and performance, etc., of the service brake shall be as shown below:

(1) The service brake shall be capable of decelerating the traveling rolling stock, stopping it and maintaining it in the stopped condition.;

(2) There shall be a function that applies braking force to all wheels of the rolling stock. However, this excludes the leading and trailing wheels of a locomotive and some wheels on special vehicles, etc.;

(3) The braking force shall be according to the brake ratio and shall satisfy the values in the following table that correspond to the type of rolling stock.

	Type of rolling stock	Loaded car brake ratio
1	Locomotives (excluding (2)), passenger vehicles and freight wagons, (limited to electric motored freight wagons and internal combustion freight wagons)	70/ 100 or more
2	Steam locomotives, (limited to when the maximum speed setting enables to stop in a distance of 600 m or less by the emergency brake)	50/ 100 or more
3	Other rolling stocks	25/ 100 or more

Note 1: The loaded vehicle brake ratio means the ratio of total force acting on the brake shoes to the weight of the loaded vehicles.

Note 2: The brake ratio shall be calculated by the friction coefficient of cast iron brake shoe.

(4) On the locomotives provided with driving cabs both in the front and in the rear (of the crew cabins, this is defined as the cabin stationed by the person who drives the motive power vehicle and performs the control of powering, braking, etc. Hereinafter the same.), there shall be a structure that will not enable to depart when braking force cannot be obtained on the cab at the side of being operated.

(5) When the air is used as the source of operating power, the following shall apply:

[1] The air tank shall have the capacity for storing sufficient pressure for braking;

[2] When there is the risk that a reduction in pressure in the main air reservoir or a reduction in pressure in the brake piping will impede the braking effect, there shall be structure that will not enable departure. However, this does not apply when a warning device is provided on

steam locomotives;

[3] The equipment and air piping (except being installed in the interior, hereinafter the same) in the section from the final air tank (including the check valve on the main air reservoir side, hereinafter the same) used to supply braking force to the brake cylinders shall be arranged within the width of the bogie (including the bolster anchor and other main parts provided on the bogie). However, this does not apply when the equipment and air piping is protected by some means having suitable strength;

[4] On the rolling stock having a driving cab, the equipment and brake piping in the section from the final air tank, serving as the supply for braking force for the cab that will become the front part of the leading vehicle of a train, to the brake cylinder shall be arranged to the inside of the front end of the underframe. However, this does not apply when the equipment and air piping is protected by some means having suitable strength.

(6) When the hydraulic pressure is used as the source of operating power, the following shall apply:

[1] The accumulator shall have the capacity for storing sufficient pressure for braking.;

[2] When there is the risk that a reduction in pressure will impede the braking effect, there shall be a structure that will not enable departure.;

[3] In the driving cab, it shall be possible to confirm that the supply source for the braking force of rolling stock is normal;

[4] The equipment and hydraulic piping (except being installed in the interior. Hereinafter the same .) in the section from the final accumulator used to supply braking force to the brake cylinders shall be arranged within the width of the bogie (including the bolster anchor and other main parts provided on the bogie). However, this does not apply when the equipment and air piping is protected by some means having suitable strength;

[5] On the rolling stock having a driving cab, the equipment and brake piping in the section from the final accumulator serving as the supply for braking force for the cab that will become the front part of the leading vehicle of a train to the brake cylinder shall be arranged to the inside of the front end of the underframe. However, this does not apply when the equipment and air piping is protected by some means having suitable strength.

4. The function and performance, etc., of the parking brake device shall be as shown below:

(1) "Parking brake device" shall have performance that is equal to or higher than the manual brake device, car side brake device and others that are used for preventing the parked rolling stock from rolling;

(2) The braking force shall be according to the brake ratio and shall satisfy the values in the

following table that correspond to the type of brake.

	Type of brake	Empty vehicle brake ratio	Loaded vehicle brake ratio	Calculation conditions
1	Hand brake device (Except when (2))	20/100		The force for operating the handle shall be 294 N for a handle operated by one hand and 441 N for handle operated by both hands. Braking leverage shall be 1200 or less.
2	Hand-operated brake device (Limited to when the hand brake device and the hand-operated gear is intended for preventing rolling, when a steam locomotive is parked,)	5/100		
3	Vehicle side brake device		6/100	The effort for operating the vehicle side brake device shall be 980 N and the braking leverage shall be 15 or more.

Note 1: The empty vehicle brake ratio means the ratio of total force acting on the brake shoes to the weight of the empty vehicle.

5. The function and performance, etc., of the security brake device shall be as shown below:

(1) The security brake device shall stop the traveling rolling stock when the service brake device has failed and shall be capable of maintaining the stopped condition for the necessary period;

(2) It shall automatically activate when the service brake device has failed. However, this does not apply when the operating device for the said device is provided in the driving cab and conductor's cabin (this means a crew cabin other than the driving cab for 3 (4). Hereinafter the same.);

(3) The braking force shall correspond to the empty vehicle brake ratio of 70/100 or more;

(4) When the air is used as the source of operating power, the following shall apply;

[1] The air tank shall have the capacity for storing sufficient pressure for braking;

[2] The equipment and air piping in the section from the final air tank serving as the supply source for braking force to the brake cylinder shall, as far as possible, be independent from other equipment and air piping;

[3] The equipment and air piping in the section from the final air tank serving as the supply source for braking force to the brake cylinder shall be arranged to the inside of the width of the bogie frame. However, this does not apply when the equipment and air piping is protected by some means having suitable strength;

[4] On the rolling stock having a driving cab, the equipment and brake piping in the section from the final air tank serving as the supply for braking force for the cab that will become the front part of the leading vehicle of a train to the brake cylinder shall be arranged to the inside of the front end of the underframe. However, this does not apply when the equipment and air piping is protected by some means having suitable strength.

(5) When the hydraulic pressure is used as the source of operating power, the following shall apply;

[1] The accumulator shall have the capacity for storing sufficient pressure for braking;

[2] The equipment and hydraulic piping in the section from the final accumulator serving as the supply source for braking force to the brake cylinder shall, as far as possible, be independent from other equipment and air piping;

[3] The equipment and brake piping in the section from the final accumulator serving as the supply for braking force to the brake cylinder shall be arranged to the inside of the width of the underframe. However, this does not apply when the equipment and air piping is protected by some means having suitable strength;

[4] On the rolling stock having a cab, the equipment and brake piping in the section from the final accumulator as the supply for braking force for the cab that will become the front part of the leading vehicle of a train to the brake cylinder shall be arranged to the inside of the front end of the underframe. However, this does not apply when the equipment and air piping is protected by some means having suitable strength.

6. A continuous brake for rolling stock shall be provided on the brake device for coupled and operated rolling stock (excluding rolling stock being coupled and operated when performing dedicated shunting, and special vehicles), and its functions shall be as shown below:

(1) The continuous brake shall act with being interlocked by operation from a crew cabin in the consisted rolling stock.;

(2) The brake shall act automatically when the consisted rolling stock is separated;

(3) When coupling the rolling stock provided with brake devices, there shall be coupling of the main air tank piping (when there is no main air tank piping, the brake pipe). However, this does not apply if it is possible to confirm in the driving cab that the pressure in the main air reservoir of all the rolling stock in the consisted train is normal.

7 The brake functions for rolling stock operated with a single vehicle that has driving cabs at both ends shall be as shown below:

(1) The brake device for passenger electric vehicles and for passenger internal combustion vehicles that have drivingcabs on both ends and travel as a single vehicle shall have one of the following structures in addition to the stipulations in 1 through 6. However, this does not apply to rolling stock manufactured prior to March 13, 2002 and without major modifications undergone;

[1] Two sets of independent brake systems shall be provided for the section from the air tank supplying the source of the braking force for the air brakes for the service brake device and the security brake device to the brake cylinder;

[2] There shall be dual air tanks and check valves for the security brake device, and by arranging the check valves so that they are on the right and left of the rolling stock it shall be possible to ensure the brake function of either the front or rear bogie;

[3] By using some method such as rail brakes other than air brakes, it shall be possible to ensure performance of 35/100 or more at the empty vehicle brake ratio when the service and security brakes have failed, and it shall be possible to maintain the rolling stock in the stopped condition.

(2) For the rolling stock in the notes (1), appropriate measures shall be taken so that brake function is not impeded, such as protecting the necessary part of the brake equipment and piping by protective covers, etc.

(Shinkansen (excluding superconducting magnetic levitation railways))

8 Other items in addition to those shown in the Basic Items are as shown below. However, in addition to reading brake ratio in Basic Item 3 (3) as deceleration, 3 (5) [3] and [4], and 3 (6) [4] and [5] do not apply:

(1) Shall have two or more independently acting brake command systems;

(2) The braking force shall be according to the deceleration and the deceleration shall satisfy the values higher than those shown in the following table. Furthermore, for locomotives, this shall be in the working state condition. For rolling stock other than locomotives, this shall be in the empty vehicle condition.

Speed (Unit: km/h)	Deceleration (Unit: km/h/s)
Exceeding 230	1.5
Exceeding 160 and not more than 230	1.9
Exceeding 110 and not more than 160	2.5
Exceeding 70 and not more than 110	3.1
Not more than 70	3.4

(Suspended railways ,straddle-type monorails, guide type rail of railways)

9 Items other than those shown in the basic items shall be as shown below. However, Basic Item 3 (limited to(5) [3] and [4], (6) [4] and [5]), and Basic Item 5 (limited to (4) [3] and [4] and (5) [3] and [4]) do not apply. On a guide rail type of railway, the brake device shall have the structure and performance to operate without losing guidance operation performance.

(Trackless electric vehicles)

10 In addition to applying Basic Item 2 and 6, the following do also apply:

(1) A main brake device (this means the brake device normally used for braking the rolling stock during operation, hereinafter the same) and an auxiliary brake device (this means the brake device used for preventing parked rolling stock from rolling, hereinafter the same) , each independently applied, shall be provided on the rolling stock.;

(2) The main brake device shall conform to the following standards;

[1] It shall have the structure and performance to operate without losing steering performance;

[2] It shall have a function that applies braking force to half or more of the wheels of the rolling stock, including the rear wheels;

[3] It shall have a function to apply brake force to two or more wheels even when there is failure occurring on parts of the piping (excluding the common parts to the two or more wheels, hereinafter the same except [5] (b)). However, this does not apply to the rolling stock provided with emergency brake devices (this means a brake device capable of applying brake force to two or more wheels of rolling stock in operation, when the main brake device has failed);

[4] It shall have the performance to stop rolling stock in the loaded condition within 14 m at a speed of 35 km/h on dry, flat and paved surface. In this case, the control force of the driver shall be 880 N or less, with the weight of a single crew member and a passenger being respectively 55 kg;

[5] The following shall apply to a brake device operated by liquid pressure:

(a) A buzzer or other such device shall be provided to warn the operator in the driver's seat when leakage of brake liquid from the piping has caused an impediment to the braking effect. However, this does not apply to the rolling stock in the proviso to [3];

(b) The function of the said brake device shall not be lost due to the brake fluid by corroding the piping, or foaming due to the heat from traction motors, etc.

[6] A brake device operating by air pressure or vacuum pressure shall have the capacity to store sufficient pressure for braking, and a buzzer or other such device shall be provided to warn the operator in the driver's seat when a change of pressure has caused an impediment to the braking effect. However, this does not apply to a brake device that has a structure complying with the standard in [4], even when that pressure becomes zero;

(3) The auxiliary brake device shall conform to the following standards:

[1] When the operator is not in the driver's seat, it shall have the performance to enable to maintain the rolling stock in the empty condition in stopped state on a dry paved surface with a 1/5 gradient by mechanical action of the auxiliary brake. In this case, the control force of the driver, for foot-operated types, shall be 880 N or less, and 490 N or less, for hand-operated types;

[2] The standards in [1] shall also apply when rolling stocks in the empty condition are coupled.

[Cable Railways]

11 In addition to applying Basic Items 2 and 6, the following shall also apply:

(1) An automatic brake device (this means a brake device that is used for braking the rolling stock when a cable breaks, or when there is significant slack in the cable, or when the operating speed becomes significantly higher. Hereinafter the same.) and a parking brake device that are each independently applied shall be provided;

(2) The automatic brake device shall conform to the following standards:

[1] It shall be automatically applied when a cable breaks, when there is significant slack or when the operating speed has become significantly higher;

[2] It shall be possible to operate the brake in the crew cabin at the front and rear of the rolling stock (when the rolling stock is coupled, this is the front end of the rolling stock that will become the front section of the leading vehicle and the rear end of the rolling stock that will become the rear section of the rearmost car of a train);

[3] It shall be capable of securely grasping the rail at two or more places for each rolling stock;

[4] The contact pressure between the brake shoe and the rail shall be 39 MPa or less;

[5] The application shall start by the time when the speed of the rolling stock exceeds 4 m/s;

[6] A rolling stock in the loaded condition shall be capable of stopping on the steepest gradient

on the route within 3.5 m. In this case, the weight of a single crew member and a passenger shall be respectively 60 kg;

[7] There shall be such a device provided that automatically acts the emergency brake device of the main driving facility in case of application;

[8] The following shall apply for the air brake device:

(a) The air tank shall have the capacity for storing sufficient pressure for braking;

(b) Equipment and air piping in the section from the final air tank serving as the supply source for braking force to the brake cylinder shall, as far as possible, be independent from other equipment and air piping;

(c) The pressure of the compressed air in the main air reservoir shall maintain the minimum effective pressure for 24 hours or more;

(d) A device shall be provided that automatically applies the emergency brake device for the main driving facility if the pressure of the compressed air becomes less than the minimum effective pressure .

(3) The parking brake shall be capable of maintaining the loaded rolling stock in the loaded condition in the stopped condition on the steepest gradient on the route by mechanical action.

[Normal conducting magnetic levitation railways]

12 Items other than those shown in the basic items shall be as shown below. However, Basic Item 3 (limited to (2) (3) and (4), (5) [3] and [4],(6) [4] and [5]) and Basic Items 4 and 5 (limited to (3), (4) [3] and [4] and (5) [3] and [4]) do not apply:

(1) The brake device shall have the structure and performance to act without losing levitation performance and guidance performance;

(2) The deceleration speed of the service brake device and the security brake device shall be 3.4 km/h/s or more when the rolling stock is in the empty condition and levitating;

(3) The service brake device shall automatically operate if the following occurs:

[1] If the main power supply to the levitating device and guidance device is interrupted;

[2] If the levitation gap and guidance gap required for safe travel cannot be attained;

(4) When the stipulated deceleration cannot be assured by the electric brake alone, there shall be other brake devices (limited to service brakes) having the function to ensure the said deceleration by means of automatic application;

(5) The parking brake shall be capable of maintaining the loaded rolling stock in the loaded condition in the stopped condition on the steepest gradient on the route by mechanical action.

[Superconducting magnetic levitation railways]

13 Based on the basic items as well as the followings. However, the “brake ratio” in basic item 3 (3) shall be read “deceleration” while “Driver cabin” in 3 (6) 3) shall be read “Crew cabin and traffic control center.” Furthermore, basic items 3 (only (4), (5) 3) and 4), and (6) 5)), 4, 5, 6 (only (1)) and 7 are not applied.

(1) Shall have two or more independently acting brake command systems.

(2) The braking force shall depend on the deceleration, which shall be the values shown in the table below or more. It shall be assumed that the train is in a tunnel and loaded.

Velocity: V (Unit: km/h)	Reduction degree (Unit: km/h/s)
Exceeding 300	0.0055V-1.25
Higher than 150 but not exceeding 300	-0.02733V+8.6
150 or less	4.5

(3) With regard to the train operation speed defined in interpretation criteria 2 (4) 1) relating to Article 54, if it is not possible to control the train velocity only by using the regenerative brake, there shall be a function used for ensuring the deceleration defined in the previous paragraph by automatically activating the other brake devices (only brake devices categorized as service brake) according to the function defined in interpretation criteria 2 (4) 4) relating to Article 54.

(4) The brake devices of consisted vehicles shall be activated in conjunction with each other.

Section 4 Carbody Structure and Rolling Stock Devices

[Ministerial Ordinance]

(Carbody structure)

Article 70. The carbody of rolling stock shall be made sturdy with enough strength and be capable of withstanding train operation.

[Approved Model Specifications]

VIII-6 Relating to Article 70 (Carbody structure)

(Basic Items)

The carbody of rolling stock shall have sufficient strength, rigidity and durability to withstand the anticipated loads, etc., to the carbody during normal operation.

[Ministerial Ordinance]

(Structure for reducing severe noise)

Article 71. Rolling stock to be used by Shinkansen shall be of the structure to abate the severe noise generated from high-speed running. However, the rolling stock used for accident recovery, testing of facilities, and inspection or maintenance is exempted from this standard.

[Approved Model Specifications]

VIII-7 Relating to Article 71 (structure for reducing severe noise)

(Shinkansen)

Shinkansen rolling stock shall have a structure that takes the prevention of substantial noise during the running of the train into consideration, such as modifying the pantograph, smoothing of the carbody, reducing weight, in order to reduce the pantograph noise, aerodynamic noise and structure-born noise from structural items.

However, the rolling stock that have a different structure than normally operated rolling stock, such as rolling stock that is used for inspection and maintenance and rolling stock used for recovery from accidents, etc., which must ensure this operability, etc., and which do not run on a regular basis, are exempt from the stipulations of this standard. However, track testing cars and electric testing cars that run at the same speeds as revenue-service trains during revenue service time shall strive to take noise-reduction countermeasures into consideration to the extent that they does not affect the items being tested.

[Ministerial Ordinance]

(Crew cabin structure)

Article 72. The crew cabin shall be separated from passengers in order for the driver not to be disturbed, and shall be provided with necessary entrance , exit as the train operation is not interfered with. This does not apply, however, to a crew cabin of a special vehicle.

2. The window of crew cabin shall be able to provide the view necessary for driving. The front window shall also have sufficient strength to protect a driver from gravel, wind pressure and other objects. This does not apply, however, to a crew cabin of a special vehicles.

[Approved Model Specifications]

VIII-8 Relating to Article 72 (Crew cabin structure)

(Basic Items)

1 The crew cabin structure shall be as shown below (excluding special vehicles):

(1) The crew cabin shall be partitioned from the passenger room;

(2) Notwithstanding (1), driving cabs that may not be stationed by a crew member shall have a structure that provides a partition with doors, etc., so that passengers cannot easily contact the equipment provided in the cab, or shall have a structure whereby the same devices, etc., can be mechanically or electrically locked;

(3)The exterior entrance/exit for the crew cabin shall be as shown below:

[1] An exterior entrance/exit for the crew shall be provided. However, this does not apply to the rolling stock that enables the crew to easily enter/exit through the passenger room , etc;

[2] The door of an entrance/exit on the side of rolling stock shall be an inward-opening hinged door or a sliding door. However, an outward-opening door may be used only for the driving cab, when a device is provided to indicate that the door is open. When an outward-opening door is used, a clearance of 75 mm or more shall be maintained between the opened door and the structure gauge;

(4) On passenger cars having a crew cabin, an entrance/exit with a sliding door or hinged door structure shall be provided between the crew room and passenger room, etc. In this case, when a hinged door is to be used for evacuation in the event of emergency, it shall open into the crew cabin, or be capable of opening in both directions.

2 Crew room windows shall be as shown below:

(1) A window having the necessary visibility for operation shall be provided on the front surface of the driving cab and a wiper device, etc., shall be provided to ensure visibility during rain, etc.;

(2) The glass, or other material having equal or better performance, that can withstand the wind pressure due to the operating speeds and climatic conditions, that can ensure operator’s visibility even when damaged by a small stone, bird or other flying objects, and that cannot be easily penetrated, shall be installed in this window. In this case, JIS R 3213(Safety glass for railway rolling stock) laminated glass, is an examples of conforming glass that cannot be easily penetrated;

(3) Windows necessary for operation shall be provided on both sides of the crew cabin. In this case, the both side windows (when the conductor's room is provided on one side of the rolling stock, the said side) that are to be used by the conductor shall be capable of being opened and closed.

(Trackless electric vehicles)

3 Shall be according to the Basic Items. However, this does not apply to 1 (3) [2], (4) and 2 (3) (limited to windows used by the conductor).

[Cable Railways]

4 Shall be according to the Basic Items. However, in addition to reading "necessary for operation in 2 (1)" as "necessary for forward confirmation," 2(2) and (3) do not apply.

[Superconducting magnetic levitation railways]

5 Based on the basic items. However, “Driver cabin” in basic item 1 (2) shall be read “Crew cabin” and basic items 1 (only (3) 2)) and 2 are not applied.

[Ministerial Ordinance]

(Passenger room structure)

Article 73. Passenger rooms shall comply with the following:

(1) Window of passenger vehicle shall have sufficient strength, and when open, shall be free from the chance of contacting other facilities or endangering passengers to fall out;

(2) Passenger rooms shall be capable of required ventilation;

(3) Lightening facilities shall be installed for operation at night or in tunnels to keep passenger rooms properly illuminated even at the time of emergency;

(4) Aisles shall provide safe and smooth passage of passengers;

(5) Seats or standing spaces for passengers shall secure safety, taking the motion of the train into consideration.

(6) Toilets shall be provided as needed.

(7) In addition to the aforementioned, passenger rooms shall be facilitated for passengers to be utilized safely.

[Approved Model Specifications]

VIII-9 Relating Article 73 to (Passenger room structure)

(Basic Items)

Passenger room structure shall be as shown below:

(1) Windows shall be as shown below:

[1] Shall not be capable of opening to the outside;

[2] The height of the bottom border of the opening section (the section that passengers and staff members can open, hereinafter the same) from the floor surface shall be as follows:

(a) The window at the lateral side of a seat or behind a seat: 800 mm or more;

(b) The window facing an aisle: 1200 mm or more.

[3] Dimensions of opening section (dimension between upper and lower borders) are as shown in the table below.

	Height from floor surface	Dimensions of openings		
		General rolling stock	Rolling stock operated on sections where the distance between the center lines of the tracks is narrow. (Note 1)	Rolling stock operated on sections where the distance between the structure gauge and rolling stock gauge is small. (Note 2)
Windows facing to the lateral side of a seat or behind a seat	800 mm or more and 1200 mm or less than	No limit	200 mm or less. However, no limit when there are protective bars, etc., on the window. (Note 3)	150 mm or less However, 250 mm or less when there are protective bars, etc., on the window. (Note 4)
	1200 mm or more	No limit	No limit	No limit
Windows facing to the standing space or an aisle	1200 mm or more and 1400 mm or less than	No limit	200 mm or less. However, no limit when there are protective bars, etc., on the window. (Note 3)	150 mm or less. However, 250 mm or less when there are protective bars, etc., on the window. (Note 4)
	1400 mm or more	No limit	No limit	No limit

Note 1: The rolling stock operating on track sections where the distance between center of tracks of the main line is less than the value of the maximum width of the basic limits for the rolling stock gauge plus 600 mm , except the rolling stock where the maximum width (excluding sign markers)is been less than the value of the distance between center of tracks of the main track minus 600 mm.

Note 2: The rolling stock operated on sections where the space between the structure gauge and basic limits of the rolling stock gauge at the side section is less than 400 mm.

Note 3: Protective bars on the window (including alternative facilities to these, hereinafter the same) shall be mounted on the outside of the window and the distance between the center of this mounting and the bottom border of the opening shall be in a range from 150 mm to 200 mm.

Note 4: Protective bars on the window shall be mounted on the outside of the window and the distance between the center of this mounting and the bottom border of the opening shall be in a range from 100 mm to 150 mm.

[4] The window glass shall be safety glass or have performance that is equal to or better than it. In this case, examples of "safety glass" is safety glass in compliance with JIS R 3213 safety glass for railway rolling stock.

2. The passenger room interior ventilation shall be as shown in the following table.

<table>
<tr><th></th><th>When natural ventilation is used</th><th>When forced air ventilation is provided</th></tr>
<tr><td>Normal operation</td><td rowspan="2">The total area of the opening for the windows, etc., in the passenger room during normal operation shall be 1/20 or more of the floor area of the passenger room of the said rolling stock
(Note 1)</td><td>The forced ventilation device shall have the performance capacity that has been calculated using two times the rated passenger capacity, based on a ventilation volume of 13m^3 per person per hour.
(Note 1 and Note 2)</td></tr>
<tr><td>In the event of the main power supply being interrupted</td><td>One of the following items shall apply in the event of the main power supply being interrupted;
[1] Be capable of maintaining the function of the forced ventilation device for a fixed period.
[2] In addition to the windows in the passenger room , the total area of the openings added for side sliding doors, etc., shall be 1/20 or more of the floor area of the passenger room of the said rolling stock. (Note 3)</td></tr>
</table>

Note 1: When natural ventilation alone or forced ventilation alone cannot satisfy the conditions,

it is acceptable to satisfy the conditions by adding each respective capacity.

Note 2: On trains that will not be carrying more than the rated capacity, a capacity calculated by a multiple of passenger capacity is acceptable.

Note 3: Measures shall be taken at these doors to prevent falling, etc. In addition, limited to the case when the train set of rolling stock is fixed, when the area of the opening for the side sliding doors is added, the total of the area of the opening at the gangway connecting adjacent rolling stock may be added to the total for the s area of openings in the said rolling stock and may make the total area of the openings 1/20 or more of the total floor area of the passenger room of the said rolling stock. However, in this case, the total of openings for the all rolling stock in the fixed consisted train set shall be 1/20 or more of the total floor area of the passenger room of the entire consisted vehicles for the said rolling stock.

3 The lighting shall be as shown below:

(1) Appropriate lighting devices shall be provided;

(2) Auxiliary lighting devices that will automatically switch on in the event of the main power supply being interrupted shall be provided. However, this does not apply to lighting devices that do not turn out even when the main power supply is interrupted;

(3) When an auxiliary lighting device (including lighting devices that do not turn out even when the main power supply is interrupted) is provided, illumination equal to or exceeding the level that enables the positions of doors or door cocks, etc., to be identified shall be maintained. (The reference standard shall be the brightness of two or more 10-watt incandescent bulbs for each 10 meter length of the vehicle.)"

4 Aisles shall be as shown below.

(1) On passenger cars, an aisle shall be provided from the exterior entrance/exit to the seats. However, this does not apply to passenger cars on which it is possible to sit down on seats immediately after passing through the entrance/exit;

(2) Aisles shall enable safe and easy passage;

(3) The effective width and effective height of the aisle shall be as indicated in the following table.

	General rolling stock		Rolling stock with a track gauge of 0.762 m, rolling stock of 8 m or less and trackless electric vehicles with a body length
	More than 800 mm from floor surface	Within 800 mm from floor surface	

Effective width Note 1	550 mm or more	450 mm or more	400 mm or more
Effective height	1800 mm or more		

Note: Effective width can be reduced in the section where the aisle height exceeds 1700 mm or more when there is no impediment to passenger passage.

5 Accommodations for standing passengers shall be as shown below:

(1) Accommodations for standing passengers may be provided only to the floor space other than the floor space provided for use by dedicated seating;

(2) Hand straps, hand rails and other facilities to ensure the safety of passengers shall be provided.

6 Seats shall be as shown below:

The passenger car shall be provided with the appropriate number of passenger seats by taking into consideration the application of the rolling stock, the section of track it will use, etc. However, in the case of passenger cars, this does not apply to rolling stock that do not have a specified rated passenger capacity (power supply rolling stock, dining rolling stock and rolling stock similar to these).

7 Toilets shall be as shown below:

(1) Toilets, for trains running long distances, etc., shall be installed according to the application of the rolling stock and the sections where it will be used;

(2) In principle, toilets shall be holding tank type (a type other than an open type).

[Ministerial Ordinance]

(Structure of entrance/exit for getting on/off of passengers)

Article 74. Entrance and exit for passengers shall provide safe and smooth getting on and off of passengers, and the doors shall be equipped with automatic opening and closing devices that comply with the following standards:

(1) Shall be able to open or close simultaneously;

(2) Shall make it possible for crew to check and confirm the open or closed condition;

(3) Shall prevent the train from departing when the door is opened. This standard does not apply, however, to a passenger car when a crew can directly confirm the doors to be closed;

(4) Shall be able to be open manually for emergency. This does not apply, however, to the rolling stock that run over the electrified section by the third rail.

[Approved Model Specifications]

VIII-10 Relating to Article 74 (Construction of entrance/ exit for getting on/off of passengers)

(Basic Items)

1 Entrance/exit for passengers' getting on/off shall be provided on both sides of passenger cars. However, this does not apply to the rolling stock without accommodations for standing passengers, when there are adjoining cars at both ends of the said rolling stock (the adjoining cars in case of the rolling stock serving as the first front car or the last rear car of a train and a gangway has been provided from the said rolling stock to the above mentioned cars and the entrance/exit near to the gangway enables for passengers to get on/off from both sides.).

2. The structure and function of entrance/ exit for passenger getting on/off shall be as shown below:

(1) The effective width of entrance/exit for passengers' getting on/off shall be 660 mm or more and the effective height shall be 1800 mm or more. However, the effective width for entrance/exit for passengers in wheelchairs shall be 800 mm or more (except for unavoidable structural reasons);

(2) Entrance/exit for passengers' getting on /off shall have sliding doors, inward-opening hinged doors (including folding doors) or slide-type plug doors;

(3) The gap between the floor surface of entrance/exit for passengers' getting on/off and the edge of the platform shall be as small as possible within the range so that there is no danger of travelling of rolling stock being impeded;

(4) The height of the floor surface of entrance/exit for passengers' getting on/off and the height of the edge of the platform shall be as flat as possible;

(5) The floor surface of entrance/exit shall have a patterned-indented surface or a material, etc., used for the surface shall be slip resistant.

3 An automatic door operating device shall be provided for the doors of the entrance /exit for passengers' getting on/off.

4. The structure and function of the door operating device provided on entrance/exit for passengers' getting on/off shall be as shown below:

(1) The crew shall be able to perform unified opening or closing operations and the confirmation of the open or closed state of the doors;

(2) The operating device shall be capable of being electrically or mechanically locked;

(3) The doors shall have a structure that will not enable them to open during travel even if the lock in (2) is released and the door operating device is set to the release position;

(4) There shall be pilot lamp provided that automatically illuminates when entrance/exit door

for passenger s' getting on/off is opened, and this lamp shall be as follows:

[1] It shall be provided at the top part on both of the side surfaces of the rolling stock;

[2] It shall be red;

[3] It shall be easily distinguished from other lamps.

(5) A device that enables the doors to be manually opened during an emergency shall be provided on the inside and outside of the rolling stock. In this case, the device on the inside shall be capable of being easily operated by passengers. However, this does not apply to the following rolling stock:

[1] Rolling stock running on sections with third rails and double rigid conductor system;

[2] In dedicated underground structures, the rolling stock running on sections of track where the space between the structure gauge and the rolling stock gauge is small [NOTE] (Excluding the rolling stock that travel on dedicated double track sections and other sections where evacuating from the side of other vehicles is possible and in addition the rolling stock that performs the through service operation and provides the indication that passengers should follow the instructions of the staff;

[3] Suspended railways, straddled type monorail and normal conducting magnetic levitation railways.

[NOTE] "In dedicated underground structures, rolling stock running on sections of track where the space between the structure gauge and the rolling stock gauge is small" means that among the passenger cars of an underground railway, these are the rolling stock that travel on sections of track where the space between the structure gauge and the basic limit of the rolling stock gauge at the side surface is less than 400 mm.

(6) For the device in (5) (limited to devices that are installed on the inside of the rolling stock), the location, operating instructions and precautions of the operating device shall be displayed so as to be easily visible by passengers. However, this shall not be displayed in the rolling stock indicated in (5) [1], [2], [3].

5. Doors at entrance/exit used for the getting on/off of passengers shall have a structure whereby it is not possible to depart until the doors are closed. However, this does not apply to passenger cars (including cable railway rolling stock) where the staff can directly confirm that the doors are closed.

6 Doors at entrance/exit used for the getting on/off of passengers shall take the safety of the passengers into consideration, such as by a structure that reduces the speed of the doors just prior to their closing.

[Regular Railways]

7 Items other than those shown in the basic items shall be as shown below:

(1) When it is unavoidable that the height of the floor surface of the entrance/exit for passengers' getting on/off is more than 380 mm from the platform (empty car condition), a step shall be provided. In this case, the height of each step shall be 380 mm or less and the effective depth shall be 260 mm or more. Moreover, when the shape of the step is anything other than a rectangle, that shape shall be capable of including a 350 mm wide by 260 mm deep rectangle;

(2) Passenger car entrance/exit provided with step for getting on and off shall be as shown below:

[1] The height of the step shall be the height of the platform or more. However, this does not apply when there is no danger of impediment to the safe and smooth getting on/off of passengers;

[2] The step shall have a patterned-indented surface or a material, etc., used for the surface shall be slip resistant;

[3] A handle for use during getting on/off shall be provided.

(Trackless electric vehicles)

8 Items other than those shown in the basic items shall be as shown below. However, in Basic Item 1, in addition to reading "both side surfaces" as "the left side of the rolling stock" 2(1), 4(3) and (4) does not apply:

(1) The effective width of the entrance/exit for passenger s' getting on/off shall be 660 mm or more and the effective height shall be 1800 mm or more;

(2) When it is unavoidable that the height of the floor surface of the entry/exit for passenger s' getting on/off on a rolling stock (empty car condition) is more than 380 mm from the platform, a step shall be provided. In this case, the height of each step shall be 380 mm or less and the effective depth shall be 260 mm or more. Moreover, when the shape of the step is anything other than a rectangle, that shape shall be capable of including a 350 mm wide by 260 mm deep rectangle;

(3) Passenger car's entrance/exit for getting on/off provided with a step shall be as shown below:

[1] The step shall have a patterned-indended surface or a material, etc., used for the surface shall be slip resistant;

[2] A handle for use during getting on/off shall be provided.

[Cable Railways]

9 Items other than those shown in the Basic Items shall be as shown below. However, Basic Item 2 (1), 4 (excluding (1) and (2)) does not apply:

(1) The effective width of the entrance/exit for passengers' getting on/off shall be 660 mm or more and the effective height shall be 1800 mm or more;

(2) The door operating device at the entrance/exit door for passengers' getting/off shall be provided with a lamp that automatically lights on when the door is opened, and this lamp shall be as follows. However, on rolling stock with only one entrance/exit for passenger s' getting on/off on the right and left side respectively, it shall be possible to eliminate this requirement, as far as there is a door closed confirmation device in the crew room:

[1] It shall be provided at the top part on both of the side surfaces of the rolling stock;

[2] It shall be red;

[3] It shall be easily distinguished from other lamps.

(3) A device shall be installed on the inside of the rolling stock that enables the door for passengers' getting on/off to be opened manually, and the location of the operating device and operating instructions shall be displayed so as to be easily visible by passengers.

[Superconducting magnetic levitation railways]

10 Based on the basic items. However, "Crew cabin" in basic item 4 (1) shall be read "Traffic controller, station master or crew member" and basic items 2 (only (3)) and 4 (only (4)) are not applied.

[Notice concerning applicable timing] (2004: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.125)

1. Standards relating to the Approved Model Specifications 4 (5) [2] for Article 74 (limited to the rolling stock for which the provision of new devices will be applicable) shall be applied from December 27, 2004. (There are provisos.)
2. Standards relating to the Approved Model Specifications 4 (6) for Article 74 (limited to the rolling stock for which the provision of new devices will be applicable) shall be applied from July 1, 2005.

[Operation Notice]

9 Relating to Article 74 (Structure of entrance/exits for the getting on/off of passengers)

(1) In Approved Model Specifications 2 (4) "The height of the floor surface of the entrance/exit for passengers' getting on/off and the height of the edge of the platform shall be as flat as

possible." means that besides taking into consideration the height of the platform at each station on the section of track where the said rolling stock is operated and the actual conditions of the rolling stock being operated on that section of track together with taking into consideration the upgrading of rolling stock operating on the said section of track and the future policy of the railway operator in regards to the upgrading of platforms at each station on the said section of track, the basis for bringing the floor height at the entrance/exit for getting on/off of passengers as close as technologically possible to the height of the platform shall be as shown below:

[1] For the rolling stock without a step provided at the entrance/exit for the getting on/off of passengers, when the floor height of the entrance/exit for getting on/off of passengers is lower than the height of the platform, it shall be limited to 20 mm;

[2] For the rolling stock on which it is unavoidable to provide a step at the entrance/exit for the getting on/off of passengers, the height of the step for the entrance/exit for getting on/off of passengers shall be the height of the platform or higher, except when there is the anxiety that it would impede the safe and smooth getting on/off of passengers.

(2) The meaning of "during travel" in Approved Model Specifications 4 (3), "The doors shall have a structure that will not enable during travel them to open even if the lock in (2) is released and the door operating device is set to the release position" is when the speed of the rolling stock is in the condition of a predetermined, extremely slow speed or higher. This speed shall be as low as possible; 5 km/h or less is desirable, with the maximum being 10 km/h.

(3) In Approved Model Specifications 5, "doors . . . shall have a structure whereby it is not possible to depart until the doors are closed" means the following:

[1] "Doors are closed" means that the space between each of the door ends (when there is only one door, this shall be the space between the door end and door stop where it contacts the carbody) is 30 mm or less;

[2] "It is not possible to depart" means, on electric railcars, there is a structure that interrupts the main circuit; on internal combustion railcars, this means a structure that interrupts the power transmission system.

Furthermore, when there is one entrance/exit for getting on/off of passengers, and the staff controlling the motive power car can confirm the getting on/off status of the passengers, this shall include providing of a device that prevents the departure with opened doors, such as a device for limiting the operation of the motive power control device, etc.

[Ministerial Ordinance]

(Structure of gangway entrance and gangways)

Article 75. Passenger cars shall be equipped with gangway entrance and gangways for passengers to pass through to the next cars. This will not apply, however, to a single car operation.

2. A train that runs through the section that does not allow an emergency evacuation from the side of the train because of the facilities, shall be able to provide sure evacuation from the front part of the first car and the rear part of the last car (in case of a locomotive haul train, the rear end of the train).

[Approved Model Specifications]

VIII-11 Relating to Article 75 (Construction of gangway entrance and gangways)

(Basic Items)

(1) The dimensions of gangway entrance and gangway facilities shall be as indicated in the following table.

(Regular Railways)

Type of rolling stock	Required number of gangway entrances	Required number of gangways	Effective width of gangway entrances and gangways	The effective width of gangway entrances and gangways when the track gauge is 0.762 mm	Effective height of gangway entrances and gangways=
Passenger car operating with one dedicated car (Of passenger cars used in subways, etc., excluding rolling stock operated on	0	0			

sections where the space between the structure gauge and basic limits of the rolling stock gauge at the side section is less than 400 mm and rolling stock operated on sections of track with third rails.)					
Passenger car	1	1	550 mm or more	400 mm or more	1800 mm or more
Subway, etc., passenger cars (Note 1)	2	2			
○ Rolling stock that serve as the front part or the rear part of the train. ○ Rolling stock connected to dedicated locomotives ○ Rolling stock with special measures taken (Note 2)	1	1			

		Rolling stock that serve as the front part or the rear part of the train operating on electrified sections of track with third rail	2	1			
		Rolling stock operating as dedicated single car on electrified section of track with third rail	1	0			

		Rolling stock travelling on sections where the space between the structure gauge and basic limits of the rolling stock gauge at the side section is less than 400 mm.		2	2		600 mm or more	600 mm or more	
			Rolling stock operating as dedicated single car	2	0				
			Rolling stock that serve as the front part or the rear part of the train.	2	1				
Shinkansen (Passenger		Rolling stock with driver's cab (Note 3)		1		1	550 mm or more		1800 mm or more

car)	Rolling stock other than the above	2	2			

(Special Railways)

Type of Rolling Stock			Required number of passageways	Required number of gangways	Effective width of passageways and gangways	Effective height of passageways and gangways
Suspended railways, straddled type monorail			2	2		
	Rolling stock that serve as the front part or the rear part of the train.		1	1		
Guide(~~d~~) rail type of railways			2	2	(Note 4)	
	Rolling stock that serve as the front part or the rear part of the train		1	1		
		Rolling stock operating on electrified section of double rigid conductor system.	2	1		
Trackless railways			1	1		
	Passenger cars operating as		0	0		

	dedicated single car				
Cable Railways		1	1		
	Passenger cars operating as dedicated single car	0	0		
Levitation railway		2	2		
	Rolling stock that serve as the front part or the rear part of the train.	1	1		

Note 1: Subway, etc., passenger cars in the table means passenger cars used on railways having one of the following tunnel configurations: passenger cars using railways having mainly an underground construction and long tunnels (for tunnels provided underground in urban areas, this is a tunnel that exceeds 1.5 km in length; for tunnels provided underground in other than urban areas, this is a tunnel that exceeds 2 km in length; and when the station is built inside the tunnel, this is when the distance between stations in the tunnel (known as the distance between the edges of the platforms) or the tunnel distance from the end of the tunnel to the edge of the platform of the nearest station exceeds 1 km.)

Note 2: "Rolling stock with special measures taken" means the said rolling stock on a passenger train comprised of coupled consists of two or more cars when any one of the following measures has been taken for the rolling stock of the coupled sections.

- When there is a crew member (hereinafter, the security crew member) in each of the coupled trains that can provide guidance and evacuate passengers in the event of an emergency.
- When there is a security crew member in either of the coupled trains, and there is a function provided on the emergency communication devices in all rolling stock forming the said passenger train that enables communication between passengers and the security crew member.

Note 3: When two trains of Shinkansen (passenger cars) are coupled and operated, it shall be limited to when the conditions of "rolling stock with special measures taken" indicated in Note 2 are satisfied.

Note 4: On guided track railways, where rolling stock with a car body length of 8 m or less is used, and on the front end it will serve as the front part of the first car of a train and on the rear end it will serve as the rear part of the last car of a train, this may be 450 mm or more.

2 Construction of gangway entrance and gangways shall be as shown below.

(1) The following door that is capable of being securely closed during normal times shall be provided at the gangway entrance at the front end that will serve as the front part of the first car of a train or at the rear end that will serve as the rear part of the last car of a train.

[1] When this is a hinged door, it shall be capable of maintaining the released condition in case it is on the coupled side.

[2] If it can be easily touched by passengers, it shall have a construction that will not cause a dangerous condition when inadvertently operated by a passenger.

(2) When the door for the parts other than those indicated in 2 (1) is provided, this shall be a sliding door.

(3) Gangway bellows and foot plates, etc., shall be provided at a gangway so as to enable safe passage free from remarkable differences in height, etc., that would impede passage so as to enable safe passage.

[Ministerial Ordinance]

(Structure of emergency exits)

Article 76. Rolling stock that does not provide easy evacuation for passengers in case of an emergency shall be equipped with an emergency exit to accommodate an easy and secure evacuation of passengers. It shall also enable for a crew to confirm easily whether it is open or not.

[Approved Model Specifications]

VIII-12 Relating to Article 76 (Construction of emergency exits)

(Basic Items)

1 An emergency exit that enables easy evacuation shall be provided in a passenger room in which there is only one route for evacuating to another rolling stock or to the outside. However, this does not apply to private rooms used by passengers, etc.

2 Construction of an emergency exit shall be as shown below.

(1) The effective width shall be 400 mm or more and the effective height shall be 1200 mm or more.

(2) There shall be no differences in height, protruding objects, etc., at or near the emergency exit that could impede evacuation.

(3) This shall be an outward-opening hinged door or a sliding door (including plug doors).

(4) The door, shall be securely closed at normal times, capable of being opened manually from the inside at times of emergency, and shall not close under its own weight. In this case, it shall be easily opened from the inside without using a key or any other special tool.

(5) The location and the operating instructions shall be clearly displayed. Furthermore, when the location is indicated by lamp, the color of that lamp shall be green.

(6) A lamp shall be provided that automatically switches on when the door is opened. Furthermore, this lamp shall be provided at the top part on both of the side surfaces of the rolling stock and shall be easily distinguished from other lamps (except lamps that switch on when the emergency alarm device and emergency stop device are operated).

(Trackless electric vehicles)

3 Items other than those shown in the basic items shall be as shown below. However, Basic Items 1 and 2 (6) does not apply.

・ The emergency exit shall be provided on the right side of the rolling stock.

[Ministerial Ordinance]

(Coupling device)

Article 77. Coupling devices (excluding articulated bogie or the similar construction) shall be made robust with sufficient strength to be able to withstand vibration, impact, etc., and with capability of coupling cars each other completely.

[Approved Model Specifications]

VIII-13 Article 77 Related to (Coupling device)

(Basic Items)

1 The coupling device for the rolling stock (except articulated bogies and constructions similar to that) shall be as indicated below.

(1) Shall be robust and have sufficient strength to withstand operation.

(2) It shall not release due to vibration and impact.

(3) It shall automatically coupled by the tight contact of rolling stock to rolling stock. However, this does not apply to coupling devices provided on locomotives and the fixed-coupled rolling stock in addition to coupling devices used for rescue, etc.

(4) It shall have a shock absorbing function. However, this does not apply to coupling devices provided on locomotives and coupling devices used for rescue, etc.

2 The air piping coupling device shall not be caused to leak air due to vibration and/or impact.

3 The electric wiring coupling device shall prevent mixed contacts or short circuits due to the ingress of rain water, vibration and/or impact.

(Trackless electric vehicles, cable railways)

4 Basic Items 1 (3) and 2 (4) does not apply.

[Ministerial Ordinance]

(Structure of rolling stock to transport special cargo)

Article 78. Freight cars that transport flammable liquid, automobiles and other special freight shall have the construction and devices to be able to prevent disasters caused by them.

[Approved Model Specifications]

VIII-14 Relating to Article 78 (Structure of rolling stock to transport special cargo)

(Basic Items)

1 Tank reservoir structure shall be as shown below.

(1) The tank shall be securely mounted to the bogie so as to prevent movement or damage and its front and rear ends shall not protrude beyond the front and rear ends of the bogie.

(2) Tanks that transport the dangerous liquids (the dangerous materials which the Minister of Land, Infrastructure and Transportation has stipulated by public notice but to which Paragraph 2 in the Article 20 of the Explosive Control Law is not applied as dangerous items (limited to flammable liquids, acids, corrosives and volatile poisons) and of liquid form), shall be as shown below.

[1] The thickness of the steel plate for the shell plate shall be 9 mm or more, the thickness of the tank head shall be 12 mm or more and the thickness of the manhole and filler port cover shall be 6 mm or more, or have the strength and durability equal to or better than steel plate. Here, the "steel plate" means JIS G 3101 general structural cold rolled steel or JIS G 3114 hot-rolled atmospheric corrosion resisting steels for welded structure.

[2] Attached devices, such as protruding valves, filler ports, etc., shall be provided with a device that prevents damage.

[3] Tanks that transport dangerous liquids for which there is a danger of fire due to static electricity shall be provided with a grounding device.

2 Automobile transport car construction shall be as shown below.

Open wagon operating on electrified sections of track with extremely high voltage AC and transporting automobiles shall be provided with a device for electrically connecting between the automobiles and the said rolling stock.

[Ministerial Ordinance]

(Crew cabin facilities)

Article 79. A crew cabin to be used for car operation shall be provided with the facilities for power running, braking and other necessary controls for car operations.

2. The aforementioned facilities shall be easily operated and confirmed by the train crew.

3. A crew cabin to be used for car operation shall be equipped with the devices that are capable of stopping the train automatically when a train operator becomes incapable of driving. This does not apply, however, when a safe train operation would not be impaired depending upon the facilities and rolling stock structure.

4. When the devices described in the paragraph 2 of Article 54 or Article 57 get installed, the opening switch of the relevant device shall not be able to be easily released by the crew.

[Approved Model Specifications]

VIII-15, Relating to Article 79 (Crew room facilities)

(Basic Items)

1 The crew room shall be provided with the facilities shown in the following table. Moreover, these facilities shall be capable of being easily operated or confirmed by the crew.

Type of Crew Room		Facilities Provided
1 Operating Cab	(1)	Operating devices for control facilities
	(2)	Operating devices for service brake devices
	(3)	Transmitting devices and receiving devices for sign devices and communication devices (limited to rolling stock provided with the said equipment)
	(4)	Speedometer
	(5)	Aspect facilities of onboard signal equipment (limited to rolling stock operating on sections of track using onboard signal equipment)
	(6)	Operating device for lowering the pantograph (limited to rolling stock provided with pantograph)
	(7)	Operating device for protective grounding switch (limited to rolling stock provided with the said equipment)
	(8)	Transmitting devices and receiving devices for safety communication equipments (limited to the said equipments provided on the rolling stock)
	(9)	Warning generating devices and transmitting devices for alarm signal facilities (on the Shinkansen, the receiving device) (limited to rolling stock operating on sections of track using alarm signals) (excluding locomotives that are only used for shunting)
	(10)	Whistle activation device
	(11)	Pressure gauge indicating pressure of main air tank pipes
	(12)	Operating devices for head marker lights

		(13)	Device for warning of abnormality in wheel speed (Limited to Shinkansen)
		(14)	A pressure gauge with the maximum operating pressure of boiler indicated (Limited to steam locomotives)
	The driver's cabs of passenger trains (excluding locomotives) shall have the items shown on the right columns in addition to common facilities	(15)	Receiving devices for emergency communication devices or device indicating the operating status of an emergency stop device (Limited to rolling stock provided with emergency alarm device or emergency stop device)
		(16)	Device indicating the status when emergency exit door is opened (Limited to rolling stock provided with emergency exits)
		(17)	Door closed confirmation device for entrance/exit for the getting on and off of passengers
2 Conductor's room		(18)	Operating devices for service brake devices (Limited to the devices for rapidly stopping the rolling stock)
		(19)	Sign devices or transmission devices and receiving devices for communication devices (Limited to rolling stock provided with sign devices or communication devices)
	The conductor's rooms of passenger trains shall have the items shown on the right columns in addition to common facilities	(20)	Transmission device for onboard public address device (Limited to rolling stock provided with onboard public address device)
		(21)	Operating device of automatic door closing equipment for entrance/exit for the getting on and off of passengers
		(22)	Receiving devices for emergency communication devices or the device indicating the operating status of an emergency stop device (Limited to rolling stock provided with emergency alarm device or emergency stop device)

		(23)	Device indicating status when emergency exit door is opened (Limited to rolling stock provided with emergency exits)

2 In addition to the above, the following devices shall be provided in the driver's cab.

(1) Shall be provided with a device that automatically and rapidly stops the rolling stock when the staff person operating the motive power car should become sick, etc., and not be able to continue driving (hereinafter, train stop device in case of driver's abnormality). However, this does not apply to rolling stock where it is assumed that there are two or more members of the crew on duty in the cab, rolling stock operated on sections of underground or elevated track with automatic train operation device, automatic train control device or automatic train stop device (limited to devices where there is no danger of the limited speed being normally exceeded).

(2) The train stop device in case of driver's abnormality shall not be capable of easily releasing the function manually.

3 The speedometer shown as (4) in the table in 1 shall comply with the standard "JIS E 4603 Railway Rolling stock -- Speedometer equipment" or have performance equal to or better than it, and in addition it shall be provided with an illumination device, or be self-luminous, or have the indicator plate and needle painted with self-illuminating paint.

4 The transmitting device for the warning signal facility shown as (9) in the table in 1 shall automatically switch to a power supply from a separate electrical source even when the main electric power supply and electrical power supply from the storage battery shown in the Approved Model Specifications relating to Article 85 have been interrupted.

However, this does not apply to the following cases.

(1) When the power supply from storage battery shown in the Approved Model Specifications relating to Article 85 is automatically supplied by a separate circuit different from the main electric power supply and there is no danger of the electrical power supply being interrupted by a train collision, etc.

(2) When the storage battery shown in the Approved Model Specifications relating to Article 85 is installed inside of a car and there is no danger of the power supply being interrupted by a train collision, etc.

(3) In case of being used in combination with a device that can be used even when the supply from the main electrical power supply and the storage battery shown in the Approved Model Specifications relating to Article 85 have been interrupted.

5 The pressure gauge shown as (11) in the table in 1 shall display the regulator inflow pressure and the release pressure. However, this shall also include digital pressure gauges using a different display method when below the inflow pressure and when above the release pressure (meaning a pressure gauge that displays pressures intermittently for a preset interval). Moreover, it shall be provided with an illumination device, be self-luminous, or have the indicator plate and needle painted with self-illuminating paint.

6 The following shall apply to the rolling stock running on sections of track provided with automatic train stop device, automatic train control device and automatic train operation device.

(1) An indicator device displaying the operating status of the said device and an operating device shall be provided in the cab that is being used for operation.

(2) A release switch for the onboard facilities shall be provided.

(3) The release switch shall not be capable of being operated while the staff member is in the normal operating position, or the said switch shall be covered by a switch cover, etc.

(Trackless electric vehicles)

7 Other items than those shown in the Basic Items shall be as shown below. However, in the table in 1 for the Basic Items, other than reading "operator's seat" for "cab," "conductor's seat" for "conductor's room”, and "main brake or auxiliary brake device" for “service brake,” the operating device for (18) in the table in item 1 Basic Items, does not apply.

・A steering handle shall be provided in the driving cab.

[Cable railways]

8 The following facilities shall be provided in the crew room without applying the Basic Items.

[1] Operating device for automatic brake device and parking brake device.

[2] Operating device for activating the emergency brake device for the main drive facility.

[3] On rolling stock provided with sign device or communication device, the transmitting device and receiving device for the said equipment.

[4] On rolling stock provided with public address device, the transmitting device and receiving device for the said equipment.

[5] On rolling stock provided with onboard equipment for safety communication facilities, the transmitting device and receiving device for the said equipment

[6] Receiving devices for emergency communication devices or device indicating the working status of an emergency stop device.

[7] Device for indicating the status when emergency exit is opened.

[8] Operating device and door close confirmation device for automatic door operating device.

[9] Whistle activation device

[10]Pressure gauge indicating pressure of main air tank piping

[11] Operating devices for front marker lights

[Superconducting magnetic levitation railways]

9 Without applying the basic items, the crew cabin shall be equipped with the following facilities. Also, these facilities shall be controlled or checked by crew members without difficulties. However, facilities 6) to 11) shall be installed in the major crew cabins.

1) Transmitting devices and receiving devices for communication devices

2) Transmitting devices and receiving devices for safety communication equipments

3) Receiving devices for emergency communication devices

4) Transmission devices for onboard public address device

5) Train stop trigger switch

6) Operating devices for control facilities

7) Device showing the pressure status of the pneumatic reservoir tank of each aerodynamic brake

8) Pressure gauge indicating pressure of the accumulator of each bogie

9) Device for warning of abnormality in support wheel rotation

10) Door closed confirmation device for entrance/exit for the getting on and off of passengers

11) Operating device of automatic door closing equipment for entrance/exit for the getting on and off of passengers

[REVISION]

[1] New standards added to Approved Model Specifications relating to 2 and 4 of Article 79 (April 28, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.18)

[2] Of the items stipulated in Revised Ministerial Ordinance Supplemental Provisions, one of the items to be relevant for each item of Article 2, Paragraph 2 of the said supplemental provision shall apply until June 30, 2011, Article 79, Paragraph 3 the new Ministerial Ordinance.

・ In regards to the device in 4 of Article 79 relating to new Approved Model Specifications, shall be applied as a rule until June 30, 2011. [Notice April 28, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.19]

[Ministerial Ordinance]

(Internal pressure vessels and other pressure supply sources together with their attached devices)

Article 80. Internal pressure vessels and other pressure supply sources together with their attached devices shall comply with the following standards.

(1) Shall be capable of preventing any abnormal pressure rise.

(2) Shall be capable of preventing any decline of function due to moisture, etc.

(3) Shall be capable of withstanding any vibration or impact that could lead to damages.

[Approved Model Specifications]

VIII-16 Article 80 Related to (Internal pressure vessels and other pressure supply sources and their attached devices)

(Basic Items)

1 The following shall apply for the pressurized vessels and its attached device.

(1) A safety valve shall be provided at the main air tank or at a location near to where the air piping connects to the said air tank.

(2) The main air tank shall be provided with a drain cock (this shall include a drain plug on the main air tank that receives its air supply from a compressor provided with a desiccant filter unit) or an automatic drain device. In addition, of the drain cocks indicated above, a protective device shall be provided on those for which there is the danger of damage due to impact from a foreign object during operation.

(3) The pressurized vessels and its piping shall be mounted so as to be protected from damage due to vibration or shock.

(4) Pressurized vessels shall be provided in a place where it is easy to inspect.

2 Rolling stock equipped with an air compressor shall be provided with a regulator. However, when two or more air compressors are installed on a train and they are connected by air piping, it is acceptable not to provide a regulator with each compressor.

3 The following shall apply for the accumulator and its attached device.

(1) A safety valve shall be provided at the accumulator or at a location near to where the hydraulic piping connects to the said accumulator.

(2) The accumulator and its piping shall be mounted so as to be protected from damage due to vibration or shock.

(3) Accumulators shall be provided in a place where it is easy to inspect.

4 A hydraulic pump shall be provided with a regulator.

5 The on-board refrigerator's pressure container and their auxiliary devices shall conform to the following criteria.

1) A safety valve shall be provided at the pressurized container of the refrigerator or at a location near to the piping connects to the said container.

2) The pressurized container of the refrigerator and it piping shall be mounted so as to be protected from damage due to vibration or shock.

3) The safety valve of the refrigerator's pressurized container shall be provided at a place where it is easy to inspect.

4) The compressor of the refrigerator shall be equipped with a regulator.

[Ministerial Ordinance]

(Devices attached to rolling stock)

Article 81. Rolling stock shall be equipped with the following attached devices that comply with the relevant standard described below. However, will be exempted from this rule, the rolling stock that are capable of securing safe and smooth running as well as safe and smooth getting on and off of passengers:

(1) Sign device: Shall be capable of signing among crew surely;

(2) Communication device: Shall be capable of assuring smooth communication between crew;

(3) Whistle device: Shall have sufficient volume to be capable of warning danger;

(4) Public address system: Shall be capable of reaching every passenger room;

(5) Emergency alarm Device: Shall be easily available for passengers to notify crew if an emergency arises;

(6) Emergency stopping device: Shall be easily available for passengers to stop the train if an emergency arises;

(7) Marker light: Shall be recognized from the ahead and from the behind of the train to confirm the direction the train is heading to.

2. The attached device prescribed above under the item (6) shall not be installed in the case that it could pose a danger like electric shock, to passengers who has evacuated the train.

[Approved Model Specifications]

VIII-17 Article 81 Related to (Devices attached to rolling stock)

(Basic Items)

1 The following shall apply the sign device.

(1) A sign device shall be provided on rolling stock on which the departure sign is performed by the conductor. However, this does not apply when the departure sign is performed by a sign device provided at the station.

(2) Transmission and receiving shall only be performed reciprocally among crew members.

(3) It shall have a structure in which the function cannot be easily cancelled by the decision of the receiver.

2 The following shall apply the communication device.

(1) A communication device (including a portable communication device) shall be provided on passenger trains. However, this does not apply to rolling stock operated as a single car.

(2) Transmission and receiving shall only be performed reciprocally among crew members. However, this does not apply when it has a function that gives priority to reciprocal

communication among crew members and will not impede crew member communication.

(3) It shall have a structure in which the function cannot be easily cancelled by the decision of the receiver.

3 At the front part of the first car of trains shall be provided a whistle device that has sufficient volume capable of warning danger.

4 An onboard public address device shall be provided that enables guidance information to all rooms on passenger cars. However, this does not apply to rolling stock operated as a single car.

5 The following shall apply the emergency alarm device.

(1) An emergency alarm device shall be provided on passenger cars. However, this does not apply to the rolling stock provided with an emergency stop device and/or operated as two or less rolling stock cars (one car on cable railways).

(2) The transmission device of the said device shall be provided in the room of passenger cars provided with an emergency alarm device. However, this does not apply to the passenger room on rolling stock having a crew room whereby passengers can easily notify the crew.

(3) The location and operating instructions shall be displayed at the emergency alarm device or near to it so as to be easily visible by passengers.

(4) It shall not be possible to manually cancel the function.

(5) On passenger cars provided with an emergency alarm device, a lamp shall be provided that automatically lights on when the said device is operated. However, this does not apply when the location of the emergency alarm device that has been operated can be confirmed by the crew in the driver’s cab and conductor's room.

(6)The lamp in (5) shall be provided at the top part on both of the side surfaces of the rolling stock and shall be easily distinguished from other lamps (except lamps that automatically light on when the emergency exit is opened and when emergency stopping device are operated).

6 The following shall apply the emergency stopping device.

(1) The operating device for the emergency stopping device shall be provided in the room of passenger cars provided with an emergency stopping device. However, this does not apply to the passenger room on the rolling stock having a crew room whereby passengers can easily notify the crew.

(2) The location and operating instructions shall be displayed at the emergency stopping device or near to it so as to be easily visible by passengers.

(3) It shall not be possible to manually cancel the function.

(4) Rolling stock operating on sections of electrified track with a third rail and double rigid

conductor system, suspended and straddle type rolling stock, normal conducting levitation railway rolling stock shall not have an emergency stopping device provided in the passenger room.

(5) On passenger cars provided with an emergency alarm device, a lamp shall be provided that automatically lights on when the said device is operated. However, this does not apply when the location of the emergency stop device that has been operated can be confirmed by the crew in the driver's cab and conductor's room.

(6) The lamp in (5) shall be provided at the top part on both of the side surfaces of the rolling stock and shall be easily distinguished from other lamps (excluding lamps that automatically light on when the emergency exit is opened and when an emergency communication device is operated).

7 The following shall apply for marker lights.

(1) White-color front marker lights shall be provided at a symmetrical position to the center surface of the rolling stock on the front surface of rolling stock having a driver's cab. Furthermore, at night, it shall be possible to confirm that the lights are on from the front of the rolling stock, and shall be possible to reduce the light intensity or changing the direction of the light beams downward.

(2) Rear markers shall be provided on the rear surface of the rolling stock of the rear end part of the last car of a train. The rear markers should be red lamps or red reflectors (which is limited to items that can be recognized by the illumination of the front marker lights of a following train) and shall be capable of shining or reflecting light from the rear of the rolling stock at night. However, on Shinkansen, two or more red lamps shall be provided at a symmetrical position to the center surface of the rolling stock.

(3) The rear marker lights on the front surface of the rolling stock and the front marker light on the rear surface of the rolling stock shall not provide confusing lamp lights.

[Cable Railways]

8 The items other than those shown in the Basic Items shall be as shown below. However, Basic Items 1, 2 and 7 (1) does not apply.

(1) Transmission and receiving of the sign device and communication device shall only be performed between crew members and staff members in the driving cab.

(2) White-color front marker lights shall be provided at a symmetrical position to the center surface of the rolling stock on the front surface of rolling stock having a cab and at night it

shall be possible to confirm that the lights are on from the front of the vehicle.

(3) Transmission and receiving of the communication device shall only be performed between crew members and staff members in the driver's cab. However, this does not apply, when there is a function that gives priority to communication between the crew members and the staff members in the driver's cab and there will be no impediment of the communication between the crew members and the staff members in the driver's cab.

[Superconducting magnetic levitation railways]

9 Based on the basic items. However, "Driver cabin and conductor room" in basic item 5 (5) shall be read "Crew cabin" and basic items 1, 3, 6 and 7 (only (1)) are not applied.

- White-color front marker lights shall be provided at a symmetrical position to the center surface of the rolling stock on the front surface of the first rolling stock.

[Ministerial Ordinance]

(Rolling stock Indication)

Article 82. Rolling stock shall have indication necessary to be properly identified.

[Approved Model Specifications]

VIII-18 Article 82 Related to Rolling stock indication

(Basic Items)

1 The indication for rolling stock shall be as shown below.

(1) Rolling stock shall have the indication such as code, number, etc., in order to identify individual rolling stock.

(2) The maximum loading capacity shall be indicated on freight cars.

[Cable Railways]

2 In addition to the Basic Items, the maximum passenger capacity and the maximum loading capacity shall be indicated.

Section 5 Countermeasures against Rolling Stock Fire, etc.

[Ministerial Ordinance]

(Countermeasures against rolling stock fire)

Article 83. Electric wires and cables used in rolling stock shall be capable of preventing fire caused by electric confusion, overheating of equipment and other reasons.

2. Devices that are likely to generate arc or heat shall be provided with the pertinent protective measures.

3. The body of passenger cars shall be built with the appropriate structure and materials so that they can prevent prospective fire from starting and spreading.

4. Locomotive (excluding steam locomotive), passenger cars and freight cars with crew cabin, shall be provided with fire extinguishing devices to contain fire at an early stage.

[Approved Model Specifications]

VIII-19 Article 83 Related to (Countermeasures against rolling stock fire)

(Basic Items)

1 The countermeasures against rolling stock fire shall be as shown below.

(1) The countermeasures of wiring, equipment, etc., against rolling stock fire shall be as shown below.

Wiring	Items near to or connected to equipment for which there is the danger of arcs or heat being generated.	Cover with extremely flame retardant material including incombustible material, hereinafter the same)
	Other than the above	Cover with flame retardant material (including extremely flame retardant material and incombustible material, hereinafter the same) However, this does not apply to items for which there is no danger of mixed contact or shorting.
Electrical Equipment	Equipment for which there is the risk of arcs or heat being generated.	Shall isolate from floors, walls, etc., and as necessary provide insulation and incombustible heat-resistant plate between

		them.
Rolling stock with internal combustion engines		The engine shall be isolated from floors, walls, etc., and as necessary provide incombustible heat-resistant plate between them.
		Shall reinforce the heat insulation between the smoke stack of the exhaust pipe and the carbody. (This means a structure for stopping burning to the carbody even if flame leakage due to wear, etc., of the smoke stack of the exhaust pipe, etc.; it means a structure such as providing a incombustible heat-resistant plate.)

(2) The countermeasures against rolling stock fire for passenger cars shall be as shown in the following table.

Part		General Passenger Cars	Subway, etc., passenger cars and Shinkansen passenger cars (excluding the superconducting magnetic levitation railways)	Special Railways (Note 10)						
					S	G	T	C	L	Su
Roof	Roof (Note 1)	Metal or equal to or better than the incombustibility of metal (Note 2)		incombustible	○	Same as S			Same as S	Same as S

			Metal or equal to or better than the incombustibility of metal			○			
	Roof top surface	Shall be covered with a flame retardant insulating material (limited to passenger trains that travel on sections of track with electrified overhead contact) line) (except extremely high voltage contact lines)			○	○			
	Equipment and hardware mounted to the roof	The mounted part shall be insulated from the car body or shall be covered with a flame retardant insulating material (limited to passenger trains that travel on sections of track with electrified overhead contact line) (except extremely high voltage contact lines)			○	○			
External sheeting	End section	Flame retardant Shall use incombustible material for the surface paint (Note 6)	Incombustible Shall use incombustible material for the surface paint (Note 6)	○	Same as S			Same as S	Same as S

	Other than end section	Shall be incombustible or surface shall be covered with a incombustible material (Note 3), shall use incombustible material for the surface paint (Note 6)	Incombustible Shall use incombustible material for the surface paint (Note 6)		○	Same as S			Same as S	Same as S
Passenger room	Ceiling	Shall be incombustible or surface shall be covered with a incombustible material (Note 3), shall use incombustible material for the surface paint (Note 6)	Incombustible Shall have resistance to burning due to radiant heat, and shall have resistance to melting and dripping. (Note 5) Shall use incombustible material for the surface paint (Note 6)	Incombustible Shall use incombustible material for the surface paint (Note 6)	Same as G	○			Same as G	Same as G

	Inside panel	Shall be incombustible or surface shall be covered with a incombustible material (Note 3), shall use incombustible material for the surface paint (Note 6)	Incombustible Shall use incombustible material for the surface paint (Note 6)	○	Same as S			Same as S	Same as S
Heat insulation and noise insulation			Incombustible	○	Same as S			Same as S	Same as S
Floor	Floor	Structure where there is little risk of smoke and fire flowing.		○	Same as S			Same as S	Same as S
	Floor covering	Flame retardant		○	Same as S			Same as S	Same as S
	Filler material under floor covering (Note 7)		Extremely flame retardant	○	Same as S			Same as S	Same as S

	Floor panel		Metal floor sheeting or equal to or better than the incombustibility of metal (Note 2)		○	Same as S			Same as S	Same as S
	Underfloor surface (Note 8)	Shall be incombustible or surface covered with metal.	Shall be incombustible or surface covered with metal and shall use incombustible material for the surface paint (Note 6)	Surface paint (Note 6) shall be incombustible.	○	Same as S			Same as S	Same as S
Underfloor equipment box (Note 9)			Incombustible. However, flame retardant when the need for insulation is unavoidable.		○	Same as S			Same as S	Same as S
Seat	Fabric	Flame retardant				Same as S		○	Same as S	Same as S
	Filler		Flame retardant			○	Same as S		Same as S	Same as S

	When electric heater is provided under the seat		Provide incombustible heat-resistant plate in between heating element and seat.	○	Same as S			Same as S	Same as S
Window shade	Window shade	Flame retardant							
Gangway bellows	Gangway bellows		Flame retardant	○	○			Same as S	Same as S

Note 1: "Roof" means the section above the rain trough or rain gutter of the upper structure of the carbody, but when the rain trough or rain gutter is located inward of one-third the maximum carbody width as measured from the centerline of the carbody, "roof" shall mean the section up to one-third the maximum width of the carbody respectively as measured from the centerline of the carbody. However, when part of the roof is in integral part of the external sheeting of end section, the said section shall be the "end section" of the "external sheeting" shown in (2) of the table.

Note 2: The expression "equal to or better than the incombustibility " for "roof" and "floor" means that the non-combustion performance is equal to or better than the metal used on the existing roof and floor sheeting, which is different from the stipulation for incombustible in the combustibility standards for materials used in railway rolling stock.

Note 3: "Surface shall be covered with a incombustible material" include incombustible materials combined with incombustible materials such as metal.

Note 4: Among guide rail type of railways, the "ceiling" on rolling stock used for railways with underground construction and railways having long tunnels shall be in accordance with stipulations for passenger cars for subways.

Note 5: The material for ". . . have resistance to burning due to radiant heat, and shall have resistance to melting and dripping . . ." shall, in addition to ceiling materials, include main facilities for air conditioning outlets, etc., installed in upper section of passenger rooms. However, excluding small items, etc., that will not affect the spreading of the fire.

Note 6: "Surface paint" means the most outer coat of paint when there are multiple coats.

Note 7: "Filler material under floor covering" means the filler for floors with keystone construction, and the hardboard, water-resistant veneer, etc., that are sandwiched between metals or between metal and flooring material are included in the stipulations for filler material.

Note 8: When a metal sheet is affixed under the underfloor surface so that hot air from equipment installed underfloor will not affect the underfloor surface, the said metal sheet shall be deemed the "underfloor surface."

Note 9: The covers for relays, etc., are not included in “underfloor equipment box."

Note 10: The abbreviations for the types of special railways are as shown below.

S: Suspended railways, straddled type monorail

G: Guide rail type of railways

T: Trackless electric vehicles

C: Cable railways

N: Normal conducting magnetic levitation railway

Su: Superconducting magnetic levitation railway

(3) Non-combustible, extremely flame retardant and flame retardant are used in the tables in (1) and (2) are according to the standards in the following table which are based on the following Test Method I for Non-Metallic Materials for Use on Railways.

Combustibility Standards for Materials for Use on Railways

Classification	During Burning of Alcohol				After Burning of Alcohol			
	Ignition	Flame	Smoke	Flame Condition	Residual Flam	Residual Ash	Carbonization	Deformation
Non-combustible	None	None	Negligible				100 mm or less discoloration	100 mm or less surface deformation

Extremely flame retardant	None	None	Little				Does not reach top edge of test piece	150mm or less deformation
	Yes	Yes	Little	Weak	None	None	30mm or less	
Flame retardant	Yes	Yes		Flame does not exceed top edge of test piece	None	None	Reaches top edge of test piece	Deformation that reaches edge, localized penetrating holes

Note: Dimensions of carbonization and deformation are shown on major axis.

・Items that burn abnormally shall have one rank lower classification.

・Determinations shall be according to the following test methods.

Test Method I

In the Test Method I for Non-Metallic Materials for Use on Railways a B5-size (182 x 257 mm) test material is held at a 45 degree angle as shown in the figure and the center of the bottom of the fuel container is placed on wood platform, such as cork, having a low heat conduction ratio so that it will be positioned 25.4 mm (1 inch) perpendicularly below the center of the bottom plane of the test piece. The fuel container is filled with 0.5 cc of pure ethyl alcohol, which is ignited and allowed to burn until consumed.

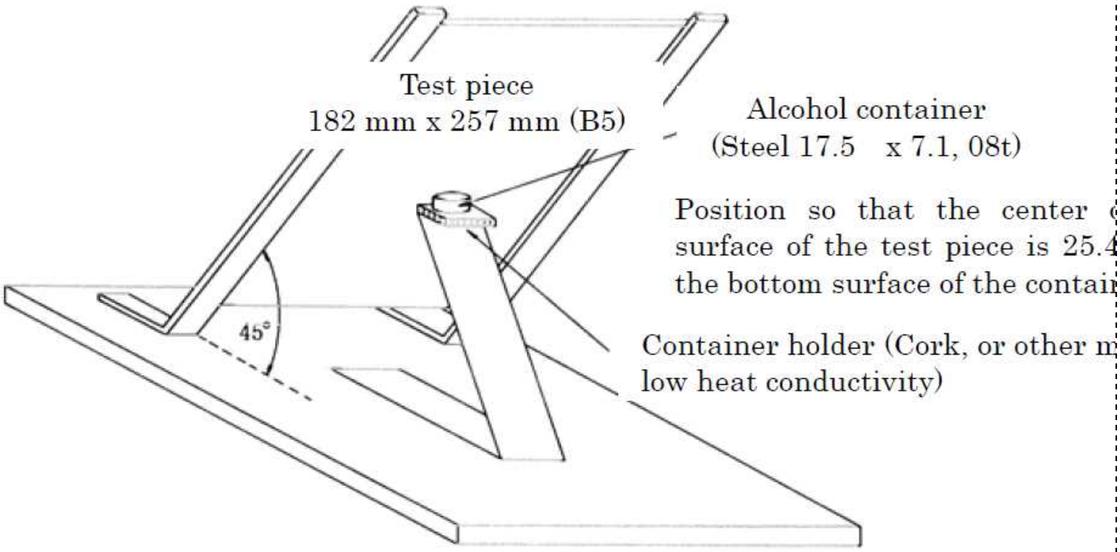
The determination of combustibility is classified into during burning and after burning, with ignition, flame, smoke condition and flame condition, etc., of the test material being observed during burning and residual flame, residual ash, carbonization and deformation being investigated after burning.

In regards to the pre-test treatment of the specimen, when the material has absorption characteristics, it shall be finished to the prescribed dimensions and left in the ventilated rooms for 5 days above 1 m or more apart from the floor surface avoiding the direct sunshine. The conditions in the test room shall be as follows, without any flow of air.

Temperature: 15 to 30 degrees Celsius

Humidity: 60% to 75%

General Sketch of Test Method



(4) " . . . shall have resistance to melting and dripping . . ." used in the table in (2) means that the surface of the material shall maintain its smoothness after the alcohol in the Test Method I for Non-Metallic Materials for Use on Railways has been burned .

(5)"Resistance to burning" in the table in (2) shall be according to the following standard which is based on the Test Method II for Non-Metallic Materials for Use on Railways.

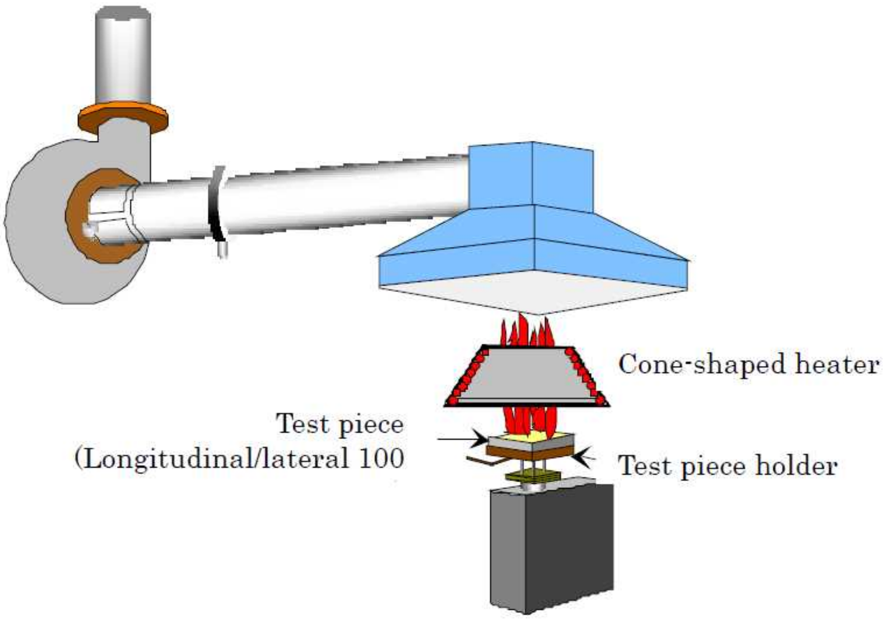
Overall heat value (MJ/m^2)	Ignition time (Sec)	Maximum heating speed (kW/m^2)
8 or less		300 or less
Exceeding 8 and 30 or less	60 or more	

Test Method II

Test Method II for Non-Metallic Materials for Use on Railways applies ISO 5660-1: 2002 as shown in figure, where a square test specimen having a smooth surface and width and length of 100mm and thickness of up to 50 mm is exposed to a radiant heat of 50 kW/m^2 for 10 minutes.

This test verifies whether the difference between the average value of the maximum heating speed of three test specimens and the maximum heating speed of each test specimen is less than 10%, and if less than 10%, the data of the said three test specimens will be adopted. In the event that the difference was 10% or more, the tests shall be conducted on another three test specimens, and among the six test specimen sheets, the data of the four test specimens of which the maximum value and the minimum value of the maximum heating speed are excluded shall be used. The combustion determination shall be based on the total heating value (MJ/ m^2) and the maximum heating speed (kW/ m^2) and ignition time (seconds) during the test.

The ignition time (seconds) shall be the time from the start of the test until the initial ignition is confirmed. The initial ignition is deemed to be the case that the flame has existed for 10 seconds or more.



2. A gangway door, etc., having a construction with the function to close it during normal operation, shall be provided on rolling stock with connecting rooms on passenger cars for subways, etc., passenger cars for Shinkansen, passenger cars for suspended railways, passenger cars for straddled type monorail, passenger cars for guided railways (limited to rolling stock used in railways having underground structures and having long tunnels) and passenger cars on normal conducting magnetic levitation railways and superconducting magnetic levitation railways. However, if the connecting section is the crew room, it is acceptable that the door for the gangway entrance be one that is easily closed.

[Notice concerning applicable timing] (2004: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.125)

1 The stipulations relating to the section limiting "Shall have resistance to burning due to radiant heat, and shall have resistance to melting and dripping" to "ceilings" in "passenger rooms " found in the table in (2) of the Approved Model Specifications relating to Article 83 and the stipulations for Approved Model Specifications 2 shall apply from December 27, 2004. (There are provisos.)

2. Stipulations relating to the Approved Model Specifications for Article 83 1 (6) (limited to the section related to the display for the location of the fire extinguisher) shall apply from July 1, 2005.

[Ministerial Ordinance]

(Fire alarms)

Article 84. Sleeping cars shall be equipped with fire alarms that are automatically triggered in case of fire.

[Approved Model Specifications]

VIII-20 Article 84 Relating to (Fire alarms)

(Basic Items)

The following shall apply for fire alarms and their functions.

(1) Fire alarms shall be provided in sleeping cars and rolling stock with *tatami* mats (limited to trains that travel at night).

(2) Fire alarms shall have a sensor that automatically detects the occurrence of fire through the use of heat or smoke resulting from fire.

[Ministerial Ordinance]

(Function of devices at power failure)

Article 85. The devices or equipment needed to secure the safety of both train operation and passengers shall be able to function for a fixed period of time even after the main power supplies source is interrupted.

[Approved Model Specifications]

VIII-21 Relating to Article 85 (Functions of devices at power failure)

(Basic Items)

1 When the devices, etc., indicated in the following table are provided, their functions shall be ensured for a fixed period of time by a storage battery even when the power supply from the contact line has been interrupted or when the failure of a generator, etc., causes a state of interrupted power supply.

Item	Device, etc.
Power generation system, etc.	・Device that indicates when the temperature of the exhaust pipe has become abnormally overheated.
Brake devices	・When electric circuits are used for brake operation.
Passenger room construction	・Ventilation for rolling stock provided with forced-air ventilation (When appropriate to ([1] in table in item 2 of [Basic Items] of Approved Model Specifications relating to Article 73) ・Lighting devices or auxiliary lighting devices.
Construction of entrance/exits for getting on and off of passengers	・ Automatic door closing device functions ・ Door open indicator lamps for entrance/exits for getting on and off of passengers. ・ Indicator of location and operating method of the door opening device (limited to when this device is provided on the inside of the rolling stock) that enables doors to be opened manually in case of emergency.

Construction of emergency exits	・ Indicator of location and operating method for emergency exits. ・ Door open indicator lamps for emergency exits.
Crew room facilities	・ Aspect facilities for onboard signal equipment ・ Train stop device in case of driver's abnormality ・ Cut-out switch for onboard facilities, devices indicating operating status of automatic train stop device, automatic train control device and automatic train operation device. ・ Device indicating door-opening/closing status of emergency exit. ・ Door closed confirmation device for entrance/exit for getting on and off of passengers.
Devices attached to rolling stock	・ Sign device ・ Whistle ・ Communication device ・ Public address device ・ Lamps that light on for indicating the functions of the emergency alarm device/emergency stop device, the location and operating method indicators, and lamps that light on when the emergency alarm device/emergency stop device are operated. ・ Rear marker lights

Rolling stock facilities for trains, etc., stationed by a single staff member who drives the motive power car.	・Onboard facilities for safety communication facilities
Other facilities	・Operating condition recording device

[Normal conducting magnet levitation railway]

2 In addition to those items indicated in the Basic Items, levitating force shall be achieved to ensure the necessary levitation gap for safe travel and guiding force shall be achieved to ensure the necessary guidance gap for safe travel even when the power supply from the contact line has been interrupted or when the failure of a generator, etc., causes a state of interrupted power supply.

[Superconducting magnetic levitation railway]

3 In addition to those items indicated in the Basic Items, levitating force and guiding force shall be achieved to ensure safe travel even when the power supply to the on-board power supply has been interrupted.

[Operation Notice]

Relating to Article 85 the (Function of devices at power failure)

The standard for the fixed period of time expressed as “functions shall be ensured for a fixed period of time" in Approved Model Specifications 1 shall be 30 minutes or more.

[REVISION] New stipulations for " train stop device in case of driver’s abnormality " and "operating condition recording device" added to Approved Model Specifications relating the table in Item 1 of Article 85(April 28, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.18)

Section 6 Rolling Stock Facilities for Trains, etc., Stationed by a Single Staff Member Who Drives the Motive Power Car.

[Ministerial Ordinance]

(Rolling stock facilities for trains, etc., stationed by a single staff member who drives the motive power car)

Article 86. The train stationed by a single staff member who drives the motive power car shall not only abide by the rules stipulated in the previous Article 64 through the 85, but also comply with the following standards.

(1) A passenger car that runs in the underground structure or other sections that make a quick evacuation of passengers difficult at the time of emergency shall be equipped with appropriate measures to maintain passengers' safety in case of emergency, including the installation of automatic notification system to inform to stations or control centers that the device under paragraph 3 to of Article 79 has been triggered.

(2) A crew that operates a motive power car shall be able to communicate without difficulty with station or operation control center at the regular operating position when needed safety.

(3) As for a passenger car, a crew that operates a motive power car shall be able to manipulate the passenger doors and make necessary announcement easily from the regular operating position.

2. A train without a crew to operate the motive power car shall abide by the rules or standards covered from the Article 64 through the preceding Article. Further, safety device that enables passengers in a passenger car to communicate with operation control centers and other security measures to maintain passengers' safety shall be installed. This rule does not apply, however, to the case when crew onboard can secure the safety in case of emergency.

[Approved Model Specifications]

VIII-22 Relating to Article 86 (Rolling stock facilities for trains, etc., stationed by a single staff member who drives the motive power car)

(Basic Items)

1. The following shall apply to trains stationed by a single staff member who drives the motive power car.

(1) Rolling stock for trains stationed by a single staff member who drives the motive power car shall be according to the Approved Model Specifications relating to Article 64 through to the preceding article 85. However, the facilities that should be installed in the conductor's room shown in the table for Item 1 of the Basic Items of Approved Model Specifications

relating to Article 79, Basic Item 2 and Items 2, 4, 5(1) of the Basic Items of Approved Model Specifications relating to Article 81 does not apply.

(2) Shall be provided with an onboard public address device that enables guidance information to all rooms in passenger cars.

(3) An emergency alarm device shall be provided on passenger cars. However, this does not apply to the rolling stock provided with an emergency stop device and the rolling stock operated as one) car.

(4) On passenger cars, a device for operating the onboard public address device and the automatic door operating device for entry/exits for the getting on and off of passengers shall be provided in the driver's cab of rolling stock serving as the front section of the first car of a passenger train.

(5) The device for operating the onboard public address device and the automatic door closing device for entry/exit for the getting on and off) of passengers shall be capable of being easily operated when the crew member is in his/her regular operating position.

(6) The operating device for the automatic door operator shall be in position that enables easy confirmation of the condition of the passengers at the station through the use of car-side mirrors, etc. However, when the condition of the passengers is confirmed by a window provided on the side surface, it shall be the position where the crew confirms the getting on and off of the passengers.

(7) On the rolling stock operated on sections where the space between the structure gauge and rolling stock gauge is small, shall display the method for opening the said gangway door near the gangway entrance that serves as the rear part of the last car of a train.

(8) The rolling stock that do not indicate the location, etc., of the device for enabling the door to be manually opened inside of the car, shall be provided with a function that enables communication to the train dispatcher, etc., and that enables onboard announcements to the passenger room from the train dispatcher, etc., in case that notification from the passenger room to the crew cannot be ensured.

(9) The following devices shall be provided in the driver's cab.

[1] Train stopping device in case of driver's abnormality shall be provided in the cab. However, this does not apply to the rolling stock operated by automatic train operation device on sections of track with underground construction or elevated construction and also the rolling stock without passengers onboard being operated on sections of track with underground construction or elevated construction by automatic train brake device or automatic train stop device (limited to devices where all the time there is no danger of the limited speed being

exceeded).

[2] When a device in [1] is provided on passenger cars for subways, etc., a device shall be provided to automatically notify a station or an operation dispatch center when a device in [1] operates.

[3] A device in [1] shall not be capable of easily releasing the function manually.

[4] On the rolling stock operated on sections where the space between the structure gauge and rolling stock gauge is small, the doors between passenger rooms adjoining to the crew room at the rear section of the train (limited to crew rooms provided with a gangway exit) shall have a function that enables the door locks to be released from the driver's cab.

(10) The following onboard facilities for safety communication facilities shall be provided in the driver's cab.

[1] On the rolling stock serving as the front part of the train, shall be provided onboard security communication facilities that enable transmission and receiving between a station and an operating dispatch center. However, this does not apply when communication is performed by communication facilities provided at wayside.

[2] Onboard facilities for the safety communication facilities shall not be capable of easily releasing the function manually and shall not be combined with onboard public address system and emergency alarm device.

2. For trains without a staff to drive the motive power car, the following shall apply in addition to the Approved Model Specifications relating to Article 64 through the preceding article.

(1) Trains without a staff onboard shall comply the following standards.

[1] Passenger rooms shall be provided with onboard communication facilities that enable transmission and receiving with the operating dispatch center.

[2] On railways with underground construction and other railways where the track cannot be used as an evacuation route, if a passenger attempts to open a getting on/off door, etc., on a running train, the said train shall automatically be stopped.

[3] On railways with underground construction and other railways where the track cannot be used as an evacuation route, it shall not be easy for a passenger to open/close the train doors for getting on/off

[4] On railways with underground construction and other railways where the track cannot be used as an evacuation route, it shall be possible for the train dispatch center to stop the rolling stock.

[5] It shall be possible to confirm the abnormalities of rolling stock from the train dispatch center.

[6] When the contact line is a third rail, etc., and there is the danger of electrical shock while using an evacuation route, it shall be possible to stop the feeder for the sections needed for evacuation when the getting on/off doors, etc., are opened on trains stopping between stations. In this case, regardless of the Approved Model Specifications relating to Article 81 Item 6 (4), it is possible to provide an emergency stopping device.

(2) The following standards shall apply to the trains stationed by a single staff member other than the staff member who drives the motive power car.

[1] In the crew room, shall be provided onboard facilities for the safety communication facilities that enable transmission and receiving with the train dispatch center.

[2] When the staff member cannot perform stopping operations at the time of emergency, it shall be possible for the train dispatch center to stop the rolling stock.

[3] Shall be according to the stipulations of ɫBasic Items 1 (7) to (8) and (9) [4].

(Trackless electric vehicles)

3 The items other than those shown in the Basic Items shall be as shown below.

(1) A device such as a mirror, etc., shall be provided at the driver's seat of the rolling stock serving as the front part of the train that enables the driver to check the contact status between the trolley pole and contact wire if necessary during operation.

(2) A buzzer or other such device shall be provided in the passenger room that can be easily used to notify the driver that a passenger is about to get off. However, this does not apply when operation is only on sections of track that only have stations at the beginning and end of the line.

[Notice concerning applicable timing] (2004: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.125)

1. Standards relating to the Approved Model Specifications 1 (8) , (9) [4] and 2 (2) [3] (excluding the section relating to Approved Model Specifications 1 (7) of Article 86)shall apply from December 27, 2004. (There are provisos.)

2. Stipulations 1(7) and 2(2) [3] (limited to the section relating to 1(7) of the Approved Model Specifications for Article 86) of Approved Model Specifications relating to Article 86 shall apply from July 1, 2005.

[REVISION] Revisions accompanying the addition for " train stop device in case of driver's abnormality " for Approved Model Specifications for Article 86 ((April 28, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.18) are implemented on July 1.

Chapter 8-2 Other facilities
[Ministerial Ordinance]

(Devices for recording the operating condition of trains)

Article 86-2. For trains, operation control centers and other necessary places, event recorders to record train operation shall be installed. However, this rule does not apply to such exceptional cases as the maximum train speed is low, or installation is made difficult by the structural reasons.

[Approved Model Specifications]

VIII-II-1 Relating to Article 86-2 (Device for recording the operating condition of trains)

1 The "Device for recording the operating condition of trains" shall be capable of recording the following items.

However, this does not apply when the maximum train operating speed is 40 km/h or less or when the recording of the necessary information is difficult due to structure.

(1) Basic information relating to train operation

[1] Time

[2] Speed

[3] Position (including when calculated from speed and time)

(2) Basic information relating to driver operation

[1] Status of operating devices for control facilities

[2] Status of operating devices for service brake devices

(3) Operation of automatic train stopping device and automatic train control device.

(4) Recording of communications between operating dispatch center and driver, etc.

[1] Voice

[2] Time

2 The recording of 1 shall be capable of recording the amount for the most recent one day or more.

[1] New standards added to Approved Model Specifications relating to Article 86 (April 28, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.18)

[2] Of the items stipulated in Revised Ministerial Ordinance Supplemental Provisions, one of the items to be relevant for each item of Article 2, Paragraph 2 of the said supplemental provision shall apply until June 30, 2011, Article 79, Paragraph 3 the new Ministerial

Ordinance

[Notice, April 28, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.19)

Chapter 9 Maintenance of Facilities and Rolling stock

[Ministerial Ordinance]

(Maintenance of Facilities and Rolling Stock)

Article 87. Rail track and electric facilities to operate trains, etc. (hereinafter referred to as “electric facilities”) shall be maintained in an appropriate condition to provide a safe train operation at the designated speed.

2. In case the main track and the electric overhead lines installed over the main track are not in the condition described in the previous paragraph temporarily, necessary measures including speed restriction shall be taken to maintain a safe train operation. Those sections that need special attention shall be carefully monitored.
3. Train protection facilities shall be maintained so as to operate accurately.
4. Rolling stock shall not be used unless they are maintained to function accurately and to be safely operated.

[Approved Model Specifications]

No Approved Model Specifications is provided.

[Ministerial Ordinance]

(Inspection and Field Test of Newly Installed Facilities and Newly Manufactured Rolling Stock, etc.)

Article 88. Newly installed, reconstructed, renovated or repaired tracks and electric facilities shall not be used unless inspection and test run are completed. Test run may be omitted, however, for track and electric facilities that have been slightly reconstructed or repaired and also for side tracks that do not seem to impair the main track.

2. When the track and electric facilities were suspected of faulty because disaster and other operation accidents took place, and also the track and the electric facilities that have not been used for a while are to be used for train operation, the relevant track and electric facilities shall be inspected in advance and test run shall be conducted wherever and whenever necessary.

3. Train protection facilities that have been newly installed, reconstructed or repaired shall not be used until after inspection and confirmation of its function are completed. This rule also applies to the train protection facilities that are suspected of faulty due to disasters and other operation accidents and to the train protection facilities that are again used after not being used for a while.

4. Newly made or purchased and remodeled or repaired rolling stock shall not be used until after inspection and test run have been conducted. Test run may be omitted, however, when only a minor remodeling or repair was done.

5. Rolling stock that is suspected of failure because of derailment and other operation accidents and also that has not been used for a while shall be inspected in advance, or shall be put for test run if needed before it is put to operation.

[Approved Model Specifications]

IX-1 Related to Article 88 (Inspection and Field Test of Newly Constructed Facilities, and Newly Manufactured Rolling Stock, etc.)

1 Tunnel covered by concrete shall be, upon completion, be inspected by the following methods.

(1) The first overall inspection shall be made by visual inspection from a close distance and hammering test.

(2) The detail of the visual inspection and the hammering test shall be defined and determined based on The Notice on "Maintenance Management Manual of Tunnel" (Railway Construction Procedures No.31) issued on February 28, 2000.

(3) Judgment of the inspection results shall be for each category: separation and falling, external force, degradation and water leakage based on the Notice on "Maintenance Management Manual of Tunnel" (Railway Construction Procedures No.31) issued on February 28, 2000.

2 When there is such danger that modifications, etc., may influence the static wheel load, the ratio of wheel load unbalance shall be confirmed to be appropriate by directly measuring the wheel load.

[Ministerial Ordinance]

(Patrol Inspection and Monitoring of Main Track as well as Overhead Contact Line Installed over the Main Line and Inspection of Train)

Article 89. Patrol inspection shall be conducted for the main track and overhead contact line installed over the main track, according to the situation of the section block and traffic conditions of trains.

2. When a possibility of disasters that can interfere with the safe train operation on the main track is found, the relevant track shall be carefully monitored.

3. Main component of a rolling stock shall be inspected according to the type and traffic condition of trains.

[Approved Model Specifications]

IX-2 Related to Article 89 "Patrol Inspection and Monitoring of Main Track as well as Overhead Contact Line installed over Main Line and Inspection of Train":

1 Patrol inspections of the rail tracks as well as overhead contact line installed on the main line shall be appropriately carried out considering the situation of the section block and traffic conditions in order to maintain them in the condition as to secure the safe operation of rolling stock at the pre-determined speed. Details of frequency, timing, method, etc. of the patrol inspections shall be determined considering the surrounding circumstances.

2 When a certain disaster that may influence or interfere with the operation of trains, is expected to occur on the main line, it is necessary to monitor the main line, and to limit the running speed of trains, if necessary, or to stop the operation of trains on the line or the relevant section block. Moreover, an appropriate monitoring arrangement, restricted operation speed of the train, etc. corresponding to the foreseeable disasters shall be prepared in advance.

3 A railway operator shall carry out the inspection of trains pursuant to the pre-determined content of the inspection at the pre-determined timing in consideration of the usage of the rolling stock, design method, the management method applied to them, and the traffic condition of the trains.

[Ministerial Ordinance]

(Periodic Inspection of Facilities and Rolling Stock)

Article 90. A pertinent cycle, item and method of periodic inspection for facilities and rolling stock shall be determined according to their type, structure and usage, in advance.

2. When Minister of Land, Infrastructure, Transport and Tourism issues a public notice to stipulate the items for the periodic inspection mentioned above, periodic inspection shall be carried out according to the public notice.

Public Notice on Periodic Inspection of Facilities and Rolling stock

(Purport)

Article 1 This public notice shall define the Periodic Inspection of the facilities and the rolling stock stipulated in Paragraph 2 of Article 90 of The Ministerial Ordinance setting up the technical standard of the matters related to the railway.

(Periodic Inspection of Railway Track)

Article 2 Inspection of railway tracks shall be carried out periodically within the month in which the day, passed the respective basis period specified in the third column reckoned from the basis date of inspection, is involved, or within the tolerable deviation period, specified in the right column of the table below, from the day passed the respective basis period, for each facility and equipment listed in the second column, for the kind they are installed as described in the left column of the table below.

Here, the basis date of inspection is stipulated as the day to determine the period for performing the inspection for each facility or the part by taking into consideration the characteristic of the facility and the other conditions. Hereafter, the same shall apply in the next Item and Item 3 Number 1.

Additionally, the month in which the day passed the basis period is involved is redefined as the day passed the basis period, when the basis period of the said facility is below 1 year. Hereafter, in this Item, referred to as "the day passed the respective basis period".

Kind of Railway	Kind of Facility	Basis Period
Railway other than Shinkansen	Track	1 year
	Bridge, tunnel and other structures	2 years
Shinkansen	Track (Limited to gauge, alignment, cross level, and twist of main line of ordinary railways)	2 months
	Track	1 year
	Bridge, tunnel and other structures	2 years

2 Above the basis date of inspection may be changed, when there are inevitable reasons.

3 In either of the following cases, the content of the said each Number is applied notwithstanding the provision of Item1.

(1) When it is found to need the reducing of the inspection period stipulated in Item 1, by taking into consideration the characteristic of the facility and the other conditions, the periodic inspection shall be carried out by stipulating appropriate period (when the timing for performing the inspection of facilities is limited by the characteristic of the facility and the other conditions, the appropriate timing for the inspection is taken into consideration.), for each facility or the part, within the Basis Period specified in the table of Item 1.

On the inspection cycle of this case, the period based on tolerable deviation period described in the table of Item 1 may be involved within the range of period described in the following table, in the vicinity of the month (the day passed the said period, when the said period of the facility is below 1 year.) in which the day, passed the said period reckoned from the basis date of inspection.

Appropriate period stipulated within the basis period described in the table of Item 1	Period based on tolerable deviation period described in the table of Item 1
Not less than 1 year	1 month
Not less than six months and Below 1 year	30 days
Below six months	14 days

(2) In the case that detailed inspection, analysis and estimation (hereinafter referred to as a "inspection, etc.") are performed in addition to the periodic inspection in Item 1, when it is found that the facilities(except tracks, tunnels, earth structures and retaining structures) performed the said inspection, etc. have sufficient durability, periodic inspection may be carried out within the range of period to be found that there is in no .danger of durability loss, for each facility, by stipulating appropriate period exceeding the basis period described in the table of Item1. On the inspection cycle of this case, the same period as the tolerable deviation period described in the table of Item 1 may be involved.

4 In respect of the tunnel, a detailed inspection, in addition to the inspection as stipulated in Item 1 and above Number 1, shall be carried out within every 20 years for railways other than the Shinkansen and within every 10 years for Shinkansen.

(Periodic Inspection of Electric Equipment)

Article 3 Inspection of electric equipment shall be carried out periodically within the month in which the day, passed the respective basis period specified in the third column reckoned from the basis date of inspection, is involved, or within the tolerable deviation period, specified in the right column of the table below, from the day passed the respective basis period, for each facility and equipment listed in the second column, for the place they are installed as described in the left column of the table below.

Here, the basis date of inspection is stipulated as the day to determine the period for performing the inspection for each facility or the part by taking into consideration the characteristic of the facility and the other conditions. Hereafter, the same shall apply in Item2, Item 3, and Article 4 Item 1 to Item3.

Additionally, the month in which the day passed the basis period is involved is redefined as the day passed the basis period, when the basis period of the said facility is below 1 year. Hereafter, in this Item, referred to as "the day passed the respective basis period".

Place Installed	Kind of Equipment	Basis Period	Tolerable Deviation Period
Railway other than Shinkansen and Shinkansen (Shed only)	Overhead contact line, transformer to be used for train operation, equipment and device which can protect equipment of transformer station, distribution line, etc., under abnormal conditions and other important electric equipment.	1 year	1 month
	Any electric equipment other than the above specified.	2 years	1 month
Shinkansen (Excluding	Equipment and device which	3 months	14 days

Shed)	can protect equipment for the transformer station, distribution line, etc., at unusual situation. (limited to breaker at feeding side)		
	Overhead contact line (limited to connecting point, sectioning device, overhead crossing device and feeding branch device only)	6 months	30 days
	Any electric equipment other than the above.	1 years	1 month

2 Above the basis date of inspection may be changed, when there are inevitable reasons.

3 In either of the following cases, the content of the said each Number is applied notwithstanding the provision of Item1.

(1)When it is found to need the reducing of the inspection period stipulated in Item 1, by taking into consideration the characteristic of the facility and the other conditions, the periodic inspection shall be carried out by stipulating appropriate period (when the timing for performing the inspection of facilities is limited by the characteristic of the facility and the other conditions, the appropriate timing for the inspection is taken into consideration.), for each facility or the part, within the Basis Period specified in the table of Item 1.

On the inspection cycle of this case, the period based on tolerable deviation period described in the table of Item 1 may be involved within the range of period described in the following table, in the vicinity of the month (the day passed the said period, when the said period of the facility is below 1 year.) in which the day, passed the said period reckoned from the basis date of inspection.

Appropriate period stipulated within the basis period described in the table of Item 1	Period based on tolerable deviation period described in the table of Item 1

Not less than 1 year	1 month
Not less than six months and Below 1 year	30 days
Below six months	14 days

(2) In either of the following cases [1] to case [3], the periodic inspection may be carried out by stipulating appropriate period for each facility or the part, over the Basis Period specified in the table of Item 1. On the inspection cycle of this case, the period based on tolerable deviation period described in the table of Item 1 may be involved within the range of period described in the following table, in the vicinity of the month (the day passed the said period, when the said period of the facility is below 1 year.) in which the day, passed the said period reckoned from the basis date of inspection.

[1] Electric equipment equipped with equipment or device that will start the auxiliary equipment for the said equipment automatically when a failure occurs, or failure appears imminent.

[2] Electronic or sealed equipment and equipment for which its functions can be ensured by periodic replacement of the equipment, by which the function of the equipment can be ensured for periods beyond those specified in the table of Item 1.

[3] Structures supporting contact line, etc.

Appropriate period stipulated within the basis period described in the table of Item 1	Period based on tolerable deviation period described in the table of Item 1
Not less than 1 year	1 month
Not less than six months and Below 1 year	30 days

Below six months	14 days

(Periodic Inspection of Train Protection System and Equipment)

Article 4 Inspection of train protection system and equipment shall be carried out periodically within the month in which the day, passed the respective basis period specified in the third column reckoned from the basis date of inspection, is involved, or within the tolerable deviation period, specified in the right column of the table below, from the day passed the respective basis period, for each facility and equipment listed in the second column, for the place they are installed as described in the left column of the table below.

Additionally, the month in which the day passed the basis period is involved is redefined as the day passed the basis period, when the basis period of the said facility is below 1 year. Hereafter, in this Item, referred to as “the day passed the respective basis period”.

Place Installed	Kind of Equipment	Basis Period	Tolerable Deviation Period
Railway other than Shinkansen and Shinkansen (Shed, etc., only)	Equipment to ensure the block, device to ensure train distances, signal indication device for railway, equipment and device to link the signals, etc., equipment and device to slow down or stop the train automatically, and other important train protection system and equipment.	1 year	1 month
	Any train protection system and equipment other than the above.	2 years	1 month
Shinkansen (Excluding Shed, etc.)	Equipment to ensure train distances, and major part of the	3 months	14 days

	switch and lock movement.		
	Signal indication device for railway, major part of the equipment to link the signals and the communication equipment for safety (for train operation only).	6 months	30 days
	Any train protection equipment other than the major part of those listed in the above two columns.	1 years	1 month

2 Above the basis date of inspection may be changed, when there are inevitable reasons.

3 In either of the following cases, the content of the said each Number is applied notwithstanding the provision of Item1.

(1)When it is found to need the reducing of the inspection period stipulated in Item 1, by taking into consideration the characteristic of the facility and the other conditions, the periodic inspection shall be carried out by stipulating appropriate period (when the timing for performing the inspection of facilities is limited by the characteristic of the facility and the other conditions, the appropriate timing for the inspection is taken into consideration.), for each facility or the part, within the Basis Period specified in the table of Item 1.

On the inspection cycle of this case, the period based on tolerable deviation period described in the table of Item 1 may be involved within the range of period described in the following table, in the vicinity of the month (the day passed the said period, when the said period of the facility is below 1 year.) in which the day, passed the said period reckoned from the basis date of inspection.

Appropriate period stipulated within the basis period described in the table of Item 1	Period based on tolerable deviation period described in the table of Item 1
Not less than 1 year	1 month

Not less than six months and Below 1 year	30 days
Below six months	14 days

(2) In either of the following cases [1] and case [2], the periodic inspection may be carried out by stipulating appropriate period for each facility or the part, over the Basis Period specified in the table of Item 1. On the inspection cycle of this case, the period based on tolerable deviation period described in the table of Item 1 may be involved within the range of period described in the following table, in the vicinity of the month (the day passed the said period, when the said period of the facility is below 1 year.) in which the day, passed the said period reckoned from the basis date of inspection.

[1] Any train protection system and equipment equipped with a function to automatically activate its auxiliary equipment when a when a failure occurs, or failure appears imminent.

[2] Electronic or sealed equipment and equipment for which its functions can be ensured by periodic replacement of the equipment, by which the function of the equipment can be ensured for periods beyond those specified in the above item.

Appropriate period stipulated within the basis period described in the table of Item 1	Period based on tolerable deviation period described in the table of Item 1
Not less than 1 year	1 month
Not less than six months and Below 1 year	30 days
Below six months	14 days

(Periodic Inspection of Rolling Stock)

Article 5 Inspection of the rolling stock shall be carried out periodically within the respective period specified in the right columns for the type of rolling stock listed in the left column of the appended table. However, this does not apply to the parts of rolling stock having characteristics of anti-wear and durability, and the functions of such parts are assured to be maintained for a longer period than the period specified in the right columns of the Appendix.

(Exceptions)

Article 6 In case of the rolling stock whose operation is suspended (limited to when certain measures to prevent corrosion, deformation, degradation of electric insulation, etc., possible to occur during such suspended period have been applied to such rolling stock if they are the rolling stock other than those of trackless electric car), such suspended period shall not be counted in the calculation of the period for the inspection interval stipulated in Article 5. However, such period not to be counted in the calculation of the period of inspection interval shall not exceed the period corresponding to the kind of inspection as specified below:

(1) Inspection of condition and function: two (2) months
(except for steam locomotive: forty (40) days)
Inspection of important and critical parts: two (2) years
(except for steam locomotive: one (1) year)

(2) Overall inspection: four (4) years

2 In case of the rolling stock whose usage for operation is then suspended, and the facility or the rolling stock such that any inspection is unable to be implemented due to a certain special reason, inspections required by the provisions of Article 2 to 5 as stated above can be postponed until such situation or reason shall cease.

Supplementary Provision:

This public notice shall come into force from March 31, 2002.

Supplementary Provision:

This public notice shall come into force from February 26, 2007.

(Transitional Measure)

The Periodic Inspection based on Article 2 Item 1, Item 3 (except Number 2), Article 3 Item 1, Item 3 (except Number 2), and Article 4 Item1, Item3 (except Number 2) of the revised Public Notice on Periodic Inspection of Facilities and Rolling stock may abide by the prior and existing examples until after the day passed 1 year reckoned from the effective date of this public notice.

Appendix (Related to Article 5)

<table>
<tr><td colspan="2" rowspan="2">Kind of Rolling Stock</td><td colspan="3">Period</td></tr>
<tr><td>Inspection of Condition and Function</td><td>Inspection of important and Critical Part</td><td>Overall Inspection</td></tr>
<tr><td rowspan="4">Locomotive, Passenger Car and Freight Car</td><td>Electric car of Trackless rolling stock</td><td>1 month</td><td>1 year</td><td>3 years</td></tr>
<tr><td>Steam locomotive</td><td>40 days</td><td>1 year</td><td>4 years</td></tr>
<tr><td>Freight car</td><td>3 months</td><td>2 years and 6 months</td><td>5 years</td></tr>
<tr><td>Rolling stock of suspended railway, straddle type monorail, and guided railway</td><td>3 months</td><td>3 years (except for the first inspection of newly manufactured rolling stock which shall be within 4 years upon commencement of its usage)</td><td>6 years (except for the first inspection of newly manufactured rolling stock which shall be within 7 years upon commencement of its usage)</td></tr>
</table>

	Internal combustion locomotive and Internal combustion railcar	3 months	4 years, or the period of traveled mileage of the rolling stock being not exceeding 500 thousand kilometers (or 250 kilometers if the rolling stock is equipped with internal combustion engine with pre-combustion chamber or with transmission having dry clutch), of which shorter period is selected .	8 years
	Other rolling stock of the railway other than Shinkansen	3 months	4 years, or the period of traveled mileage of the rolling stock being not exceeding 600 thousand kilometers, of which shorter period is selected .	8 years

	Passenger car of Shinkansen (excluding superconducting magnetic levitation railways)	30 days or the period of traveled mileage of the rolling stock being not exceeding 30 thousand kilometers, of which shorter period is selected.	1 year and 6 months (except for the first inspection of newly manufactured rolling stock which shall be within 2 years and 6 months upon commencement of its usage), or the period of traveled mileage of the rolling stock being not exceeding 600 thousand kilometers (or 450 thousand kilometers if the rolling stock is equipped with traction circuit having control system by way of tap changer), of which shorter period is selected.	3 years (except for the first inspection of newly manufactured rolling stock which shall be within 4 years upon commencement of its usage), or the period of traveled mileage of the rolling stock being not exceeding 1,200 thousand kilometers (or 900 kilometers if the rolling stock is equipped with traction circuit having control system by way of tap changer), of which shorter period is selected.
	Shinkansen (applicable only to superconducting magnetic levitation railways)	30 days	1 year	2 years
	Freight car of Shinkansen	90 days	2 years and 6 months	5 years
	Other type of car of Shinkansen	90 days	3 years, or the period of traveled mileage of the car being not exceeding 250 thousand kilometers, of which shorter period is selected. .	6 years

	Special rolling stock	Freight car	3 months	3 years (except for the first inspection of newly manufactured freight car which shall be within 3 years and 6 months upon commencement of its usage)	6 years (except for the first inspection of newly manufactured freight car which shall be within 6 years and 6 months upon commencement of its usage)
		Internal combustion locomotive and Internal combustion Car	3 months	3 years and 6 months (except for the first inspection of newly manufactured car which shall be within 4 years upon commencement of its usage), or the period of traveled mileage of the car being not exceeding 250 thousand kilometers, which is shorter.	7 years (except for the first inspection of newly manufactured car which shall be within 7 years and 6 months upon commencement of its usage)
		Other rolling stock of the railway other than Shinkansen	3 months	3 years and 6 months (except for the first inspection of newly manufactured car which shall be within 4 years upon commencement of its usage), or the period of traveled mileage of the car being not exceeding 400 thousand kilometers, of which shorter period is selected.	7 years (except for the first inspection of newly manufactured car which shall be within 7 years and 6 months upon commencement of its usage)

	Passenger car of Shinkansen	30 days, or the period of traveled mileage of the car being not exceeding 30 thousand kilometers, of which shorter period is selected.	1 year and 6 months (except for the first inspection of newly manufactured car which shall be within 2 years and 6 months upon commencement of its usage)	3 years (except for the first inspection of newly manufactured car which shall be within 4 years upon commencement of its usage)
	Freight car of Shinkansen	90 days	3 years	6 years
	Other type of car of Shinkansen	90 days	3 years and 6 months	7 years

Remarks:

(1) The "Inspection of Condition and Function" in this table shall mean the periodic inspection of the condition and function of the rolling stock.

(2) The "Inspection of Important and Critical Part" in this table shall mean the periodic inspection of the major part of power generation system, running gear, braking device, and other critical and important equipment of the rolling stock.

(3) The "Overall Inspection" in this table shall mean the general inspection of the rolling stock as a whole.

Revision – Article 2, 3 and 4 of the Public Notice was fully revised on February 26, 2007 (Public Notice No. 229 prescribed by the Ministry of Land, Infrastructure and Transport). The revision involved the allowance for the deviation of inspection timing for facilities, and the setting of substantial reasons for extension of the period.

[Approved Model Specifications]

(Related to the Ministerial Ordinance setting up the technical standard of the matters on the railway)

IX-3 Article 90 Related to the (Periodic Inspection of Facilities and Rolling Stock)

1 The inspection of cable railway shall be carried out pursuant to No.4 of Appendix on the "Inspection of Cable Railway".

2 Replacement of cables of any cable railway shall be made in accordance with the stipulation of No.5 of Appendix on the "Standard of Cable Replacement of Cable Railway".

[Approved Model Specifications]

(Related to the public notice on the Periodic Inspection of Facilities and Rolling Stock)

I-1 Article 2 Related to the (Periodic Inspection of Railway Track)

1 The words "characteristics and other situations of facilities" in Paragraph 1 of Article 2 of the public notice shall refer to the degree of susceptibility of the facilities to the weather conditions, conditions of vegetation around the facilities, etc.

2 The words "if there is any inevitable reason" in Paragraph 2 of Article 2 of the public notice shall refer to the case where the large-scale refurbishment is implemented for the facilities, etc., that is, the case where the inspection either equaling or surpassing the periodic inspection is conducted without exceeding the inspection period from the inspection reference date before the modification prescribed for the relevant facilities or each of their parts.

3 The words "characteristics and other situations of facilities" in Number 1 of Paragraph 3 of Article 2 of the public notice shall refer to the soundness, use conditions, surrounding weather conditions, etc. of the facilities.

4 The "appropriate period" in Number 2 of Paragraph 3 of Article 2 of the public notice shall refer to 4 years for steel and composite structures and 6 years for concrete structures.

5 The periodic inspection of railway track shall be performed for the track irregularities (gauge, cross level, longitudinal level irregularity, alignment and twist), the condition of track materials such as rail and sleepers, and the condition of tracks such as joint gaps, etc.

6 The inspection on tunnels shall be carried out by using the following methods.

(1) As part of the periodic inspection (excluding the inspection prescribed in Paragraph 4 of Article 2 of the public notice), the visual inspection on foot, etc. shall be carried out using sufficient lights, as well as using the method equaling or surpassing the hammering test in the places deemed necessary.

(2) As part of the inspection prescribed in Paragraph 4 of Article 2 of the public notice, careful visual inspection shall be carried out using sufficient lights as well as using the method equaling or surpassing the hammering test in the places deemed necessary.

I-2 Article 3 Related to the (Periodic Inspection of Electric Equipment)

1 In respect of such items of electric equipments the state and condition of which are continuously watched by the continuous state monitoring equipments and such state and condition of which are regularly reported to the command and control center, etc., it can be regarded that the periodic inspection has been implemented.

2 The words “characteristics and other situations of facilities” in Paragraph 1 of Article 3 of the public notice shall refer to the degree of susceptibility of the facilities to the weather conditions, etc.

3 The words “important power facilities” in the Table of Paragraph 1 of Article 3 of the public notice shall refer to the power facilities including those described below.

(1) The overhead contact lines and transmission lines defined in Section 1 of Chapter 6 of the Ministerial Ordinance

(2) The equipment which may protect the devices of the power substation, electric lines, etc. in the emergency cases defined in Section 2 of Chapter 6 of the Ministerial Ordinance and the transformers used for the operation of trains

4 The words “if there is any inevitable reason” in Paragraph 2 of Article 3 of the public notice shall refer to the case where the large-scale refurbishment is implemented for the facilities, etc., that is, the case where the inspection either equaling or surpassing the periodic inspection is conducted without exceeding the inspection period from the inspection reference date before the modification prescribed for the relevant facilities or each of their parts.

5 The words “characteristics and other situations of facilities” in Number 1 of Paragraph 3 of Article 3 of the public notice shall refer to the age of service, use conditions, surrounding weather conditions and structures, etc.

I-3 Article 4 Related to the (Periodic Inspection of Train Protection System and Equipment)

1 In respect of the items of the train protection system and equipments of which the state and conditions are watched by the continuous state monitoring equipment and such state and conditions of which are regularly reported to the command and control center, etc., it can be regarded that the periodic inspection has been implemented.

2 To determine the inspection reference date defined in Paragraph 1 of Article 4 of the public notice, the situations such as the degree of susceptibility of the facilities to the weather conditions, etc. shall be taken into consideration.

3 The Table "Important train protection system and equipment" of Paragraph 1 of Article 4 of the public notice shall include the train protection system and equipment defined in Section 1 (excluding Paragraph 2 of Article 56 and Article 58) and Section3 of Chapter 7 of the Ministerial Ordinance.

4 The "Major parts" mentioned in the Table of Paragraph 1 of Article 4 of the public notice shall refer to those parts which give rise to significant functional deterioration or loss in the entire equipment if they break down, or are damaged or broken.

5 The words "if there is any inevitable reason" in Paragraph 2 of Article 4 of the public notice shall refer to the case where the large-scale refurbishment is implemented for the facilities, etc., that is, the case where the inspection either equaling or surpassing the periodic inspection is conducted without exceeding the inspection period from the inspection reference date before the modification prescribed for the relevant facilities or each of their parts.

6 The words "characteristics and other situations of facilities" in Number 1 of Paragraph 3 of Article 4 of the public notice shall refer to the age of service, use conditions, surrounding weather conditions, etc. of the facilities.

I-4 Article 5 Related to the "Periodic Inspection of Rolling stock":

1 Inspection Item and Method of the "Inspection of important and Critical Part" and the "Overall Inspection":

(1) The items and the methods of the inspection of the important and critical part and the overall inspection of the rolling stock of ordinary railways shall be determined by the kind of rolling stock in accordance with the stipulations of the Appendix. However, in the inspection of the important and critical part, application of the inspection items and the methods required in the Appendix to those parts other than the major part of the important and critical equipment can be omitted in consideration of the structure, function and the situation of usage of the said rolling stock.

(2) The items and the methods of the inspection of the important and critical part and the

overall inspection of the rolling stock of special railways shall be determined pursuant to the stipulations of the Appendix in consideration of the design and the situation of usage of the said rolling stock.

2 Management of the static wheel load of Rolling stock:

Management of the static wheel load of the rolling stock based on the Approved Model Specifications 2 related to Article 66 of the Ministerial Ordinance shall be carried out by directly measuring the wheel load at the time of the rolling stock's shop-out.

3 Insulation Test:

(1) When the periodic inspection is conducted, an insulation test shall be made on the equipment and wires of the electric circuits if it is deemed necessary.

(2) When an insulation test is conducted, an insulation resistance test and a dielectric strength test shall be implemented in consideration of insulation materials used for the electric circuits and wires, wiring devices and instruments, structure of the rolling stock, and existence or nonexistence of any protective circuit.

(3) When the dielectric strength test is carried out, a voltage of 1.65 times or more of the service voltage shall be used and be continued for 1 minute or more if the direct current of more than 750 voltages or the alternate current of more than 300 voltages is served for the electric circuit.

4 Inspection of Axle:

When a flaw and penetration detection is carried out in the periodic inspection of the axle, the inspection method to be applied shall comply with the "Standard of Flaw and Penetration Detection of Axle" shown in No.1 of the Appendix.

5 Inspection method of the brake equipment of a rolling stock which obtains the necessary braking force structurally by single brake cylinder and is operated by a single car:

The inspection method of the brake equipment of the rolling stock shall comply with No.2 of the Appendix.

6 Inspection method of the truck frame:

The inspection of the truck frame shall comply with the "Inspection Manual of Truck Frame" as shown in No.3 of the Appendix.

7 Inspection Intervals as defined in the proviso to Article 5 and after of the public notice:

(1) The examples of the equipment which can be regarded as such equipment as defined in Article 5 of the public notice as "However, the above statement does not apply to the parts of any rolling stock having characteristics of anti-wear and durability, and the functions of such parts are assured to be maintained for longer period than the period

specified in the right columns of the Appendix" shall be the following:

① Any equipment that has no contact points by use of electronic devices,

② Any equipment that has reduced mechanically movable parts,

③ Any equipment such that its anti-wear characteristics and durability have been improved by the change of material quality, etc.,

④ Any equipment of which inspection interval could be deemed appropriate judging from the usage results, inspection record, etc., though no changes of structure, material quality, etc., were made to the conventional equipment,

⑤ Any equipment such that the state and functions of its major component and devices is continuously monitored, and is easy to grasp its state and functions, and

⑥ Any equipment of which inspection intervals can be changed by applying more reliable inspection methods such as nondestructive inspection, etc.

(2) The railway operator, who could prove themselves complying to the public notice by a certain objective review method such as verification or theoretical analysis based on the actual data corresponding to their respective technical reference, can determine the inspection intervals and the methods of the inspection for the equipment as above referred.

I-5 Article 6 Related to the "Exceptions for Inspection of Rolling stock":

When the railway operator wants to implement testing on the rolling stock in order to extend the inspection interval of the rolling stock because of a certain "special cause or reason" as stated in Paragraph 2 of Article 6 of the public notice, they shall be required to report to the authority of the following:

① Rolling stock to be tested,

② Period of the test,

③ Cause or reason of implementing the test,

④ Data and information on the rolling stock to be tested,

⑤ Measures to secure safety during the test period.

[Operation Notice]

Related to Article 6 of the public notice in respect of periodic inspection of facility and rolling stock:

In the "Special Cause or Reason" as referred in Paragraph 2 of Article 6, situations under which no inspection is possible to be implemented because of the unavoidable event such as bad weather, etc., shall be included.

[Ministerial Ordinance]

(Records)

Article 91. Records shall be made and kept for all of the inspections, rebuilding, remodeling or repair carried out for facilities and rolling stock, according to the Article 88 and 90.

[Approved Model Specifications]

IX-4 Article 91 Related to (Records)

1 All the records of inspections, conversions, renovations and repairs of the facility shall be kept for the pre-determined period of time. Also, all the records of the deformations of bridges, tunnels, and other structures shall be kept in such manner that the history of such deformations can be understood. The results of the first overall inspection, ordinary overall inspections and the special overall inspection of the tunnel shall be recorded in the development diagram or the like which shall be, if necessary, amended upon completion of such inspection accordingly.

2 Inspection of Rolling Stock

All the records of the inspection of the newly built rolling stock, etc., and of the periodic inspections shall be kept until the first overall inspection directly after the above inspections will have been completed. In addition, the date and year, and the place of the periodic inspection of the rolling stock shall be printed at the appropriate place of the rolling stock. However, the inspection on the state and function shall be excluded. When the railway operator is maintaining all the records of the date and year and the place of the periodic inspections, they can omit printing of the above information on the rolling stock.

Chapter 10 Train Operation

Section 1 Loading Limitation, etc.

[Ministerial Ordinance]

(Loading Limitation of Vehicle, etc.)

Article 92 Vehicles shall not be overloaded beyond their specified loading limitation.

2. In loading goods on vehicle, effort shall be made to balance the burden of the weight and to prevent goods from falling, rolling, etc., due to oscillation during operation.

3. Goods shall not be loaded onto a vehicle beyond its rolling stock clearance. In case of transporting extra large cargo, however, this rule does not apply if it is confirmed that loaded condition would not impair the vehicle operation.

[Approved Model Specifications]

X-1 Article 92 Related to (Loading Limitation of Vehicle, etc.)

1 Goods exceeding the maximum load as indicated on vehicles shall not be loaded.

2 When transporting extra-large cargoes, possible hindrances along the route shall be checked in advance and any necessary measures shall be taken to ensure safety.

3 Where possible, hazardous cargos shall be loaded on vehicles with a sealed structure (including vehicles loaded with tank containers, etc.; hereafter, the same shall apply).

4 When hazardous materials are loaded onto vehicles with a sealed structure, or when containers filled with hazardous materials are loaded onto vehicles, they shall be checked to ensure that there is no risk of leakage.

[Ministerial Ordinance]

(Display of Dangerous Cargo)

Article 93 A car that is loaded with hazardous cargo shall have hazardous labels on conspicuous spots of both sides of the vehicle.

[Approved Model Specifications]

X-2 Article 93 Related to (Display of Hazardous Cargo)

Labeling with respect to vehicles loaded with hazardous materials shall include descriptions concerning not only the name of the relevant hazardous materials but also the properties thereof in order to help determine the course of action to be taken in the event of an emergency.

Section 2 Train operation

[Ministerial Ordinance]

(The maximum Number of Coupled Vehicles, etc.)

Article 94 The maximum number of cars to be coupled to make a train consist shall comply with the performance, structure and strength of the rolling stock and the situation of facilities.

2. When vehicle (excluding one with hermetically sealed structure) loaded with nothing but hazardous goods is coupled to a train, pertinent preventive measures shall be taken so as not to endanger passengers and crew.

[Approved Model Specifications]

X-3 Article 94 Related to (The maximum Number of Coupled Vehicles, etc.)

1 “Situation of facilities” as provided in 1 refers to the gradient of a railway track and the effective length of a railway track in a station where a train stops as outlined in the operation plan; additionally, in the case of passenger trains, it refers to the effective length of platforms in stations (excluding those where doors are not allowed to open and where measures to eliminate danger, e.g., avoiding the risk of passengers falling by making public announcements, are implemented in cases where low volumes of passengers board and alight and where such exclusion is unavoidable for the operation of trains).

2 When coupling a vehicle loaded with hazardous cargos only (excluding vehicles with a sealed structure) to a train, in consideration of the influence on passengers, three or more vacant vehicles or vehicles loaded with materials other than explosives or hazardous cargos shall be interposed with respect to vehicles used for passengers, and one such vehicle or more shall be interposed with respect to traction units. In such cases, a bogie car may be regarded as two vehicles.

[Ministerial Ordinance]

(Brake for Train)

Article 95 A train that is consisted with two or more vehicles shall adopt the braking system that will work in conjunction with all of the vehicles and apply automatically when the consisted vehicles are separated. However, if any measures to avoid hindrance to the safe operation of trains, the same does not apply.

2. When a train is made up or the train consist is altered, brakes shall be tested to confirm their functions.

[Approved Model Specifications]

X-4 Article 95 Related to (Brake for Train)

1 Trains deemed to be subject to “measures to avoid hindrance to the safe operation of trains” as mentioned in the provision of 1 shall be as follows:

(1) Trains made up of locomotives exclusively in which a person in charge of traction unit operation mans each locomotive, or service trains, relief trains or snow removal trains where there is a person in charge on board to take safety measures such as stopping, uncoupling vehicles or preventing the rolling of vehicles.

(2) Trains where continuous brakes (as prescribed in Approved Model Specifications 6 related to Article 69; hereafter the same shall apply) do not work on some vehicles due to failure, etc., as a failed vehicle is coupled within the mid-portion, and a brake is used in the foremost and rearmost vehicles.

(3) Trains where there is a damaged vehicle on which a continuous brake does not act, and a special vehicle (limited to those that cannot be coupled in the mid-portion of a train) is coupled at the front or rear of the train, and where the design allows the person in charge of monitoring the vehicle to board it or to prevent the vehicle from being uncoupled.

2 Methods of testing train brakes shall be established in advance based on the conditions at the time a train is made up or when the make-up of a train is altered.

[Ministerial Ordinance]

(Brake Power of Train)

Article 96 Brake power of a train shall have sufficient capability to accommodate the gradient of track and the train speed.

[Approved Model Specifications]

X-5 Article 96 Related to (Brake Power of Train)

1 Certain criteria shall be established in relation to train braking force to allow judgment, including the ratio of the number of axles of a vehicle on which a required braking force is applied to the number of axles of the made-up vehicle.

2 The above-mentioned ratio shall be a value of 100 as standard. If the value needs to be set to less than 100, such as when connecting a vehicle with a failed brake or a special car, the ratio shall be established based on the standard railway track gradient and running speed.

[Ministerial Ordinance]

(Boundary of Station and Halt)

Article 97 In case the operation handling inside of the station and halt boundary differs from that of outside, the boundary shall be clearly indicated in a manner that is easily recognizable.

[Approved Model Specifications]

X-6 Article 97 Related to (Boundary of Station and Halt)

1 The boundary between the inside and the outside of a station and halt shall be indicated on each railway track by the following methods:

(1) In the case of a railway track allowing trains to enter a station and halt in a double-track line, or a railway track at a station in a single-track line.

An outermost home signal (or a wayside signal in the case of Shinkansen) or a home sign in the station, or an indicator marking the station section

(2) In the case of a railway track allowing trains to exit a station in a double-track line.

An indicator marking the station section (the outermost stop limit indicator in the case of Shinkansen (excluding the superconducting magnetic levitation railways))

2 Notwithstanding the provisions of 1, for station and halt located in a double-track operation section where there is no potential hindrance to train operation, the boundary of two or more tracks in such stations may be provided using the position of a home signal, a home sign or a sign indicating the section of the station described in 1 (1) as a reference.

(Operation on Main Track Outside of Station and Halt)

Article 98 Any vehicle shall not be operated on the main track outside of the station and halt unless it is made up into a train. This rule does not apply, however, to a vehicle to be shunted.

[Approved Model Specifications]

X-7 Article 98 Related to (Operation on Main Track Outside of Station and Halt)

“Vehicle shunting” as mentioned in the provision shall be limited to cases where the shunting of vehicles within a station runs unavoidably to the outside of the station due to the situations of facilities.

[Ministerial Ordinance]

(Train Operation Time Table)

Article 99 Train shall be operated to meet the scheduled departure time, passing time and arrival time at stations, according to the need.

2. When a train operation is disturbed, effort shall be made to bring it back to the schedule.

[Approved Model Specifications]

X-8 Article 99 Related to (Train Operation Time Table)

1 In assessing train traffic conditions or making traffic operation adjustments, running times need not be established for stations that are not the targets of such operation.

2 Any necessary traffic operation adjustment shall be performed according to instructions from the head of transport or the person in charge of traffic operation adjustment.

[Ministerial Ordinance]

(Prevention of Accident at Train Departure)

Article 100 A crew shall not depart a train when passengers are recognized to be in dangerous situations such as being caught by a closing train door.

[Approved Model Specifications]

X-9 Article 100 Related to (Prevention of Accident at Train Departure)

In consideration of actual platform conditions, train operation, etc., a method shall be established to prevent trains from starting in a situation in which a passenger is caught by a door or when any other dangerous situation exists.

[Ministerial Ordinance]

(Safety Assurance between Trains)

Article 101 A train shall be operated by one of the following methods in order to secure safety between trains. This rule will not apply, however, to the train to be operated within the station and halt premise according to the signal aspect or display, or the direction of the person who is in charge of managing the station and halt (including the case that a person is designated by a manager ahead of time):

(1) Method using blocks;

(2) Method using device to secure the distance between trains;

(3) Method using a device to secure the distance between trains or the method in which the person in charge of driving the locomotive performs operation in consideration of forward sighting and other conditions necessary for safe train operation.

2. In case safety measures are provided separately for such trains as a rescue train or a facility construction train in the section where another facility construction train is already working, the aforementioned rule may be exempted.

[Approved Model Specifications]

X-10 Article 101 Related to (Safety Assurance between Trains)

1 In train operation by the "method using blocks" as mentioned in 1 (1), the following shall apply:

(1) The main track shall be divided into block sections. However, this does not apply for sections in which two or more trains are not operated at the same time along the entire track.

(2) The main track in the station and halt may not be a block section.

(3) Excluding the following cases, two or more trains shall not be operated at the same time in one block section:

[1] When a train is operated with a split within the block section

[2] When a train is guided into a block section where there is already another train

[3] When, on the heels of a train being operated by the block method, a train is operated by the method using a device to secure the distance between trains or the method in which the person in charge of driving the locomotive performs operation in consideration of forward sighting and other conditions necessary for safe train operation (hereafter referred to as the “method using the attentiveness of the person driving the locomotive”)

(4) Types of block method regularly used for train operation shall be as follows:

[1] In the case of double track operation

[A] Automatic block system

[B] Cab signal block system

[2] In the case of single track operation

[A] Automatic block system

[B] Cab signal block system

[C] Semi-automatic block system

[D] Controlled manual block system

[E] Tokenless block system

[F] Tablet instrument block system

[G] Staff and ticket block system

[H] Staff block system

(5) Handling in the case of automatic block systems, cab signal block systems and semi-automatic block systems shall be as follows:

[1] Blocks shall be executed using devices that meet the provisions of 1 and 3 related to Article 54.

[2] In single track lines, trains shall start from a station and halt in which a starting signal (or a starting indicator in the case of cab signal block systems; hereafter, the same shall apply in this item) is installed only after the direction of operation has been determined through advance arrangements with a forward station fitted with a starting signal. However, this does not apply when the direction of operation is controlled from the train or when remote control is conducted.

(6) Handling in the case of controlled manual block systems or tokenless block systems shall be as follows:

[1] Blocks shall be executed using devices that meet the provisions of 1 and 3 related to Article 54, electric bells and dedicated telephones.

[2] For a train to enter a block section, prior approval from the other-side station shall be required. In addition, the absence of any train in the block section shall be confirmed before approval is given.

(7) Handling in the case of tablet instrument block systems shall be as follows:

[1] Blocks shall be executed using devices that meet the provisions of 1 related to Article 54.

[2] Tablets in adjacent block sections shall be different in type.

[3] Tablets having been used for train operation may be used for other trains once they are put into the tablet block machine. However, this does not apply in cases where trains pass each other or where a train turns back within a short time (approximately 10 minutes) in accordance with the train operation diagram.

[4] When operating a train, the tablet for its block section shall be carried along.

[5] The person in charge of tablet adjustments shall be designated beforehand.

[6] The provisions of (6) [2] above shall apply mutatis mutandis.

(8) Handling in the case of staff and ticket block systems shall be as follows:

[1] Blocks shall be executed using one staffs per block section and a dedicated telephone.

[2] Stations and halts shall be equipped with a train ticket placed in a staff and ticket box, as well as a block token to show the presence or absence of trains in the block section.

[3] In adjacent block sections, the staffs used shall be of different types, and train tickets shall have a hole shape for the staff for the relevant block section represented in red or another different color.

[4] The staff and ticket box shall be a type that cannot be opened by anything other than the staff for the relevant block section.

[5] The train ticket shall include the names of the stations and halts at both ends of the block section, the date of issue, and the number of the train to carry the train ticket. Once a train ticket is used, it shall not be used for other trains.

[6] The train ticket shall be issued at the station and halts provided with a staff only when two or more trains are operated subsequently in the same section and in the same direction. In such cases, the preceding train shall carry the train ticket, and the last train shall carry the staff.

[7] When handing a train ticket over to the person driving a locomotive, the staff for this block section shall be shown. In such cases, the person driving the locomotive shall receive the train ticket after confirmation of the staff.

[8] When operating a train, the staff or train ticket for its block section shall be carried along.

[9] The provisions of (6) [2] above shall apply mutatis mutandis.

(9) Handling in the case of staff block systems shall be as follows:

[1] Blocks shall be operated using one staff per block section.

[2] Staff for adjoining block sections shall be of different types.

[3] When operating a train, the staff for its block section shall be on board.

(10) Regardless of the provisions of (4), operation in sections where two or more trains are not operated simultaneously along the entire track shall be conducted by establishing a

method therefore.

2 In the case of train operation by “the method using a device to secure the distance between trains” as prescribed in Item 1 Number 2, a device as prescribed in Article 54, 2 and 3 shall be used.

3 In the case of train operation by the method using the attentiveness of the person driving the locomotive as prescribed in Item 1 Number 3, the following shall apply:

(1) Train operation by “the method using the attentiveness of the person driving the locomotive” shall be implemented in cases other than those where trains leave stations (limited to stations and halts equipped with a home signal, a home sign or a wayside signal; hereafter the same shall apply) or enter stations and halts, and where there is a need to operate a train by means other than the method using blocks or the method using a device to secure the distance between trains.

(2) Handling in the case of “the method using the attentiveness of the person driving the locomotive” shall be as follows:

[1] Other than Shinkansen cases

(A) In cases where a predetermined time period has passed after the departure of a train from a station and halt, and thereafter the next train is started in the same direction as the preceding train:

(a) The person driving the locomotive shall operate it with a speed at which the train can be stopped within the visible distance forward.

(b) Trains running in the same direction shall be operated with an appropriate interval in relation to the preceding train.

(c) When operating a train in one direction in a single-track operation section, a method to prevent other trains from operating in the opposite direction shall preliminarily be established.

(B) In cases where, after a train operated by the block method stops in response to a stop signal, or where a train operated by the method using a device to secure the interval between trains stops in response to stop control, it is operated by changing the train operation method to the method using the attentiveness of the person driving the locomotive.

(a) The person driving the locomotive shall operate it with a speed at which the train can be stopped within the visible distance forward.

(b) When changing the operation method, trains shall start again after one minute of being stopped.

(c) When a moving train comes close to the preceding one, it shall promptly stop and wait for one minute after the preceding train starts before restarting.

[2] Shinkansen cases

The person driving a locomotive shall operate it with a speed at which the train can be stopped within the visible distance forward.

4 Handling when operating a train by the method using blocks in cases where devices regularly used for blocks, devices to secure the distance between trains, etc., become unusable due to a fault or for other reasons shall be as follows:

(1) Either the block system under the provisions of 1 (4) or the following block system shall be brought into practice:

[1] In the case of double track operation

[A] Communication system

[B] Command type

[C] Detection system

[2] In the case of single-track operation

[A] Pilot and telephone system

[B] Pilot and dispatch system

[C] Pilot and detection system

[D] Pilot system

(2) In cases where between adjacent stations and halts allowing pass-by are divided into two or more block sections because of track failure, etc., and when operating a train by the method using blocks, a pilot system or a staff block system shall be employed with respect to the relevant stations and halts.

(3) Handling in the case of communication systems shall be as follows:

[1] Blocks shall be implemented for block sections extending between stations and halts by specifying a telephone at the stations at both ends of the block section, and by using a communication system register. However, when using a device enabling train detection in block sections, a communication system register need not be used.

[2] Communication system registers shall include block approval, train arrival/departure and block cancellation.

[3] Train entry to block sections requires prior approval from the other-side station. Further, the absence of trains in a block section shall be confirmed before such approval is given.

(4) Handling in the case of the command type shall be as follows:

[1] Blocks shall be operated by the head of transport or the person in charge of operation adjustment using a train radio device, with the track extending between stations as one unit block section.

[2] Train entry to block sections requires prior instruction from the head of transport or the person in charge of operation adjustment. Further, the head of transport or the person in charge of operation adjustment shall confirm the absence of trains, etc., in the block section when giving such instruction.

(5) Handling in the case of detection systems shall be as follows:

[1] Blocks shall be operated letting the track extending between stations be one unit block section, and using a device that automatically detects that no train is present in the block section at the stations and halts at both of its ends.

[2] When allowing a train to enter a block section, the absence of trains, etc., in this block section shall be confirmed using the device mentioned in [1] at the stations at both ends of the block section.

(6) Handling in the case of pilot and telephone systems shall be as follows:

[1] Blocks shall be operated letting the track extending between stations and halts be one unit block section by selecting a leader and a telephone per block section, and shall be provided with a pilot ticket at the stations and halts at both ends of the block section.

[2] The leader shall be specified through arrangement at the stations and halts at both ends of a block section, and his or her name shall be recorded.

[3] The leader shall wear a red armband.

[4] The pilot ticket shall include the names of the stations and halts at both ends of the block section, the date of issue and the number of the train carrying the ticket. Further, pilot tickets used for the operation of one train shall not be used for the operation of others.

[5] Pilot tickets shall be issued at the station and halt where the leader is stationed when operation of two or more trains in the same direction in the same block section is continued. In such cases, the preceding train shall carry the pilot ticket, and the last train shall have the leader aboard.

[6] The pilot ticket shall be directly handed to the person in charge of driving the traction unit by the leader in this block section.

[7] In train operation, the train shall have the leader of this block section aboard or carry the pilot ticket.

[8] In double track operation sections, when service on either track is suspended and the pilot and telephone system is implemented, the method using a device to secure the

distance between trains or the automatic block system or cab signal block system may also be used with respect to trains running in the same direction as in double-track operation.

[9] The provisions of (3) [3] shall apply mutatis mutandis.

(7) Handling in the case of pilot and dispatch systems shall be as follows:

[1] Blocks shall be operated letting the track extending between stations and halts be one unit block section by selecting one leader for this block section with the head of transport or the person in charge of operation adjustment actually using a train radio system. In such cases, the pilot ticket shall be provided at the stations and halts at both ends of the block section.

[2] The leader shall be specified, and his or her name shall be recorded.

[3] The provisions of (4) [2] and (6) [3] – [8] above shall apply mutatis mutandis.

(8) Handling in the case of pilot and detection systems shall be as follows:

[1] Blocks shall be operated letting the track extending between stations and halts be one unit block section by selecting one leader for this section and using a device that automatically detects that no train is present in the block section at the stations and halts at both of its ends. In such cases, a pilot ticket shall be provided at the stations and halts at both ends of the block section.

[2] The provisions of (5) [2] and (6) [2] – [8] above shall apply mutatis mutandis.

(9) Handling in the case of pilot systems shall be as follows:

[1] Blocks shall be operated by selecting one leader per block section.

[2] When operating a train, the leader for this block section shall be aboard the train.

[3] The provisions of (6) [3] shall apply mutatis mutandis.

(10) In executing pilot and telephone systems, pilot and dispatch systems, pilot and detection systems and pilot systems, if there is a track line with a part in which it is difficult to use a leader, such sections may be specified beforehand and a pilot staff may be used in place of the leader for this section. In this case, 4(6)[3] may be omitted for sections that use only a pilot and not a leader. Moreover, there shall be one pilot staff per block section, and pilot staffs for neighboring sections shall be of different types. Further, for the consignment of pilot tickets under pilot and telephone systems, pilot and dispatch systems and pilot and detection systems, the provisions of 1 (8) [7] shall apply mutatis mutandis.

5 Where the method to be used when driving a relief train or driving a service train in a section

where another service train is present (as outlined in 2 of ministerial ordinance 2, article 101) is to be specially established, the messenger method shall be used, and its handling shall be as follows:

(1) The train to be relieved or the preceding train shall not move from its stop position, and shall provide stop limit indications with respect to the relief train or other service trains.

(2) Besides the provisions of (1), the following shall apply:

[1] One messenger shall be selected per subject section.

[2] The messenger shall wear a white armband.

[3] When operating a train, a messenger shall be aboard the train.

[4] Once a train is started, the arrival of a messenger at the station and halt shall be confirmed before allowing another train to enter the same section.

(3) In executing the messenger method, if there is a track line with a part for which it is difficult to use a messenger, this section may be specified in advance, and a messenger ticket may be used in place of a messenger for this section. In such cases, there shall be one messenger ticket per section for which the messenger method is used.

6 Handling with blocks when executing the block system or under the provisions of 5 (2) when using the messenger method shall be executed by the head of transport, the person in charge of operation adjustment or the stationmaster (if the head of transport designates a person other than a stationmaster, execution shall be performed by the person designated).

7 When the method using a device to secure the distance between trains is changed to the method using blocks, or when a block system is changed to another block system, or when they are returned to a predetermined type, safety assurance for the first train to be operated immediately after the change shall be fully taken into consideration, and handling as required therefore shall be preliminarily provided.

8 Handling in the following cases shall be conducted in accordance with instruction from the head of transport or the person in charge of operation adjustment each time such a case arises:

(1) Other than Shinkansen cases

When temporarily changing the operation method of a train or a block section, or when returning the method to a predetermined type. However, this does not apply in cases falling under Approved Model Specifications 3 (2) [1] (B) related to Article 101, and where a train is equipped with an automatic train stop apparatus, etc., that makes it impossible to accelerate beyond a certain speed.

(2) Shinkansen cases

When the train operation method is temporarily changed or a block section is temporarily changed, or when they are returned to a predetermined type.

[Operation Notice]

11 Article 101 Related to (Safety Assurance between Trains)

(1) The method of ensuring safety between trains as regularly used for train operation (or the type of block system in the case of train operation by block methods) shall be prescribed in the implementation standard for each section. Further, handling shall be stipulated for each type.

(2) Handling with the incorporation or division of a block section related to Approved Model Specifications 1 shall be set forth in the implementation standard for the following items:

[1] Sections subject to incorporation or division

[2] Handling with tokens, etc., with respect to incorporated or divided block sections

[3] Handling in indications, etc., at a station and halt at the boundary between block sections

[4] The method of clarifying the incorporation or division to the person in charge of driving a traction unit

[5] Handling in the case where signals and point machines are stopped as a result of the incorporation or division of block sections

[6] Other matters pertaining to the handling of incorporation or division

(3) In the case of handling regarding the proviso of Approved Model Specifications 1 (7) [3], the implementation standard shall stipulate the posting of notices at each station and halt regarding trains for which turn-back operation is conducted.

(4) The handling of pilot staffs as provided in Approved Model Specifications 4 (10) shall be prescribed in the implementation standard for the following items:

[1] Sections using pilot staffs and the type of pilot staff in each section using them

[2] The format of pilot staffs

[3] The method for controlling pilot staffs and the person implementing control

[4] The method for issuing pilot staffs and the person issuing them

[5] The handling method for discontinuance of pilot staff usage

[6] Other matters pertaining to the handling of pilot staffs

(5) The handling of messenger tickets in accordance with Approved Model Specifications 5 (3) shall be prescribed in the implementation standard by applying the pilot staff provisions of (4) mutatis mutandis. In such cases, the type and format of messenger tickets shall be different from those of pilot staffs for the same section.

[Ministerial Ordinance]

(Driving Location of Train)

Article 102 A crew who drives a traction unit shall drive a train at the front end of the foremost car. However, this rule will not apply when the safe train operation would not be impaired.

[Approved Model Specifications]

X-11 Article 102 Related to (Driving Location of Train)

"Cases when the safe train operation would not be impaired." in the proviso of Article 102 shall be as outlined below, and shall include cases where the person in charge gives a signal at the front head of the foremost vehicle and the person operating the traction unit drives it, cases where the person qualified to drive the traction unit activates an air horn or continuous braking at the front head of the foremost vehicle, and other cases when safe train operation can be assured.

(1) When the railway track, contact line or vehicle is out of order

(2) When operating a service train, relief train or snow removal train

(3) When performing operation between a station and a siding part that branches out from the mid-portion of a main track outside a station

(4) When performing turn-back operation at a turn-back station

(5) When performing operation to test facilities or vehicles

(6) When performing operation in a specified section as predetermined

[Operation Notice]

12 Article 102 Related to (Driving Location of Train)

In the case of handling in line with the provisions of Approved Model Specifications (4) and (6), the station name and the section shall be specified in the implementation standard.

[Ministerial Ordinance]

(Operation Speed of Train)

Article 103 Train shall be operated at the safe speed, depending upon the track and contact line conditions, vehicle performance, operational method, signal condition, train protection method and so on.

[Approved Model Specifications]

X-12 Article 103 Related to (Operation Speed of Train)

Maximum train running speeds shall be established depending on the condition of tracks and contact lines, vehicle performance and train protection methods, and individual train running speeds shall be as stipulated below in the following cases:

(1) Speeds provided depending on the operational method of operation shall be as specified below.

[1] Other than Shinkansen cases

[A] In the case of train operation from a position other than the front head of the train (excluding cases where a snow removal vehicle is used), the speed shall be not more than 25 km/h. However, with the exception of reverse operation, in cases where the person qualified to drive the traction unit at the front head of the train activates an air horn or continuous braking, the speed shall be not more than 45 km/h.

[B] In the case of performing reverse operation (with the exception of cases where such operation is expected and the cases provided in (A)), the speed shall be not more than 25 km/h.

[C] In the case of driving a locomotive with a tender in the opposite direction (excluding cases of coupling to any part other than the foremost portion of the train), the speed shall be not more than 45 km/h.

[D] In cases stipulated under the provisions of Approved Model Specifications 3 (2) [1] (A) and (B) related to Article 101, the speed shall be not more than 25 km/h.

[2] Shinkansen cases

[A] In the case where driving is conducted in a place other than the front head of the train, the speed shall be not more than 45 km/h. However, this does not apply where the person qualified to drive the traction unit at the front head of the train activates an air horn and continuous braking, or where a device to secure the distance between trains is used.

[B] In the case of reverse operation (with the exception of cases where such operation is expected and the cases provided in (A)), the speed shall be not more than 45 km/h. However, this does not apply in cases where a device to secure the distance between trains is used.

[C] In cases stipulated under the provisions of Approved Model Specifications 3 (2) [2] related to Article 101, the speed shall be not more than 45 km/h.

(2) Speeds specified depending on signal conditions shall be as follows:

(A) Speed restriction signals

Speeds shall be not more than 25 km/h. However, in the case of operation using a device to automatically stop a train before it reaches the beginning of a section that is protected by a stop signal aspect and has a speed check function, the speed shall not exceed an appropriate level at which the train can stop at the point of the next stop signal aspect (or the stop position when there is no stop signal aspect).

(B) Caution signal

Speeds shall not exceed a level that allows stopping at the point of the next stop signal aspect (or the stop position if there is no stop signal aspect) or a level suitable to enable the point of the next speed restriction signal aspect to be passed at a predetermined speed.

(C) Reduced-speed signals

Speeds shall not exceed a level suitable to enable the point of the next caution signal or speed restriction signal aspect to be passed at a predetermined speed.

(D) Less-reduced-speed signals

Speeds shall not exceed a level suitable to enable the point of the next reduced-speed signal or caution signal aspect to be passed at a predetermined speed.

(E) Proceed signal (limited to signals in sections where a high-speed signal aspect is given)

Speeds shall not exceed a level suitable to enable the point of the next less-reduced-speed signal, reduced-speed signal or caution signal aspect to be passed at a predetermined speed.

(F) Call-on signals

Speeds shall not exceed 25 km/h.

(G) Low-speed signals

Speeds shall not exceed the specified level.

(H) Proceed signal indications from cab signals

Speeds shall not exceed the levels indicated numerically (excluding 0) (or speeds as specified otherwise in the case of indication in non-numerical form).

(I) Fixed speeds shall be established for the signal aspects of (B) to (E) from home signals, starting signals and block signals.

(3) In the case of passing a non-locked point machine in opposition (excluding spring point machines)

Speeds shall not exceed 25 km/h.

(4) In the case of wayside signals

Speeds shall not exceed 45 km/h.

[Operation Notice]

13 Article 103 Related to (Operation Speed of Train)

(1) For “maximum speed” as noted in the Approved Model Specifications, the maximum allowable value specified in the operation plan of a train shall be stipulated in the implementation standard.

(2) “A fixed speeds shall be established” as noted in the provisions of Approved Model Specifications (2) (I) basically refers to a unified speed among operators with regard to the same signal aspect. However, this does not apply when, as long as an operator having two or more track lines is concerned, it causes no hindrance to safety, such as in cases where there is no overlap between track lines as handled by the person driving a traction unit.

[Ministerial Ordinance]

(Regressive Train Operation)

Article 104 Trains shall not make reverse moves. However, whenever measures are taken to keep following trains out of the train’s reverse operation range or to prevent impediment to safe train operation, this rule may be exempted.

[Approved Model Specifications]

X-13 Article 104 Related to (Regressive Train Operation)

Cases “where measures are taken to keep following trains out of the train’s reverse operation range or to prevent impediment to safe train operation” as mentioned in the proviso shall be as follows:

(1) Where reverse operation is planned

(2) Where the railway track, contact line or vehicle is out of order and any of the following types of handling are implemented:

[1] Receipt of instructions from the head of transport, the person in charge of railway traffic operation adjustment, or the person performing block handling at the station and halt where reverse operation is performed.

[2] Implementation of arrangements to stop following trains at an appropriate distance outside the range of reverse operation in the case of small distances of reverse operation.

[Ministerial Ordinance]

(Simultaneous Entry and Departure of Trains)

Article 105 In such a case as more than or equal to two trains enter or leave the station and halt, and when there is a possibility of interfering with the route of one or the other due to overrun, those trains shall not be operated at the same time.

[Approved Model Specifications]

X-14 Article 105 Related to (Simultaneous Entry and Departure of Trains)

In addition to cases where devices are provided to stop trains automatically, in the following cases, there shall be no risk of trains causing hindrance to each other's routes due to overrun:

(1) When operating a train with a speed restriction signal indicated;

(2) When a safety siding is provided;

(3) When the distance from a home signal/starting signal or a train stop indicator to the limit of the occurrence of mutual hindrance in the event of overrun is not less than 100 m.

[Operation Notice]

14 Article 105 Related to (Simultaneous Entry and Departure of Trains)

"When a safety siding is provided" in the provisions of Approved Model Specifications (2) includes cases where the installation of a derailment point machine on a related railway track prevents trains from hindrance in the event of overrun by another train.

[Ministerial Ordinance]

(Train Protection)

Article 106 In the event that train operation shall be halted due to some problems, stop signal shall be displayed or other measures to stop the proceeding train shall be taken as quickly as possible, considering the train's emergency braking distance.

[Approved Model Specifications]

X-15 Article 106 Related to (Train Protection)

1 Train protection shall be provided in the following cases:

(1) Where, due to derailment, etc., a train causes hindrance to the route of another train operating on an adjoining railway track

(2) Where problems requiring trains to be stopped occur on railway tracks, contact lines and at other points

2 Measures for train protection shall be stop signal aspects using a main signal, cab signal, temporary hand signal or special signal, or the use of an emergency ground switch at an appropriate distance outward from the obstruction point.

3 Where a train crew needs to protect a train, the personnel required for this purpose shall be on duty before the train is operated.

4 In the case of train protection measures using portable signal equipment, the individuals

involved and the types of signal equipment to be carried or stocked regularly shall preliminarily be established.

5 The standard braking distance of a train in the case of emergency braking on railways except for the Shinkansen type shall be not more than 600 m. However, where a method is implemented for rapid train protection, e.g., a radio-based system, the value may be an emergency braking distance in keeping with the relevant method.

[Operation Notice]

15 Article 106 Related to (Train Protection)

In cases where a train crew is tasked with conducting train protection, and with trains for which the person driving the traction unit is on duty alone (in one-man operation), the following shall apply:

[1] When operating a passenger train, no hindrance shall be caused to the safety of passengers upon boarding and alighting and evacuee guidance in the event of an emergency.

[2] For double-track operation sections (including those where single tracks run in parallel), arrangements shall be made to ensure prompt protection of trains on adjacent tracks. In such cases, a device providing automatic train protection shall be installed at a point between stations as deemed necessary in consideration of danger factors such as railway track conditions, e.g., sharp curves and road traffic at level crossings.

[3] For the implementation of these measures, education and training shall be provided as necessary with respect to related personnel over a considerable period of time.

[4] The implementation of these measures shall be made known to users(passengers) over a considerable period of time.

[5] Section, train and operation handling instructions shall be stipulated in the implementation standard.

[Ministerial Ordinance]

(Track Blocking)

Article 107 When a section of the track needs to be blocked for construction or maintenance work, preventive measures shall be taken to stop other trains, etc. (excluding cars to be used for construction or maintenance work) coming into the section.

[Approved Model Specifications]

X-16 Article 107 Related to (Track Blocking)

1 The blocking of railway tracks shall be implemented in line with instructions from the head of transport or the person in charge of railway traffic operation adjustment.

2 When performing track maintenance work, etc., or when using a trolley, without blocking the track, steps shall be taken to ensure that no hindrance is caused to the operation of trains, etc.

[Revision] Approved Model Specifications 2 related to Article 107 has been revised (July 14, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.40).

[Ministerial Ordinance]

(Prevention of Danger to Train Operation)

Article 108 When there is a likelihood of typhoon, earthquake or another natural disaster posing a threat to a train operation, appropriate measures including the temporary suspension of train operation, shall be taken to prevent dangers.

[Approved Model Specifications]

X-17 Article 108 (Prevention of Danger to Train Operation)

1 Measures for preventing dangers due to weather conditions, etc.

1 Concerning actions such as the temporary suspension of train operation or running speed restrictions in cases where trains may be exposed to danger owing to weather or terrestrial conditions, the method thereof and the section, etc., in which these actions are executed shall be established in advance.

2 Measures to prevent dangers in the event of train fires, etc., on underground railways

The following details shall be defined to prevent trains from being exposed to danger and ensure the safety of passengers as well as prompt evacuation in the event of a fire on a train traveling through an underground station or in an underground station, etc. In such cases, where different types of handling are to be made depending on the conditions of facilities, etc., these types shall be clarified.

(1) If a fire breaks out on a running train, the train shall in principle continue to run until it reaches the next station or the outside of a tunnel.

(2) Related trains shall be stopped at the nearest station and held there.

(3) When a train on fire is halted at a station, or when a station is on fire, any train then approaching this station shall in principle not be allowed to stop at the station.

2 Measures to prevent dangers in the event of train fires, etc., on underground railways

The following details shall be defined to prevent trains from being exposed to danger and ensure the safety of passengers as well as prompt evacuation in the event of a fire on a train traveling through an underground station or in an underground station, etc. In such cases, where different types of handling are to be made depending on the conditions of facilities, etc., these types shall be clarified.

(1) If a fire breaks out on a running train, the train shall as a rule continue until it reaches the next station and halt or the outside of a tunnel.

(2) Related trains shall be stopped at the nearest station and held there.

(3) When a train on fire is halted at a station, or when a station is on fire, any train then approaching this station shall in principle not be allowed to stop at the station.

[Notice concerning applicable timing] (2004: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.125)
The provisions of Approved Model Specifications 2 related to Article 108 shall be effective as of July 1, 2005.

Section 3 Operation of Rolling Stock

[Ministerial Ordinance]

(Shunting)

Article 109 Shunting of vehicles (including shunting of trains. the same shall apply in the following paragraph.) shall be conducted with safety precautions such as using signs.

2. Shunting of vehicles shall be conducted in the manner not to impair a train operation.

[Approved Model Specifications]

X-18 Article 109 Related to (Shunting)

1 The shunting of vehicles shall be as follows:

(1) The "safety precautions such as using signs" as mentioned in 1 shall be any of the following. However, for shunting that causes no potential hindrance to other tracks and for simple shunting that is customary, it may be performed by a method in which the person driving the traction unit implements operation in consideration of forward sighting and other conditions necessary for safe train operation.

[1] A method using a device to automatically operate a vehicle

[2] A method using signals

[3] A method using signs

[4] A method using indicators

[5] A method using a radio device

(2) Shunting using signs or indicators shall be performed after confirming the presence or absence of any obstruction ahead before starting vehicle operation.

(3) Vehicles shall not kick off shunting unless appropriate braking can be implemented. Furthermore, vehicles carrying passengers, vehicles loaded with explosives or vehicles loaded with cargo that may possibly give rise to danger as a result of kicking off shunting shall not kick off shunting, and other vehicles shall not kick off shunting toward such vehicles.

(4) Hand-operated shunting of vehicles using main tracks shall be monitored.

(5) Shunting causing hindrance to a main track outside a station in the direction of approaching trains shall not be performed except in the following cases:

[1] Where, in sections implementing a block system in which block handling is made by arrangement between the stations located at both ends of the block section, block approval is not given;

[2] Where, in sections of block system operation using an evidence or a designated person, the evidence or designated person is located in the station;

[3] Where, in the case of implementation of measures to suppress train operation, or when there are unavoidable reasons, a considerable level of protection has been provided with respect to the direction of train approach.

(6) Shunting speeds shall be as outlined below. However, shunting to be performed using automatic train control (ATC) device is excluded.

[1] Other than Shinkansen cases

(A) Shunting of locomotives only and shunting based on a shunting signal (excluding shunting based on a call-on signal and shunting when passing a non-locked point machine by facing)

Speeds shall not exceed 45 km/h.

(B) Shunting other than that in (A)

Speeds shall not exceed 25 km/h.

[2] Shinkansen cases

Speeds shall not exceed 45 km/h.

2 Train shunting shall be performed using a method similar to that for vehicle shunting.

[Operation Notice]

16 Article 109 Related to (Shunting)

(1) Implementation of the “method using a radio device” as mentioned in Approved Model Specifications 1 (1) [5] shall be as follows:

[1] The radio system shall be equipped with the following functions:

(A) Automatic vehicle stop in the event of a system failure;

(B) Prevention of control for vehicles other than the target ones during system operation;

(C) Automatic vehicle stop when radio communications are interrupted or reception conditions become unstable;

(D) Automatic train speed control in the event that a train's speed exceeds the set preset value.

[2] Security measures related to work operations

The driving position shall basically be at the front head of the vehicle. However, when driving on the ground, it shall be in a position in which safety in the travel section of the vehicle (from the beginning point to the end point) can be confirmed by the driver.

[3] Security measures related to the driver

(A) Devices handled by a driver shall not cause hindrance to the activities of the driver.

(B) Devices shall offer instantaneous or automatic control to enable stopping in the event of abnormalities related to the driver.

[4] Driver qualifications, etc.

Since the radio device method means that the person who conventionally issues signs for shunting is also the driver of the vehicle, this driver shall have knowledge and skills as the person who issues signs, and shall also be a qualified traction unit driver.

(2) The “method in which the person driving the traction unit implements operation in consideration of forward sighting and other conditions necessary for safe train operation” as mentioned in the proviso of Approved Model Specifications 1 (1) shall be executed as follows:

[1] “Shunting that causes no potential hindrance to other tracks” as mentioned in the proviso of Approved Model Specifications 1 (1) shall refer to cases where any of the following applies:

(A) Cases where customary shunting is planned in advance;

(B) Cases where travel is within a range protected by fixed signals, etc., against the operation of other trains, etc.;

(C) Cases where there is no point machine within the travel range. However, this shall exclude point machines locked using interlocking devices, etc.;

(D) Cases where travel is at a speed allowing the vehicle to stop within the forward range of unobstructed view.

[2] “Simple shunting that is customary” as mentioned in the same proviso shall refer to cases where any of the following applies:

(A) Cases where customary shunting is planned in advance;

(B) Cases where there is no likelihood that shunting with a conflict in routes or where other shunting that may cause mutual hindrance because of overrun is performed;

(C) Cases where shunting is performed only in siding areas causing no hindrance to the main track; or, in cases of using or traversing a main track, shunting performed in a time slot in which there is no likelihood that other trains, etc., will be in operation;

(D) Travel shall be at a speed allowing the vehicle to stop within the forward range of unobstructed view. However, for train operation implemented while confirming the clear-route direction of a point machine, travel shall be at a speed that allows the vehicle to stop immediately.

[3] The method outlined in [1] shall apply mutatis mutandis to the modification of train stop positions at stations and halts. [1] [A] does not apply in this case.

[Ministerial Ordinance]

(Storage of Rolling Stock)

Article 110 When a vehicle is stored, necessary measures shall be taken to prevent it from rolling out.

[Approved Model Specifications]

X-19 Article 110 Related to (Storage of Rolling Stock)

“Necessary measures” related to storage of vehicle shall mean either the establishment of systems enabling stop arrangements as necessary with the monitoring staff stationed, or the implementation of measures such as the shutdown of motive power, restraint from handbraking and sidebraking, and installation of manual ratchets in order to prevent movement (self-movement) under vehicles’ own motive power or movement (rolling) caused by natural forces including railway track gradients and strong winds.

[Ministerial Ordinance]

(Prevention of Danger for Car Loaded with Hazardous Materials)

Article 111 When a vehicle loaded with hazardous materials is to be stored, a relevant preventive measure shall be taken according to the ambient situations, including a relocation of such a vehicle to another track.

[Approved Model Specifications]

X-20 Article 111 Related to (Prevention of Danger for Vehicle Loaded with Hazardous Materials)

In the case of storage for vehicles loaded with hazardous materials, hazard control measures, e.g., moving the vehicle to a track as far away as possible in the event that the surrounding conditions are found to pose a danger to the hazardous materials, shall be taken.

Section 4 Railway Signals

[Ministerial Ordinance]

(Relationship between Railway Signal and Train Operation)

Article 112 When trains/cars, are operated according to the railway signal aspect or indication, they shall comply with the signal aspect or indication.

[Ministerial Ordinance]

(Indicated stop aspect by signal)

Article 113 Trains, etc., shall stop at outward of the specified stop position when stop aspect is indicated. However, whenever it is not possible to obey the signal due to the timing and the location of the signal indication, a train shall stop as quickly as possible.

2. The train, etc., that stopped according to the aforementioned rule, shall not start until after the signal displays the aspect to proceed or direction to proceed is issued. However, this rule does not apply to such a case as an operational method is altered to the one stipulated under item (3) of paragraph 1 of the Article 101.

[Approved Model Specifications]

X-21 Article 113 Related to (Indicated stop aspect by signal)

1 “Outward of the specified stop position" shall refer to a place outward of the aspect point of the signal giving a stop direction (in the case of cab signals, this shall be outward of the indicator showing the limit by which the train has to stop) or outward of the protection section of the signal providing the aspect.

2 “Direction to proceed” in 2 shall be a direction by the person in charge who can determine the reason for the aspect of the signal indicating the direction to stop and the absence of problems if train operation, etc., is restarted.

[Ministerial Ordinance]

(Inaccuracy of Signal Display)

Article 114 When there is no signal aspect at the designated location, or when its signal aspect is not clear, it shall be assumed that the signal is displaying the maximum restriction on train operation, etc.

[Approved Model Specifications]

X-22 Article 114 Related to (Inaccuracy of Signal Display)

“The signal is displaying the maximum restriction on train operation, etc.” shall refer to a signal giving direction to stop in the case of main signals and cab signals, and, for subsidiary signals, a signal with an aspect giving the direction to stop of a main signal or a signal to repeat the signal giving direction to stop.

[Ministerial Ordinance]

(Prohibition of Dual Use of Signal)

Article 115 Signal shall not be used to serve more than or equal to two tracks or two kinds of purposes. However, this rule does not apply to such a case Where it causes no hindrance to the safe operation of trains, etc.

[Approved Model Specifications]

X-23 Article 115 Related to (Prohibition of Dual Use of Signal)

1 “Where it causes no hindrance to the safe operation of trains, etc.” shall be as follows:

(1) When the indication of a distant signal, a repeating signal, a signal equipped with a route indicator or a cab signal is used for two or more railway tracks

(2) When the indication of one signal installed at a point of branching for neighboring tracks with equivalent conditions for operational safety is used for two or more railway tracks

(3) When the indication of a cab signal is also used as a signal with respect to the train or vehicle to be shunted

(4) When the indication of a wayside signal is also used as a signal for the train or vehicle to be shunted

(5) When the indication of a shunting signal (including a wayside signal) is also used as a route-clear indicator for a railway track

2 In the case of using a signal for two or more purposes, indications shall be provided to enable the purpose of use to be instantly identified.

[Ministerial Ordinance]

(Conditions of Signal Aspect to Indicate to Proceed)

Article 116 The signal aspect to proceed may be displayed only to proceed as long as it causes no hindrance to the routes of trains, etc.

[Approved Model Specifications]

X-24 Article 116 Related to (Conditions of Signal Aspect to Indicate to Proceed)

As long as it causes no hindrance to the routes of trains, etc., signals giving direction to proceed may be indicated with respect to signals protecting the relevant section or those giving direction to proceed by hand signal may be indicated.

[Ministerial Ordinance]

(Other Items Concerning Signal Display)

Article 117 In addition to the rules set forth under the Article 113 through the previous article, signals shall abide by other relevant rules according to the type, display method and other conditions and handling rules, in order for the crew to make an accurate and pertinent judgment while driving a rolling stock according to the signal aspect, and also in order to secure the safe train, etc., operation.

[Approved Model Specifications]

X-25 Article 117 Related to (Other Items Concerning Signal Display)

1 The “signal type, display method and other conditions” shall be as follows:

(1) Signals for which the aspect method varies between daytime and nighttime shall be used with the daytime method from sunrise to sunset, and with the nighttime method from sunset to sunrise. However, for sections where two or more trains are operated at the same time between stations and halts, and in cases where the signal aspect with the daytime method is difficult to identify due to weather conditions or the presence of tunnels, etc., the signal aspect shall employ the nighttime method even for the period from sunrise to sunset.

(2) Fixed signals (signals fixed in a certain place on the ground to provide a signal aspect) shall be classified as follows:

[1] Main signals;

[2] Subsidiary signals;

[3] Signal appendices.

(3) Main signal types shall be as follows:

[1] Home signals: those providing a signal aspect to a train entering a station and halt;

[2] Starting signals: those providing a signal aspect to a train leaving a station and halt;

[3] Block signals: those providing a signal aspect to a train entering a block section;

[4] Call-on signals: those providing a signal aspect to a train, etc., operating beyond the signal position in response to call-on signals while not allowing the issue of a signal aspect giving direction to proceed with respect to a home signal or shunting signal;

[5] Shunting signals: those providing a signal aspect to a vehicle in shunting operation;

[6] Wayside signals: those providing a signal to a train entering or leaving a station and halt in the case where the signal aspect to a train operating according to the signal aspect from a cab signal has been disabled due to failure, etc., or to provide a signal aspect to a vehicle that performs shunting under a signal-based method, in cases where no shunting signal is provided.

(4) Types and aspect methods of signals from a main signal shall be as follows:

[1] Home signals, starting signals and block signals;

<table>
<tr><td rowspan="4">Signal type</td><td colspan="4">Aspect method</td></tr>
<tr><td>Three-position</td><td colspan="3">Two-position</td></tr>
<tr><td rowspan="2">Color light signals</td><td rowspan="2">Color light signals</td><td colspan="2">Semaphore signals</td></tr>
<tr><td>Daytime</td><td>Nighttime</td></tr>
<tr><td>Stop signals</td><td>Red light</td><td>Red light</td><td>Arm horizontal</td><td>Red light</td></tr>
<tr><td>Speed restriction signals</td><td>Upper yellow light
Lower yellow light</td><td>Upper yellow light
Lower yellow light</td><td></td><td></td></tr>
<tr><td>Caution signals</td><td>Amber light</td><td></td><td></td><td></td></tr>
<tr><td>Reduced-speed signals</td><td>Upper yellow light
Lower green light</td><td></td><td></td><td></td></tr>
</table>

Less-reduced-speed signals	Flashing upper yellow light Flashing lower green light			
Proceed signal	Green light	Green light	Arm inclined lower left at 45 degrees	Green light
High-speed signals	Upper green light Lower green light			

[2] Call-on signals

Signal type	Aspect method	
	Color light signals	Position light signals
Call-on signals	Yellow light	Positioning inclined lower left at 45 degrees

Note: Lights of position light systems shall be white or of a color that may not be mistaken for signals of other color light systems.

[3] Shunting signals and wayside signals

Signal type	Aspect method			
	Three-position signals		Two-position signals	
	Color light signals	Position light signals	Color light signals	Position light signals
Stop signals	Red light	Horizontal positioning	Red light	Horizontal positioning
Caution signals	yellow light	Positioning inclined lower left at 45 degrees		
Proceed signals	Green light	Vertical positioning	Green or yellow light	Positioning inclined lower

				left at 45 degrees

Note: Lights of position light systems shall be white or of a color that may not be mistaken for signals of other color light systems.

(5) Subsidiary signal types shall be as follows:

[1] Distant signals

Distant signals shall be subsidiary to home signals, and shall provide advanced signal aspects notifying of those of main signals with respect to trains.

[2] Passing signals

Passing signals shall be subsidiary to starting signals, and shall provide advanced signal aspects notifying of those of main signals with respect to trains entering stations to indicate the presence or absence of permission to pass the station and halt.

[3] Repeating signals

Repeating signals shall be subsidiary to home signals, starting signals or block signals, and shall provide signal aspects repeating those indicated by main signals with respect to trains.

(6) Types and aspect methods of signals from subsidiary signals shall be as follows:

[1] Distant signals

Signal type		Aspect method			
		Where a main signal is the three-position type	Where a main signal is the two-position type		
		Color light signal	Color light signal	Semaphore signals	
				Daytime	Night time
When a main signal indicates a stop signal	Caution signal	Yellow light	Yellow light	Horizontal arm	Yellow light

When a main signal indicates a speed restriction signal or a caution signal	Reduced-speed signal	Upper yellow light Lower green light	Upper yellow light Lower green light		
When a main signal indicates a proceed signal	Proceed signal	Green light	Green light	Arm inclined lower left at 45 degrees	Green light

[2] Passing signals

Signal type		Aspect method		
		Where a main signal is the two-position type		
		Color light signal	Semaphore signals	
			Daytime	Nighttime
When a main signal indicates a stop signal	Caution signal	Yellow light	Horizontal arm	Yellow light
When a main signal indicates a proceed signal	Proceed signal	Green light	Arm inclined lower left at 45 degrees	Green light

[3] Repeating signals

Signal type		Aspect method	
		Color light signals	Position light signals
When a main signal indicates a stop signal	Repeating stop signal	Red light	Horizontal positioning
When a main signal indicates a speed restriction signal	Repeating limit signal	Upper yellow light Lower yellow light	Positioning inclined lower left at

When a main signal indicates a caution signal		yellow light	45 degrees
When a main signal indicates a reduced-speed signal		Upper yellow light Lower green light	
When a main signal indicates a less-reduced-speed signal		Flashing upper yellow light Flashing lower green light	
When a main signal indicates a proceed signal	Repeating proceed signal	Green light	Vertical positioning
When a main signal indicates a high-speed signal	Repeating high-speed signal	Upper green light Lower green light	Upper vertical positioning Lower vertical positioning

Note: Lights of position light systems shall be white or of a color that may not be mistaken for signals of other color light systems.

(7) Types of signal appendices shall be as indicated below, and shall be used after establishing the aspect method.

[1] Route indicators

Route indicators shall indicate, as an appendix to signals, the route of a train when the indication of a home signal, starting signal, call-on signal, shunting signal, or wayside signal is used in common to two or more branch tracks inward of them.

[2] Preliminary route indicators

Preliminary route indicators shall be subsidiary to home signals, starting signals, block signals, distant signals or repeating signals, and shall give a preliminary indication of the route of a train as indicated by the next home signal or starting signal.

(8) Types and aspect methods of signals given by cab signals (signals that indicate a signal within the cab of a train, etc.) shall be as follows:

Signal type	Aspect method
Stop signals	Light with signs or characters representing a stop indication, or red light

Proceed signals	Signs or numbers (excluding 0) representing a speed indication, or light of a color other than red

(9) Temporary signals shall be set up when a train, etc., cannot operate at a predetermined speed due to railway track failure or other circumstances to provide a signal aspect, and its types and aspect methods, etc., shall be as follows:

[1] Types of temporary signals shall be as follows:

[A] Low-speed signals

Low-speed signals shall provide low-speed indications to trains, etc., entering sections that require low-speed operation.

[B] Low-speed notification signals

Low-speed notification signals shall be subsidiary to low-speed signals, and shall preliminarily provide low-speed notification indications to trains, etc.

[C] Speed limit termination indicators

Speed limit termination indicators shall provide speed limit termination indications to trains, etc., leaving sections that require low-speed operation.

[2] When a train, etc., is operated at low speed according to a low-speed signal, the speed shall be indicated.

[3] Temporary signals shall be used after establishing their aspect method.

(10) Hand signals shall be used to issue indications in cases where a signal cannot be used or is not installed, and the types and aspect methods, etc., shall be as follows:

[1] Types of hand signals shall be as follows:

[A] Substitute hand signals

Substitute hand signals shall be used as a substitute in cases where a home signal, starting signal, cab signal or device to secure the distance between trains (limited to cases where trains enter or leave stations and halts) cannot be used.

[B] Passing hand signals

Passing hand signals shall be used with respect to trains passing stations when a passing signal cannot be used.

[C]Temporary hand signals

Temporary hand signals shall be used in cases other than (A) and (B) and where it is necessary to provide such signals.

[2] Types and aspect methods of indications made by hand signals shall be as follows:

[A] Substitute hand signals

Signal type	Aspect method	
	Daytime	Nighttime
Stop signals	Red flag	Red light
Proceed signals	Green flag	Green light

[B] Passing hand signals

Signal type	Aspect method	
	Daytime	Nighttime
Proceed signals	Green flag	Green light

[C] Temporary hand signals

Signal type	Aspect method	
	Daytime	Nighttime
Stop signals	Red flag or red light. However, if such items are unavailable, hold both arms up high or rapidly wave any article other than a green flag.	Red light. However, if a red light is unavailable, rapidly wave any light other than a green light.
Low-speed signals	Hold a red flag and green flag (both closed) in the hands and cross them in a raised position high above the head. However, if flags are unavailable, extend both arms horizontally and move them up and down slowly.	Flashing green light
Proceed signals	Green flag or green light. However, if such items are unavailable, raise one hand up high.	Green light

[3] Flags and lights to be used for hand signals shall be types that are recognizable at a distance of not less than 400 m.

[4] When letting trains pass stations and halts in cases where passing signals cannot be used, proceed signals shall be indicated using passing hand signals inward of home signals.

[5] Hand signals may be replaced with substitute equipment for hand signals according to the aspect method given in the following table:

Signal type	Aspect method
Stop signals	Red light
Low-speed signals	Flashing green light
Proceed signal	Green light

(11) Special signals shall be used to give indications if the need to stop a train in an unexpected location arises, and the types and aspect methods of this type of signal shall be as follows:

[1] Types of special signals shall be as follows:

(A) Fusee signals: signals to stop trains using a flame

(B) Flashing light signals: signals to stop trains using a light

(C) Alarm signals: signals to stop trains using a warning sound

[2] Indications issued using special signals shall be stop signals, and their aspect method shall be as follows:

(A) Fusee signals: red flame using a fusee

(B) Flashing light signals: flashing red light

(C) Alarm signals: warning sound based on radio communication

[3] The aspect of special signals shall be recognizable at a distance within which a train can stop before the point of failure.

(12) The conditions by which indications are given through signals shall be as follows:

[1] Speed restriction indications shall be given by signal as follows:

(A) Home signals, starting signals or block signals where there is a risk of mutual obstruction due to overrun when a train enters or leaves a station (excluding cases where safety siding is provided or where the distance from the point of a home signal, starting signal or train stop indicator to the limit beyond which the mutual obstruction due to overrun may be caused is not less than 100 m)

(B) In cases where a stop signal aspect is issued at the next home signal, as well as where the distance to the outermost point machine of the protection section of this signal or to a stop section is short, there shall be a signal in the approach section.

[2] Besides the cases cited in [1], speed restriction indications may be issued by the

following signals:

(A) The innermost signal when there is a need to prevent overrun upon entering a track that terminates within a station and halt;

(B) The three-position signal outward of a signal that issues a stop indication.

[3] Caution indications shall be issued by signals as follows:

(A) The three-position signal most inward of a track that terminates within a station and halt (excluding those that indicate speed restriction signals);

(B) A distant signal or passing signal that is subsidiary to a signal that issues a stop indication.

[4] Besides the cases cited in [3], caution signals may be indicated by a three-position signal outward of a signal that issues a stop indication or a speed restriction indication.

[5] Reduced-speed signals shall be indicated by distant signals that are subsidiary to a home signal issuing a speed restriction indication or a caution indication.

[6] Besides the cases cited in [5], reduced-speed signals may be indicated by a three-position signal outward of a signal that issues a speed restriction indication or a caution indication.

[7] Less-reduced-speed signals may be indicated by a three-position signal outward of a signal that issues a caution indication or a reduced-speed indication.

[8] Proceed signals (limited to those in sections that indicate high-speed signals) may be indicated by a three-position signal outward of a signal that issues a caution indication, a reduced-speed indication or a less-reduced-speed indication.

[9] Home signals, starting signals or block signals present in a section of automatic block system implementation using a three-position signal need not be in compliance with [1] – [8] above.

[10] Shunting signals present in sections of shunting implementation using a three-position shunting signal need not be in compliance with [3] and [4] above in cases where a certain speed has been determined for a caution signal aspect.

(13) Indications issued by main signals (excluding signal aspects with respect to trains, etc., at halt) shall be recognizable at a distance that enables trains, etc., approaching the signal to decelerate or stop according to the signal aspect. However, this excludes cases where the distance that allows sighting is insufficient, and where a signal is indicated by a subsidiary signal and the total of the distance that allows recognition of the subsidiary signal and the distance from this signal to the main signal is not less than the distance that allows a train approaching the main signal to decelerate or stop

according to the signal aspect.

2 Handling concerning signals shall be as follows:

(1) Handling where there is a signal issuing a direction to proceed shall be as follows:

[1] Where there is a repeating stop signal aspect, trains, etc., shall proceed in anticipation of the aspect of the stop signal on a main signal for which the signaling distance is short;

[2] Where there is a speed restriction signal aspect, trains, etc., shall proceed in anticipation of the aspect of the stop signal on the next signal or of the location of the stop position and a short safety margin for overrunning;

[3] Where there is a caution signal aspect, trains, etc., shall proceed in anticipation of the aspect of the stop signal or speed restriction signal on the next signal or of the location of the stop position;

[4] Where there is a reduced-speed signal aspect, trains, etc., shall proceed in anticipation of the aspect of the speed restriction signal or caution signal on the next signal;

[5] Where there is a less-reduced-speed signal aspect, trains, etc., shall proceed in anticipation of the aspect of the caution signal or reduced-speed signal on the next signal;

[6] Where there is a repeating limit signal aspect, trains, etc., shall proceed in anticipation of the aspect of the speed restriction signal, caution signal, reduced-speed signal or less-reduced-speed signal on the next signal for which the signaling distance is short;

[7] Where there is a proceed signal aspect, trains, etc., shall proceed at a speed not exceeding a predetermined level (not more than the displayed speed in the case of a signal aspect for a cab signal). However, in the case of sections indicating a high-speed signal, trains, etc., shall proceed in anticipation of the aspect of the caution signal, reduced-speed signal or less-reduced-speed signal on the next signal;

[8] Where there is a repeating proceed signal aspect, trains, etc., shall proceed in anticipation of the aspect of the proceed signal on a main signal for which the signaling distance is short;

[9] Where there is a high-speed signal aspect, trains, etc., shall proceed at a speed not exceeding the predetermined level;

[10] Where there is a repeating high-speed signal aspect, trains, etc., shall proceed in anticipation of the aspect of the high-speed signal on a main signal for which the signaling distance is short;

[11] Where there is a call-on signal aspect, trains, etc., shall proceed in anticipation of the presence of other trains, etc., on the route;

[12] Home signals, starting signals or block signals present in sections of automatic block

system implementation using a three-position signal need not be in compliance with [2] – [5] and [7] above;

[13] Shunting signals present in sections of shunting implementation using a three-position shunting signal need not be in compliance with [3] above if a certain speed has been determined for a caution signal aspect.

(2) Handling in the case of an aspect indicated by a temporary signal shall be as follows:

[1] Where there is a low-speed signal aspect, trains, etc., shall proceed within the specified speed;

[2] Where there is low-speed notification signal aspect, trains, etc., shall proceed in anticipation of an upcoming low-speed signal;

[3] Where there is a speed limit termination signal aspect, trains, etc., may terminate observance of the speed limit beyond the point of this aspect.

(3) Handling of signals shall be as follows:

[1] Handling in the case of a signal aspect on a three-position signal shall be as follows:

(A) A high-speed signal shall not be indicated before a proceed signal is indicated on an inward signal;

(B) A proceed signal shall not be indicated before a caution signal, reduced-speed signal or less-reduced-speed signal is indicated on an inward signal;

(C) A reduced-speed signal shall not be indicated before a speed restriction signal or caution signal is indicated on an inward signal. However, this does not apply where a certain speed has been established for each signal aspect;

(D) A less-reduced-speed signal shall not be indicated before a caution signal or reduced-speed signal is indicated on an inward signal. However, this does not apply where a certain speed has been established for each signal aspect.

[2] Starting signals (excluding those in sections where automatic block systems and semi-automatic block systems are implemented) shall issue proceed indications after blocking has been performed with respect to the section.

[3] Call-on signals shall not indicate call-on indications before the train, etc., to be guided makes a temporary halt outward of a home signal or shunting signal. However, this does not apply where a call-on signal is indicated after taking measures to ensure a level of safety equivalent to that obtained by the indication of a call-on signal after the stopping of the train, etc.

[4] Distant signals shall not issue proceed indications before the indication of a proceed signal on the main signal, and shall not issue reduced-speed indications before the

indication of a speed restriction signal or caution signal on the main signal.

[5] Passing signals shall not issue proceed indications before the indication of a proceed signal on the main signal and a home signal as provided in the same location.

[6] Repeating signals shall not issue repeating proceed indications before the indication of a proceed signal, repeating high-speed indications before the indication of a high-speed signal, repeating limit indications before the indication of a speed restriction signal, caution signal, reduced-speed signal or less-reduced-speed signal on the main signal.

[7] Route indicators shall not indicate a route before the indication of a signal of direction to proceed on the signal attached thereto.

[8] Preliminary route indicators shall not issue preliminary route indications before the attached signal and the next signal indicate a signal of direction to proceed.

[9] Fixed signals shall be handled by the head of transport or the person in charge of railway traffic operation adjustment or the stationmaster (if the head of transport designates a person other than a stationmaster, handling shall be performed by the person designated).

(4) Indications on temporary signals and low-speed and proceed signals issued using hand signals shall be given after notification thereof to the persons concerned.

(5) In cases where a device to secure the distance between trains, or a home signal, starting signal or cab signal cannot be used due to failure, and when a train enters or leaves a station and halt, substitute hand signals shall be used. However, substitute hand signals may not be used in cases where the head of transport, the person in charge of railway traffic operation adjustment or the stationmaster (if the head of transport designates a person other than a stationmaster, this person) gives directions as necessary to proceed after checking the conditions of related routes, or in cases where, for a starting signal, the execution of a block system other than an automatic block system, semi-automatic block system, controlled manual block system or interlocked block system is implemented, and where the point machine in the protected section is a trailing type provided with a point machine sign or a spring point machine.

[Operation Notice]

17 Article 117 Related to (Other Items Concerning Signal Display)

Handling when railway signal aspects or indications become hard to recognize in normal conditions due to dense fog or snowstorms shall be stipulated in the implementation standard.

[Ministerial Ordinance]

(Action to Be Taken for Indication to Proceed)

Article 118 When the signal is indicated to proceed for trains, etc., the route shall not be impaired.

[Ministerial Ordinance]

(Sign and Indicator)

Article 119 Type and display method of signs and indicators shall be determined before they are put to use in order to secure the safe train, etc., operation.

[Approved Model Specifications]

X-26 Article 119 Related to (Sign and Indicator)

1 Signs and indicators shall be used after establishing their types and display methods. However, the signs and indicators below shall be used as follows:

(1) Signs

[1] When starting trains, starting signs shall be provided as necessary.

[2] Trains, etc., shall provide signs using air horns in the following cases:

(A) When a danger warning needs to be given

(B) When there is a need to urge caution

(C) When there is a necessity to notify of approach

(D) When an emergency or accident arises

[3] When performing vehicle shunting in response to signs, shunting signs shall be provided.

(2) Indicators

[1] Trains shall be provided with train indicators, and the display method shall be as specified in the table below.

(A) Other than Shinkansen cases

<table>
<tr><td rowspan="2">Type of indicator</td><td colspan="2">Display method</td></tr>
<tr><td>Daytime</td><td>Nighttime</td></tr>
<tr><td>Head indicator</td><td colspan="2">A minimum of one white light at the head of the foremost vehicle in a train
(During the daytime, a head indicator need not be provided.)</td></tr>
</table>

Tail indicator	A minimum of one red light or red disk at the tail of the rearmost vehicle in a train for which a continuous brake is not used	A minimum of one red light or red reflector plate at the tail of the rearmost vehicle in a train (limited to those where indication can be recognized by the light from the head indicator of the following train). However, this shall be two or more red lights or red reflector plates for trains operated using a device to secure the distance between trains and for trains operating in sections of automatic block system or cab signal block system execution (excluding sections where the distance between stations fitted with a starting signal or starting indicator is one block section).

Train indicators when reverse operation is performed shall be as previously indicated before reverse operation commences. In such cases, where a head indicator can be provided at the location that becomes the head in reverse operation at nighttime, a head indicator shall be provided in addition to a tail indicator.

(B) Shinkansen cases

Type of indicator	Display method
Head indicator	A white light at the head of the foremost vehicle in a train
Tail indicator	A red light at the tail of the rearmost vehicle in a train (a white light for a train in reverse operation)

[2] Traction units used for shunting shall be provided with a shunting traction unit indicator. However, this does not apply where a train indicator is provided.

[3] Block signals shall be provided with a block signal indicator.

[4] Color light-type repeating signals shall be provided with a repeating signal indicator.

[5] On tracks in sections of train operation using a device to secure the distance between

trains or by the cab signal block system, the following indicators shall be provided. However, this does not apply to cases where a wayside signal is located, or where a point machine is not installed or locked constantly.

(A) Tracks where trains enter a station and halt: a home indicator

(B) Track where trains leave a station and halt: a starting indicator

[6] Track where trains are shunted using indicators shall be displayed with a shunting indicator.

[7] Points that need to indicate route-clear directions shall be provided with a point indicator.

[8] Tracks where there is no starting signal, or where a starting signal cannot be located in a predetermined position, shall be provided with a train stop indicator when there is a need to indicate the train stopping limit.

[9] At points where a vehicle stop limit needs to be indicated, a vehicle stop indicator shall be provided.

[10] Tracks where the end needs to be indicated shall be provided with a vehicle stop indicator.

[11] On tracks where a contact line end needs to be indicated, a suspended wire terminal indicator shall be provided.

[12] At level crossings where an automatic barrier machine or road warning device is not installed and passers-by have no means of knowing of approaching trains, etc., an air horn indicator shall be provided at an appropriate location.

2 Handling as mentioned in Approved Model Specifications 1 (1) related to Article 117 shall apply mutatis mutandis to signs and indicators. In this case, "aspect” shall be read as “display,” and “signals” shall be read as “signs and indicators.”

Chapter 11 Special Railways

[Ministerial Ordinance]

(Special Railways)

Article 120. In addition to the rules established in this Ministerial Ordinance, railway facilities and construction and handling of rolling stock of suspended railways, straddled type monorails, guide rail type of railways, trackless electric cars, cable railways, levitation railways and other railways with special construction may be exempted from some parts of the stipulations of the Ministerial Ordinance and be ruled by other necessary exemptions, according to the Public Notice established by Minister of Land, Infrastructure, Transport and Tourism.

[Ministerial Ordinance]

Supplementary Provisions

This Ministerial Ordinance shall come into force as from March 31, 2002.

Supplementary Provisions (Ministerial Ordinance No. 96 of February 2, 2004)

(Effective Date)

Article 1.

This Ministerial Ordinance shall come into force as from the day of promulgation.

Supplementary Provisions (Ministerial Ordinance No.13 of March 24, 2006)

(Effective Date)

Article 1.

This Ministerial Ordinance shall come into force as from July 1, 2006.

(Transitional Measure)

Article 2.

The facilities or rolling stock to be completed prior to June 30, 2008 and also do not meet the Article 57, paragraph 3 of the Article 79 or the Article 86-2 of the Ordinance to determine the technical standard on railway after the rule change stipulated under the Article 1 (hereinafter referred to as "New Ordinance") may abide by the prior and existing examples until after the first remodeling or reconstruction work is completed after the enforcement of this Ordinance.

2. Notwithstanding the provision of the previous article, the facilities and rolling stock to be completed prior to June 30, 2008 and not to meet the Article 57, paragraph 3 of the Article 79 or the Article 86-2 of the New Ordinance and pertinent to any one of the following, may abide by the prior and existing examples until the earlier prior date of either the first remodeling or reconstruction work is completed or the June 30, 2016.

(1) The facilities of the railway section with the maximum number of passenger trains per hour is larger than the 10 round trips, or the rolling stock that operate in that section.

(2) The rolling stock that runs faster than 100 kilometers an hour or the facilities of the railway section where those trains are operated.

Supplementary Provisions (Ministerial Ordinance No. 78 of July 14, 2006)

(Effective Date)

Article 1.

This Ministerial Ordinance shall come into force as from the day when the law to revise the part of railway business law for the improvement of the safety of transport will be executed

Supplementary Provisions (Ministerial Ordinance No. 110 of December 15, 2006)

(Effective Date)

Article 1.

This Ministerial Ordinance shall come into force as from the day of executed (December 20, 2006).

"For Operation" (a) April 28, 2006: Railway Bureau (Ministry of Land, Infrastructure, Transport and Tourism) Notice No.20)

In Article 2, Paragraph 2, No. 1of the Revised Ministerial Ordinance Supplemental Provisions "rolling stock traveling on that section" means the rolling stock that normally use that section and shall not include the unavoidable and extremely rare occurrences when rolling stock without passengers onboard travel on that section for important parts inspection, general inspections, etc.

[Public Notice of Stipulation of Technical Standard Relating to Special Railways]

(Summary)

Article 1 As for railway facilities and the construction and handling of rolling stock stipulated in Article 120, Paragraph 1 of Ministerial Ordinance, this public notice shall be applied in addition to what is stipulated in Ministerial Ordinance prescribing the technical standard on railways.

[Public Notice]

(Suspended railways, straddled type monorail)

Article 2 On the travel surface for suspended railways and straddled type monorail some countermeasures shall be taken , as necessary, to prevent wheel slip.

2 At stations for suspended railways, facilities shall be provided to suppress the swinging of car body and also facilities shall be provided to smoothly guide the train, etc., into the station.

3 The platforms for suspended railways and straddled type monorail and also other places where is the danger of passengers' falling shall be provided with facilities such as fences and nets, or other such protection facilities, to prevent passengers from falling. (Except at places where it is unavoidable to provide such facilities in order to enable passenger' getting on/off.

4 If the rolling stock for the suspended railway or the straddled type monorail uses tires, the rolling stock shall be capable of traveling even when air has leaked out of the tires.

5 Rolling stock on suspended railways shall be capable of controlling remarkable swaying of the car body and the running gear for the rolling stock shall have guiding and steering performance.

6 The running gear for rolling stock on straddled type monorail shall be stable and shall have good guiding and steering performance.

7 Rolling stock for the suspended railway or the straddled type monorail that are not grounded shall be capable of preventing electric shock to the passengers.

[Approved Model Specifications]

I- 1 Article 2 Related to (Suspended railways, straddled type monorail)

1 On the traveling surface for the rolling stock some countermeasures shall be taken, such as providing some degree of roughness to the surface, so as to prevent wheel slip in order to provide safe operation, even when there are adverse climatic or track conditions.

2 The following facilities, etc., shall be provided in the stations.

(1) Anti-swaying device and guiding facilities for a car body (Limited to suspended railways)

(2) The following facilities shall be provided at platforms where there is the danger of passenger's falling.

[1] Fall prevention facilities (Except at places where it is unavoidable to provide such facilities for passengers' getting on /off.

The height of the fall prevention facilities shall be 1.0 m or more.

[2] Nets and other such protection facilities

Nets and other such protection facilities shall be provided in a downward direction of the related tracks between the each end section of the platform.

3 Rolling stock using pneumatic rubber tires for its wheels shall use tires with solid cores or provide auxiliary wheels.

4 The following facilities shall be provided on the rolling stock.

(1) Guide wheels.

(2) Swaying control device and swaying stopping device. (Limited to suspended railways.)

(3) Stabilizing wheels (Limited to straddled type monorail.)

5 Wayside facilities shall be provided for the facilities for grounding car bodies (hereinafter, car body grounding facilities) of the rolling stock at stations on the sections of track where rolling stock without car body grounding facilities travel.

6 For the rolling stock with car body being not grounded, the car body grounding equipment which connect electrically the said rolling stock with the wayside facilities shall be provided. However, this does not apply when grounding occurs through other rolling stock.

[Public Notice]

(Guide rail type of railways)

Article 3 The guiding control device for guide rail type of railways shall have sufficient strength and shall not contact any part of the rolling stock.

2. The stipulations in Paragraph 1, Paragraph 4 and Paragraph 7 of the preceding Article shall be applied as mutatis mutandis for guide rail type of railways.

[Approved Model Specifications]

I-2 Article 3 Related to (Guide rail type of railways)

Approved Model Specifications 1, 3,5 and 6 of Public Notice Article 2 for Special Railways shall be applied as mutatis mutandis to guide rail type of railways.

[Public Notice]

(Trackless electric cars)

Article 4 The steering device for trackless electric cars shall have sufficient strength and shall not contact any part of the rolling stock.

2 Trains stationed by a single staff member who drives the motive power car of a trackless electric cars shall enable the said staff member to check the condition of the current collection device from his/her designated position.

3. The stipulations in Article 2, Paragraph 7 shall be applied as mutatis mutandis for trackless electric cars.

4 The stipulations for Ministerial Ordinance, Article 69, Paragraph 2 (Limited to the section relating to Number 2) and Article 74 (Limited to the section relating to Number 1) does not apply to trackless electric cars.

[Approved Model Specifications]

I-3 Article 4 Related to (Trackless electric cars)

1 Items relating to the steering of rolling stock for trackless electric cars shall satisfy the following. (1) Shall be sturdy and have sufficient strength to ensure safe operation.

(2) There shall be no contact with other parts of the rolling stock while steering.

(3) There shall be no remarkable discrepancy to the right or left in the relationship between the rotated angle of the steering handle and the steering angle of the wheels of cars.

(4) There shall be no remarkable discrepancy to the right or left for the rotation force of the steering handle.

2 Stairs and handrails for passengers' getting on /off provided at the entrance/exit for passengers' getting on /off shall be insulated from the car body.

[Public Notice]

(Cable Railways)

Article 5 The construction of facilities for cable railways and the handling of rolling stock shall comply with the following standards.

1) When there is the danger that the difference between a steepest gradient and the gentlest gradient could impede the travel of the rolling stock, this difference shall be made as small as possible.

2) The track shall have adopted the measures that enable to prevent the movement of rails and ties, such as the track fixing devices and others corresponding to the gradient.

3) The cable shall have the strength to withstand the maximum anticipated load, withstand the travel of the rolling stock and conform to the pulleys.

4) The cables shall be equipped so that there is no danger of contacting with anything other

than the pulleys.

5) The pulleys shall have the strength to sufficiently withstand the maximum anticipated load and there shall be no danger that they will impede the operation of the cable.

6) At locations where trains pass each other in opposite directions, it shall be possible to automatically guide both trains and not to impede each passing.

7) Fire extinguishing equipment shall be provided at winch locations as required by the facilities.

8) The main propulsion motor shall properly start when the difference in tension between the cable on the winding side and the cable on the slack side reaches the maximum, shall enable to operate at the prescribed operating speed, and to travel safely and smoothly.

9) An auxiliary motor shall be provided so as to properly start under maximum load conditions when the main propulsion motor or the functions of its control circuit have stopped, and to enable for the rolling stock to transport the passengers onboard to the station. However, this does not apply the case that the facilities are provided to enable the passengers to safely evacuate when the rolling stock is stopped at a location other than stations.

10) Shall have the necessary functions for train protection such as the grasp of operating conditions, prevention of train collisions, automatic train stop when the cable has broken or become abnormally slack, etc.

11) The automatic operating device shall enable smooth train operation that corresponds to track conditions.

12) The rolling stock shall not cause the boarding of passengers exceeding the maximum passenger capacity (the weight of baggage also loaded onboard shall be included as passenger weight).

2 The stipulations of Ministerial Ordinance, Article 15 to 18, Article 58, Article 69, Paragraph 1 (Limited to the section related to Number 6 and Number 7) and Article 101 does not apply to cable railways.

[Approved Model Specifications]

I-4 Article 5 Related to (Cable Railways)

1 Cables shall comply with the following criteria.

(1) Twisted flexible cables shall be used. Cables with a diameter that exceeds 20 mm shall have a fiber core. However, on cables that are heat treated, this fiber core shall not be impeded by heat.

(2) The diameter of the cable and the outer layer of strands comprising it shall comply with the following equation.

$D / d \geqq 80$

$\delta_0 \geqq d / 15$ ($\delta_0 \geqq d / 20$ (when a rubber or other such liner is used in the pulleys))

Where,

D : Diameter of the pulley for the winch(Unit : mm)

d : Nominal diameter of the cable(Unit: mm)

δ_0 : Diameter of the upper strands(Unit : mm)

2 The cable shall comply to following equation relating to the safety factor.

(1) Safety factor for maximum tensile force.

$B / T > 6$

Where,

B : Breaking load of the cable (Unit: N)

T : Maximum tensile force of the cable (Unit : N)

(2) Safety factor for the combined stress of the maximum tensile stress and maximum bending stress

$\sigma / (\sigma t + \sigma b) > 4$

Where,

σ : Average tensile strength of the strands (Unit: N/mm^2)

σt : Maximum tensile stress of the cable(Unit : N/mm^2)

(Maximum tensile strength of the cable/effective cross sectional area of cable)

σb : Maximum bending stress of the cable(Unit : N/mm^2)

(Elastic coefficient of the strands (1.96×10^{5}) x diameter of the outer layer of strands / diameter of the motive power pulley)

3 The maximum tensile force of the cables in the above 2 shall be the value obtained from the following calculation.

$T = W\sin\theta + rW\cos\theta + qh + fl + (W + ql + R)\, a / g$

Where,

T : Maximum tensile force of the cable (Unit : N)

W : Empty weight and maximum weight and maximum passenger capacity weight (Unit : N)

(The average weight for one person shall be calculated as 600 N)

θ : Gradient of the said location where rolling stock generates maximum tensile force. (Unit: Degrees)

r : Rolling stock resistance (0.01)

q : Weight per unit length of cable (Unit : N/m)

h : Difference in height between the location where the rolling stock generates the maximum tensile force and the end point of the route(unit:mm)

l : Horizontal distance between the location where the rolling stock generates the maximum tensile force and the end point of the route(unit:mm) f: Frictional resistance of the guide pulley as calculated from the horizontal unit length (Unit: N/m)

$f = F / b$

However, f shall be at least 1.6

Where,

F: The value obtained through multiplying to the maximum cable load acting on the guide pulley, the value obtained after dividing the shaft diameter of the guide pulley by the wheel diameter of the guide pulley and the friction coefficient (which shall be no less than 0.0005).

(Unit: N)

b: Smallest laid gap of the guide pulley between the position of the rolling stock generating the maximum tension force and the end point of the track.

(unit:mm)

R: Total weight of the guide pulley on the distance from the position of the rolling stock generating he maximum tension force to the end point of the track.

(Unit: N)

a: Acceleration of rolling stock due to rapid starting up (Unit: m/sec 2)

g: Gravity acceleration (Unit: m/sec 2)

4 The locations where both trains pass in opposite direction shall comply with the following criteria.

(1) The effective length of the main line shall be sufficient compared to the length of trains passing in opposite direction.

(2) Turnouts shall conform to the construction of the running gear of the rolling stock, and smoothly guide the rolling stock and shall have a track shape that enables the rolling stock to smoothly pass through.

5 The output of the main propulsion motor shall conform to the following equation.

$P > 0.001 \, (t1 - t2) \, V / \eta$

P: Output of the main propulsion motor (Unit: kW)

t1: Tensile force of the cable on winding side (Unit：N)

t2: Tensile force of the cable on slack side corresponding to t1 (Unit：N)

V: Specified operating speed (Unit: m/sec)

η：Mechanical efficiency

6 The tensile force of the cable on the winding side in the above 5 and the tensile force of the cable on the corresponding slack side shall be under the maximum load conditions (hereinafter, the same) when the difference between both forces becomes maximum, taking

into consideration the following loads.

(1) Weight of the cable itself

(2) Weight of the rolling stock, the weight of the maximum passenger capacity and the maximum loading capacity.

(3) Sum of running resistance and other frictional forces

(4) Increased tensile forces at the time of starting to pull the cable

7 The electric main propulsion motor shall be capable of operating at the prescribed operating speed under maximum load conditions even when the power supply voltage has dropped by 10 percent.

8 The following train protection systems shall be provided.

(1) Speedometer

(2) Rolling stock position indicators

(3) Service brake and emergency brake device for propulsion facilities.

(4) Departure signal device that can be inter-operated among the stations or rolling stock and the winch operation room.

(5) Safety communication device that can be inter-operated among the stations, rolling stock and the winch operation room. (Except mutual communication between the station and rolling stock.)

(6) Device that will prevent operation of the main propulsion motor when any one of the following applies.

[1] When there is no departure signal from the departure signal device.

[2] When the rolling stock parking brake is in action.

9 The speedometer in 8 (1) and the rolling stock position indicators in 8 (2) shall be capable of being easily confirmed by the operator.

10 The emergency brake device in 8 (3) shall conform to the following criteria.

(1) It shall automatically act when any one of the following applies.

[1] When the revolutions per minute of the propulsion motor reaches 120 percent of its rating.

[2] When the rolling stock travels over its designated stop position.

[3] When the rolling stock enters the station at a speed exceeding its designated entry speed.

[4] On electric-powered cable railways, when the functions of the winch motor are stopped by a electric power failure, overload or other such failures.

[5] When the device operating the emergency brake device for the propulsion facilities provided on the rolling stock is brought in action.

[6] When the control device activating the emergency brake device for propulsion equipment provided on the rolling stock is operated.

(2) It shall be capable of being quickly operated by the operator in the winch operation room.

11 The safety communication facilities in 8 (5) shall conform to the following criteria.

(1) A dedicated line shall be provided.

(2) A suitable auxiliary power supply shall be provided in addition to the service power supply.

(3) It shall be able to operate without impeding the operation of the operator in the winch control room.

12 The control device for the main propulsion motors shall conform to the following criteria.

(1) It shall provide smooth acceleration and deceleration.

(2) On electric-powered cable railways, it shall automatically release the circuit breaker for the winch motor when the emergency brake device is brought in action.

13 The automatic circuit breaker in 12 (2) shall be capable of (~~a~~) being closed in the following limited cases.

(1) When the emergency brake device for the propulsion facilities have not been activated.

(2) When the service brake device for the propulsion facilities have not been activated.

(3) When the operating device for the control device is not in operation mode.

14 The automatic operation device shall conform to the following criteria.

(1) It shall smoothly control the operation of the train under an operating speed that corresponds to track conditions.

(2) It shall smoothly stop the train at the designated stop position.

(3) It shall cancel the automatic operation mode when the emergency brake device for the propulsion facilities has brought in action.

15. The following shall be used for converting to "Maximum Rated Capacity." Fractional numbers after the decimal place shall be rounded up.

(1) A child under the age of 12 shall be treated as one (1) person instead of 1.5 persons.

(2) The weight of 60 kg of baggage shall be treated as one person.

[Public Notice]

(Levitation railways)

Article 6 The installation position and construction of the rail for brake and its attached parts for normal conducting magnetic levitation railways (limited to linear induction motor propulsion systems, hereinafter, the same) shall not cause the danger of impeding the travel of the rolling stock, regardless of the working condition of the levitation device and guidance device.

2 When the main braking force for the rolling stock is regenerative braking,the facilities and the rolling stock for the normal conducting magnetic levitation railway shall have a function for stabilizing the regenerative brakes of the rolling stock to avoid cancelling regeneration.

3 The levitation device and the guidance device on the normal conducting magnetic levitation

railway and superconducting magnetic levitation railway shall have the necessary levitation force and the guidance force needed for the rolling stock to travel and there shall not be capable of impeding the travel of the rolling stock regardless of their working conditions.

4 The levitation device and the guidance device on the normal conducting magnetic levitation railway and superconducting magnetic levitation railway and other such devices shall not be capable of generating interference through their guidance operation, etc., and shall also not be capable of causing interference to other facilities or rolling stock.

5. In addition to the stipulations in preceding 2 Paragraphs, the facilities and rolling stock cars of superconducting magnetic levitation railways shall meet the following criteria.

1)The ground equipment of the levitation device and guidance device shall not pose any risk for fire.

2)The ground equipment of the power generation system shall not pose any risk for electric shock or fire, and there shall not be capable of impeding the travel of the rolling stock.

3)The ground equipment and other protection equipment of the levitation device, guidance device, and power generation system shall be equipped with the lightning guards.

4) Equipment that supplies power to the power source for feeders (excluding those installed at substations that are equipped with devices for converting the frequency of the electricity supplied to the ground equipment of the power generation equipment, and switchgear locations between the relevant substation and the ground equipment of the power generation equipment (hereinafter referred to as "specified substations, etc."); the same shall apply below), levitation devices, guide devices, power generation equipment, and vehicles must be installed such that, in normal use conditions, there is no risk of impact on human health due to the magnetic field generated by the relevant equipment in the area near the relevant equipment. However, this shall not apply in cases where installation is performed in such a way that there is no danger of harm to the human body at locations with little human traffic including agricultural fields and forests.

5) Specified substations, etc., must be installed such that, in normal use conditions, there is no risk of impact on human health due to the magnetic field generated by the relevant substation, etc., in the area near each relevant specified substation, etc. However, this shall not apply in cases where installation is performed in such a way that there is no danger of harm to the human body at locations with little human traffic including agricultural fields and forests.

6)The power generation system shall have the necessary propulsion force and braking force needed for the rolling stock to travel.

7)The braking device used when the power generation system fails shall have the designated braking force according to the velocity of rolling stock.

8)The feeding device to the on-board power supply system shall not be capable of impeding the travel of the rolling stock.

9)The structures and materials of rolling stock shall be able to keep fire from spreading over to the ground equipments of the levitation device, guidance device and power generation system.

10)The wheels, etc. shall be able to safely support and guide rolling stock and there shall not be capable of impeding the travel of the rolling stock regardless of their working conditions.

11)Measures shall be taken to the travel surface for the support wheel to assure designated braking force.

6 The stipulations in Article 2, Paragraph 3 shall be applied to the normal conducting magnetic levitation railways and those in Article 2, Paragraph 7 shall be applied to the normal conducting magnetic levitation railways and superconducting magnetic levitation railways respectively mutatis mutandis.

7. The rules stipulated in each of the following numbers shall not be applied to the levitation railways defined in each relevant number.

1) Ministerial Ordinance, Article 67 (Only the parts relating to Number 2 and Number 4), Normal
conducting magnetic levitation railways

2) Ministerial Ordinance, Article 23, Paragraph 3, Article 51, Paragraph 2-1 (Only the parts relating to feeders) and Paragraph 2-1 (Only the parts relating to specified substations, etc.), Article 67 (Only the parts relating to Number 2 and Number 4), Article 68, Paragraph 2 (Only the parts relating to Number 3 to Number 5 and Number 7), Article 69, Paragraph 1 (Only the parts relating to Number 2) and Paragraph 2, and Article 72, Paragraph 2, Superconducting magnetic levitation railways

[Approved Model Specifications]

I-5 Article 6 Related to (Levitation railways)

1 The normal conducting magnetic levitation railways (linear induction motor propulsion type only) shall meet the following rules.

(1) The material of rails for the brakes and its attached parts shall not be capable of impeding the travel of the rolling stock regardless of any rise in temperature, etc., accompanying their operation.

(2) The wayside facilities for the levitation device and guidance device shall comply with the following criteria.

1) The magnetic action between the wayside facilities and the onboard facilities shall be

capable of constituting a magnetic circuit that generates stable levitation and guidance forces.

2) The levitation and guidance forces in 1) shall be sufficiently large compared to the weight of the rolling stock, etc.

(3) The onboard facilities for the levitation device shall comply with the following criteria.

1) Shall be sturdy and have sufficient strength to withstand operation.

2) It shall provide the levitation force to maintain the necessary levitation gap for safe travel even when passing through the curve track with the smallest radius or vertically curved track.

3) There shall be a device capable of safely supporting the rolling stock in the event that the levitation force cannot be attained.

4) A levitation force that exceeds the maximum designed levitation force of the wayside facilities shall not be generated.

(4) The onboard facilities for the guidance device shall comply with the following criteria.

1) Shall be sturdy and have sufficient strength to withstand operation.

2) It shall provide the guidance force to maintain the necessary guidance gap for safe travel even when passing through the curve track with the smallest radius or vertically curved track.

3) There shall be a device capable of safely guiding the rolling stock in the event that the guidance force cannot be attained.

4) A guidance force that exceeds the maximum designed guidance force of the wayside facilities shall not be generated.

(5) The material, etc., for the wayside facilities of the propulsion device shall not be capable of impeding the travel of the rolling stock regardless of any rise in temperature, etc., accompanying propulsion.

2 The superconducting magnetic levitation railways shall meet the following rules.

(1) The power generation system shall conform to the following criteria.

1)The stable propulsion force and braking force shall be generated by the electromagnetic effects between the superconducting magnet and the propulsion coil.

2)The propulsion force and braking force under 1) shall be large enough to satisfy the operating conditions.

3) The propulsion coil shall be appropriate for the voltage used.

(2) The ground equipment of the power generation system shall conform to the following criteria.

1) The installation location and structure of the propulsion coil shall not be capable of impeding the travel of the rolling stock.

2) The cable covering used for the propulsion coil shall have the flame retardant properties accompanied by self-extinguishing characteristics meeting the flame resistance test criteria under the Ministerial Ordinance determining technical standards for electric appliances (Ordinance of the Ministry of International Trade and Industry No. 85, 1962), Appended Table 1, Appendix Table 21.

3) The cable shielding layer used for the propulsion coil shall be grounded.

(3) The levitation device and guidance device shall meet the following criteria.

1) The levitation coils and null flux cables (hereinafter referred to as “levitation coils, etc.”) shall consist an electrical circuit generating stable levitation force and guidance force by electromagnetic effects between the superconducting magnets and levitation coils, etc.

2) The installation position and structure of levitation coils, etc. shall not be capable of impeding the travel of the rolling stock.

(4) Facilities and vehicles shall comply with the following specifications.

1) Facilities and vehicles shall be installed such that the measured values for magnetic flux density (effective values for an alternating field) obtained using the measurement method of [3] for the magnetic field generated from the feeder (excluding those installed at substations that are equipped with devices for converting the frequency of the electricity supplied to the ground equipment of the power generation equipment, and switchgear locations between the relevant substation and the ground equipment of the power generation equipment (hereinafter referred to as "specified substations, etc.")), superconducting magnets, levitation coils, propulsion coils, power supply rails, noncontact current collecting ground facilities and specified substations, etc., shall be less than the reference level for public exposure in the "Guidelines for limiting exposure to time varying electric, magnetic and electromagnetic fields (2010)" by the International Commission on Non-Ionizing Radiation Protection, and less than the exposure limit for general public exposure in the "Guidelines on limits of exposure to static magnetic fields (2009)."

2) The measurement apparatus shall be one with three axes in compliance with Japanese Industrial Standard JIS C 1910 (2004) "Measurement of low-frequency magnetic and electric fields with regard to exposure of human beings - Special requirements for instruments and guidance for measurements."

3) The measurement method shall be according to IEC62110 (2009) and IEC/TS62597 (2011)s

(5) The moval contact power collectors, etc. may be controlled from the traffic control center or crew cabin.

(6) The power feeding rails and non-contact power collection ground equipment shall not be

capable of impeding the travel of the rolling stock.

(7) The wheels, etc. shall conform to the following criteria.

1)The support wheel and the emergency landing wheel shall be capable of safely supporting the rolling stock in the event that the levitation force cannot be attained by the levitation device and guidance device.

2)The guide wheel and the guide stopper wheel shall be capable of safely guiding the rolling stock in the event that the guidance force cannot be attained by the levitation device and guidance device.

3)It shall provide support and guidance function necessary for the safe travel even when passing through the curve track with the smallest radius or vertically curved track.

4)If a pneumatic tire is used as a support wheel, it shall have the function for safely supporting the rolling stock car even if the tire blows out.

5) The shock absorbers (only those containing inert gas or air) shall be installed in a manner which prevents them from being damaged by vibrations, impacts, etc.

(8)On the traveling surface for the rolling stock some countermeasures shall be taken, such as providing some degree of roughness to the surface, so as to prevent wheel slip in order to provide safe operation, even when there are adverse climatic or track conditions.

(9) Interpretation criteria 5 and 6 of Article 2 of the Notice on Non-conventional Railways shall be applied to the superconducting magnetic levitation railways mutatis mutandis.

(Addition from Partial Revision of Public Notice, June 11, 2003)

[Public Notice]

(Magnetically guided railways)

Article 7 Magnetic guidance devices for magnetically guided railways shall conform to the following criteria.

1) The wayside and onboard facilities shall be capable of guiding the rolling stock in the designated direction.

2) The wayside facilities shall withstand the anticipated loads and shall not be capable of impeding the safe travel of the rolling stock.

2 There shall be nothing capable of impeding the guidance of the rolling stock in the area surrounding the wayside facilities for the magnetic guidance device for the magnetically guided railway.

3 For the track of the magnetically guided railway, protective facilities shall be provided in a location where there is the danger of people entering the tracks or a location where people could cause an impediment to the route of the train. However, this does not apply to the case that the measures have been taken to prevent the impeding of the safe train operation.

4 At stations for magnetic railways, facilities shall be provided in order to smoothly guide the train, etc., into the station.

5 The rolling stock for magnetically guided railways shall conform to the following criteria.

1) Among the rolling stock forming a train, the speed, position and other necessary information for forming other trains shall be reciprocally conveyed and a function shall be provided for properly maintaining the reciprocal space among the said rolling stock.

2) Shall be provided with the function that quickly stops the rolling stock if a failure of the functions in the previous item has occurred or the rolling stock cannot travel in the designated direction.

3) If the facilities referred in Ministerial Ordinance Article 23, Paragraph 2 are present, there shall be a function that minimizes damage to the said facilities in the event of contacting with it.

4) Trains traveling on sections of track where the facility conditions do not enable to evacuate from the side of the train in case of emergency shall enable reliable evacuation from the front and rear ends of those trains.

6. The stipulations in Article 2, Paragraph 1 and Paragraph 4 as well as Article 4, Paragraph 1 shall be applied as mutatis mutandis for magnetically guided railways

7 The following stipulations does not apply to magnetically guided railways: Ministerial Ordinance Article 23, Paragraph 1, (Limited to the part relating to No.1); Article 31,

Paragraph 1; Article 69, Paragraph 1 (No.2, No.5 and No. 7 [limited to the operation of single vehicles using steering devices]), and Paragraph 2 (No.2 [limited to the operation of single vehicles using steering devices]); Article 74 (Limited to the part relating to No.1); Article 75 as well as Article 95, Paragraph 1

[Approved Model Specifications]

I-6 Article 7 Related to (Magnetically guided railways)

1 The wayside facilities for the magnetic guidance device shall comply with the following criteria.

(1) The wayside facilities shall be equipped at the center line of the travel route and the space shall be provided to enable the safe and smooth guidance of the rolling stock, taking into consideration turnouts and radii of curves, etc., in the travel route. Furthermore, the layout of the spacing shall apply the following standards, with the minimum space being 0.5 m.

[1] When radius is less than 20 m, 1.0 m or less.

[2] When radius is more than 20 m, 2.0 m or less.

(2) The wayside facilities shall have the magnetic characteristics and magnetic strength to enable to guide the rolling stock in the designated direction.

(3) The wayside facilities shall have sufficient resistance to the climate and corrosion and shall not have marked protrusions from the route surface so as not to impede the safe travel of the rolling stock.

2 The onboard facilities shall be capable of guiding the rolling stock in the designated direction by detecting the wayside facilities for magnetic guidance device.

3 Objects with magnetic properties, such as manholes, metal pipes, etc., that could impede magnetic guidance shall not be installed near to the magnetic markers, etc.

4 The car body guidance facilities shall be provided at the stations.

5 The rolling stock shall have the following functions.

(1) The rolling stock shall reciprocally convey the number of the formation, the number of cars in the formation and the information of formatted position, and shall convey the rolling stock position, speed, acceleration, etc., information from the rolling stock at the front to the rolling stock at the rear, and failure occurrences, condition of entrances for getting on/off and the operating condition of emergency communication devices, etc., from the rolling stock at the rear to the rolling stock at the front.

(2) Based on the speed, position and other information of the rolling stock at the front, the travel speed shall be automatically adjusted and the space between the rolling stock forming the train shall be properly maintained.

(3) The rolling stock forming the train shall be quickly stopped in the event of any of the following conditions.

[1] When an impediment occurs to the function conveying the information for forming a train or the function for properly maintaining the reciprocal space for the said rolling

stock

[2] When the rolling stock is not capable of traveling in the designated direction due to failure of the magnetic guidance device or other reasons.

6 When there is a need to restrict the weight of the rolling stock, a device shall be provided to detect that the rolling stock has exceeded the said restriction.

7 When a guard wall is provided, guide wheels with sufficient strength shall be provided on the side of rolling stock so as not to contact with the other parts of the rolling stock.

8 Approved Model Specifications 1,3, of Article 2; and Approved Model Specifications 1, Articles 4 for Special Railways Public Notice shall be applied as mutatis mutandis to magnetically guided railways.

[Public Notice]

Supplementary Provisions

This public notice shall apply from March 31, 2002

Sheet 1

Axle flaw inspection standard

1. Intent

The intent of this standard is to properly conduct flaw inspections in order to prevent accidents caused by axle fractures.

2. Scope

As this standard applies to trains, internal-combustion engine powered rolling stock and locomotives, mutatis mutandis will be applied to other rolling stock.

3. Flaw inspection technician

The person conducting the flaw inspection must have sufficient knowledge of and experience with flaw inspections.

4. Inspection

Inspection shall be performed using the appropriate method for the part or shape of the axle based on the axle ultrasound vertical flaw inspection method indicated in the attachment or on experience in flaw detection using Japan Industrial Standard (JIS).

5. Use of [defective] shafts is prohibited.

Shafts determined to be defective shall not be used.

6. Records

Record the following items for each of the following item numbers.

(1) Flaw Inspection Year Month Day

(2) Car number axle is mounted to or shaft number

(3) Flaw detection equipment

(4) Flaw detection results

Attachment
(Sheet 1)

Axle ultrasound vertical flaw inspection

(1) The operating frequency shall be based on 2 MHz.

(2) Sensitivity correction

A. Attenuation measurement sensitivity

Attenuation measurement sensitivity shall reference the overall sensitivity of (a) or (b) below.

i. 90% of the overall sensitivity of the apparent bottom surface ratios of the first reflection of the flaw in the JSPS Type II standard test sample. (JSPS = Japan Society for the Promotion of Science)

ii. The overall sensitivity in which the figure of the flaw for the RTRI Type II standard test piece becomes as shown below. (RTRI = Railway Technical Research Institute)

a Bottom surface echo

The fifth bottom echo is the saturation threshold.

b. Artificial flaw echo

[Where] the threshold of separation at the location where the echo for the first artificial flaw (Ha, Hb) rises and [when] its apparent bottom surface ratio is 60% or more.

B. Attenuation measurement sensitivity

The flaw sensitivity shall be 0.5B or more and reference 2B.

(3) Classification of attenuation levels

Classification of attenuation levels for shafts shall be as indicated below.

Classification	Condition of the bottom surface echo	Operating frequency
Class 1	B2 saturation or more	2MHz
Class 2	B2 From minute to before saturation (with B2)	2MHz
Class 3	B1 From minute to before saturation (without B2)	2MHz
Class 4	Without B1 (2 MHz) With B1 (1 MHz)	2 MHz and 1MHz
Class 5	Without B1	1MHz

(4) Classification of flaw figures

The classification of flaw figures shall be as indicated below.

A. Normal figure

B. Flaw figure

C. Attenuation figure

D. Abnormal figure

(5) Type and determination of flawed shaft

Type and determination of flawed shaft shall be as follows.

A. Type

Good shaft (Former)

Good shaft (Latter)

Defective shaft

B. Determination

i. Defective shaft

a. Shaft with harmful operational [flaw] echo (Flaw figure)

b. Class 5 attenuation level figure (Attenuation figure)

ii. Good shaft (Former)

Shafts without flaw echo and abnormal echo at Class 1 and2 attenuation levels

iii. Good shaft (Latter)

a. Shaft without harmful operational flaw echo (Flaw figure)

b. Class 5 attenuation level figure (Attenuation figure)

c. Shaft with abnormal shaft (Abnormal figure)

d. Others. Shafts that cannot be classified as good shafts (former) and defective shaft.

(6) Flaw recovery

Good shaft (former) is performed during critical section and during complete inspection.

Good shaft (latter) is performed during critical section and during complete inspection.

(7) Attenuation measurement sensitivity after use.

In regards to attenuation level measurement, eliminating this is allowed at the time of after-use inspection for axles that can be guaranteed to be equivalent to Class 1 or Class 2 of a current equivalent classification when manufactured by the axle manufacturer.

Definitions of terminology

0.5B sensitivity

Overall sensitivity when the bottom surface reflection of the axle has been corrected to 50% of the height of the saturation threshold.

2B sensitivity

Overall sensitivity when the second bottom surface reflection of the axle has been corrected to 50% of the height of the saturation threshold.

Level of attenuation

The dissipation or scattering of ultrasonic energy by such factors as physical viscosity, the existence of abnormal sections or anisotropy of crystal particles when the ultrasound is being propagated in a physical property. This is called attenuation. The apparent attenuation ratio over a unit of distance is referred to as the level of attenuation.

Normal figure

This is when there is no echo other than the bottom echo and side echo in the flaw detection sensitivity.

Figure with flaw

This is when an echo other than the ring-shaped abnormal reflection from the side surface echo and crystal particle threshold coincide at the distance from both inspection surfaces at the vertical inspection and can be determined to be a flaw echo.

Attenuation figure

Classification of attenuation levels for shafts shall be as indicated below.

Abnormal figure

Abnormal echoes other than normal figures, flaw figures and attenuation figures that are difficult to determine.

Sheet 2

Inspection method for brake devices

1. In a system in which the braking force is attained by a single brake cylinder, since the construction is such that the foundation brake device evenly conveys the braking force to each brake shoe, it is a construction in which a the breakage of any lever, rod or other component of the foundation brake will disable the attainment of braking force. This is why flaw inspection is performed during critical section inspections and during complete item inspections.
2. When performing flaw inspection, priority shall be given to performing it on welded sections, locations where there have been structural changes, etc., from among the various levers and rods, etc., comprising the foundation brake.

   Moreover, when welding, etc., is performed during periodic inspections or during repairs, etc., at times other than those inspections, flaw inspection shall be performed on those locations.
3. Provide opportunities for condition and function inspections, etc., at times other than those for critical part inspection and overall inspections, and strive to inspect for cracks in the various levers and rods, etc., of the foundation brake.

Sheet 3

Inspection Manual for Bogie Frames

1. Re-evaluating the Inspection Method for Bogie Frames

(1) Background

Starting from October 1998 numerous railway operators began discovering an increasing number of cracks in bogie frames and when an investigation was made by railway operators throughout Japan into the occurrence of cracks on bogie frames, numerous cases were reported. This is why a radical response was developed regarding the future inspection of bogie frames.

Initially this response called for the implementation of detailed inspections using magnetic particle inspection, etc., on designated bogies in accordance with emergency countermeasures in "Regarding the emergency inspection of bogies" (Tetsuho No. 55, dated April 8, 2000), and now this inspection manual for bogie frames has been established to enable the certain detection of bogie frame cracks during major inspections and overall inspections.

(2) Importance of implementing regularly scheduled bogie frame inspections

The size of the cracks that have been occurring on the bogie frames are approximately 40 mm, which can easily be detected by magnetic particle inspection or penetrant dye inspections, and require approximately 1.2 to 1.5 million kilometers of travel before they enlarge to the level of plastic deformation, so it is now clear that the cracks to no develop quickly. (Attachment 1, 2)

Therefore, it is thought that if the cracks in the bogie frames can be detected while they are still small, and if proper measures are taken, major accidents such as derailments can be prevented. Specifically, it is imperative that inspection for the existence of these cracks be made by methods that are certain to detect them, such as magnetic particle inspection, etc., during regularly scheduled major inspections and overall inspections.

2. Inspection of Bogie Frames

(1) Designation of critical inspection areas on the bogie frames

Based on an analysis of data about the occurrence of cracks in the past, it was determined that the cracks mainly occurred at welded locations at the side sill and spring cap spring seat, the welded locations of the side sill and side beam, the mounting areas for the traction motors and propulsion system, and welded locations for part mountings. However, because the cracks tend to occur at locations unique to the type of bogie, each railway operator shall take the characteristics of the bogie frame construction for each rolling stock into consideration, designate critical inspection locations and conduct inspection of the bogie frames.

Furthermore, when designating the locations for the critical inspections, [railway operators] shall refer to "Cases of Cracks Occurring in Bogie Frames" that indicates examples of the locations where cracks occurred in the past.

(2) Inspection Method for Bogie Frames

Basically, the method for inspecting for cracks on bogie frames at the critical inspection locations shall be done by flaw detection inspection. However, at locations where accurate confirmation can be made by visual inspection after removing paint and grime, visual inspections may be performed for the bogie frame inspections for which the following special countermeasures have been implemented as shown in the following items.

Furthermore, there is a need to take sufficient care and determine the crack inspection for each type of bogie, taking into consideration that there may be differences in reliability and durability due to the different times that the bogies were designed and manufactured, as well as the affects of changes in load conditions due to increases in speed, etc.

Reference shall be made to Attachment 4 when determining the inspection method for bogies.

(3) Bogies for which special countermeasures have been implemented

Bogies designed and manufactured in recent years have had the following countermeasures implemented.

[1] Confirmation of the fusing of welding joints (Example: By using ultrasound inspection or X-ray inspection, etc.)

[2] Removal of concentrated stress by weld surface condition defects (Example: Finishing by grinder, etc.)

[3] Confirmation of the weld surface (Example: Magnetic particle test, dye penetrant test, etc.)

[4] Highly precise strength assessment (Example: Static load test using multiple measuring points)

However, in particular, in regards to bogies that have received all the countermeasures indicated in [1] through [4], or bogies that have had their safety carefully considered, such as the strength of bogies, from the time of design and manufacture to the time when they are first used, such as with the Shinkansen, since there is no record of cracks occurring and when it can be confirmed that the [bogies] will not be used in excess of their design conditions, these records can be used for determining the inspection methods to be used for major inspections and overall inspections.

However, even when the items referenced above can be confirmed at the time of design and manufacture, if there have been major changes in the construction of the bogie when compared with previous constructions, there is a need to conduct critical inspections of the locations of the bogie construction that have been changed.

3. Inspection Records

Records for the inspection bogie frames shall be recorded as the inspection items in Attachment 6.

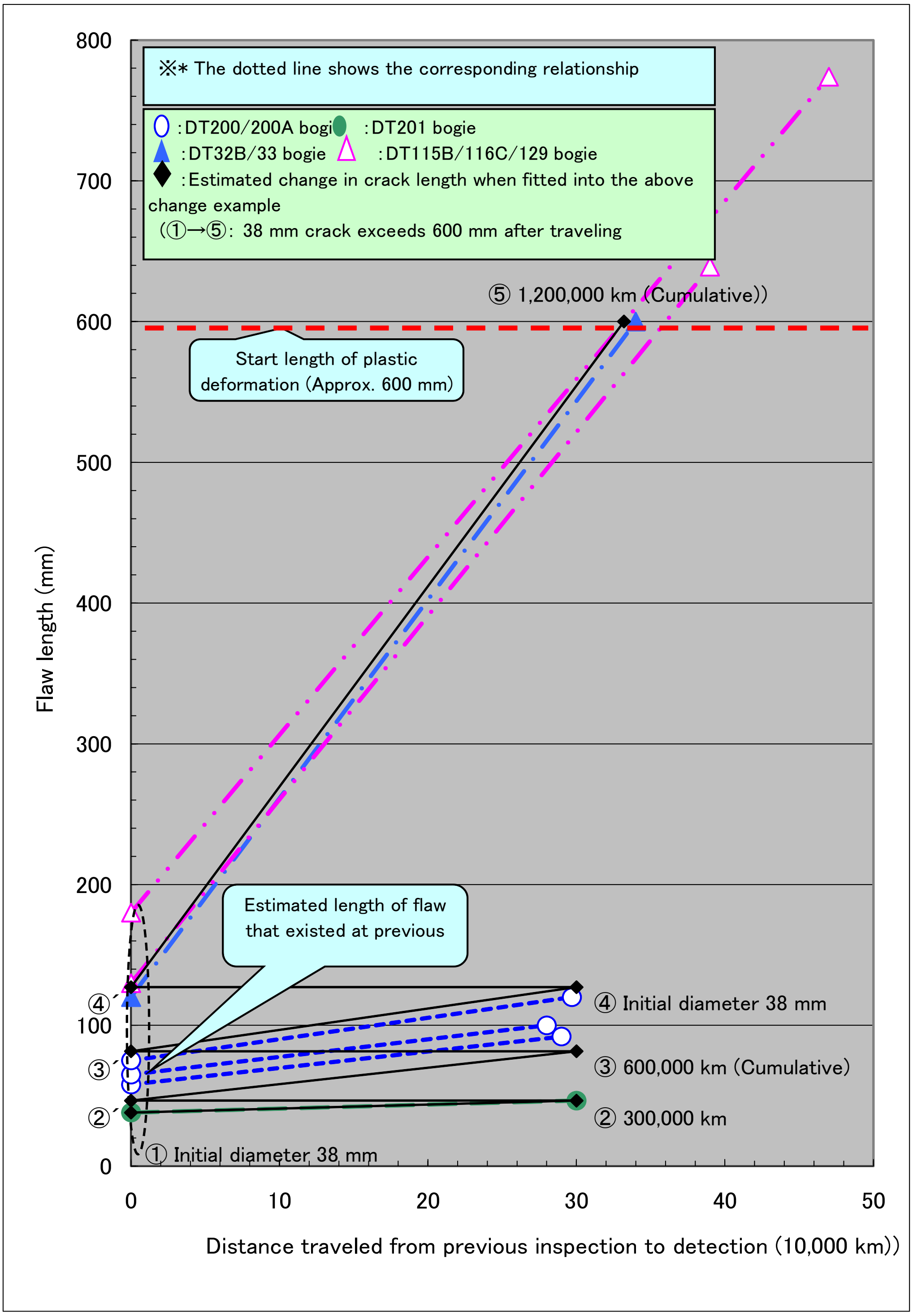
Furthermore, inspection records are the subject of security audits of the auditing rules of the railway operator, etc.

4. Others

Examples of the inspections determined for each bogie are shown in Attachments 7 and 8.

Attachment1
(Sheet 3)

Example of change accompanying the distance traveled for a side sill flaw



1) Naruse, "Strength of Welded Truck Frames and Maintenance," Ken-yusha, Inc, p 18 1999

Attachment2
(Sheet 3)

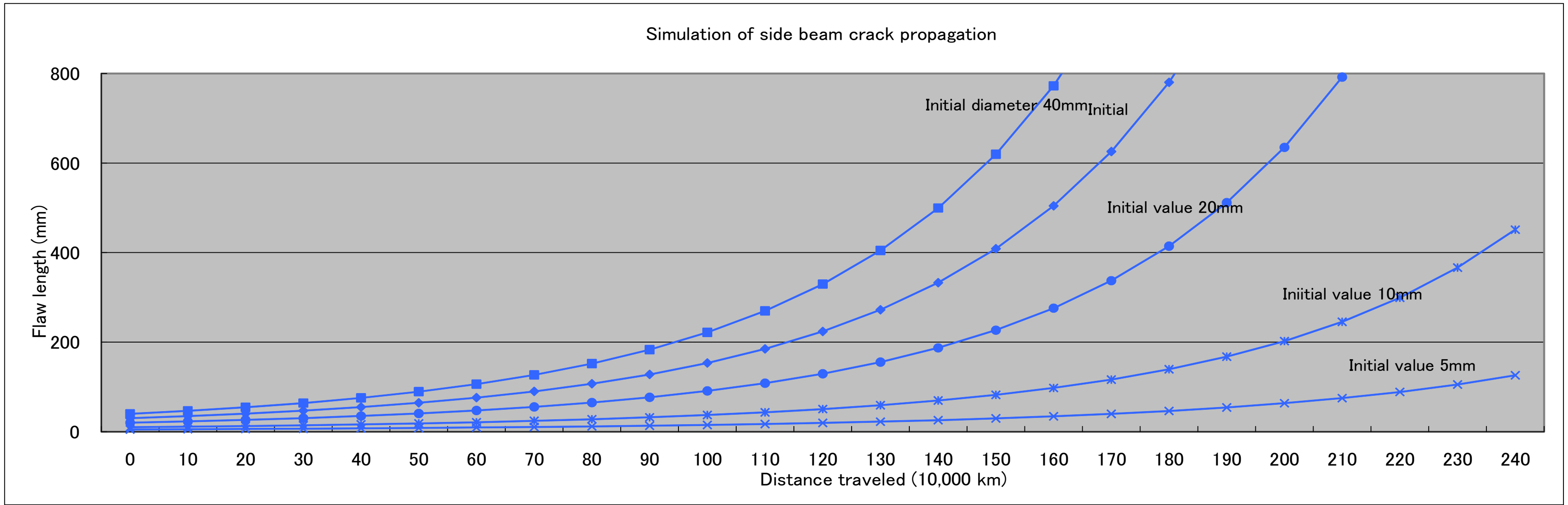
○Simulation of bogie side beam crack propagation (Calculated on side beam crack data for past 10 years)

↓Initial diameter

Travel (10,000 km)	0	10	20	30	40	50	60	70	80	90	100	110	120
Crack length (mm)	5.0	5.5	6.1	6.8	7.5	8.4	9.4	10.5	11.8	13.4	15.1	17.2	19.6
Crack length (mm)	10.0	11.2	12.7	14.3	16.2	18.5	21.1	24.2	27.8	32.1	37.2	43.3	50.5
Crack length (mm)	20.0	22.9	26.3	30.3	35.0	40.7	47.4	55.5	65.2	76.9	91.1	108.3	129.4
Crack length (mm)	30.0	34.7	40.3	46.9	54.9	64.5	76.0	90.0	107.1	127.9	153.4	184.9	223.8
Crack length (mm)	40.0	46.6	54.5	64.0	75.5	89.3	106.2	126.8	152.1	183.3	221.9	269.8	329.7

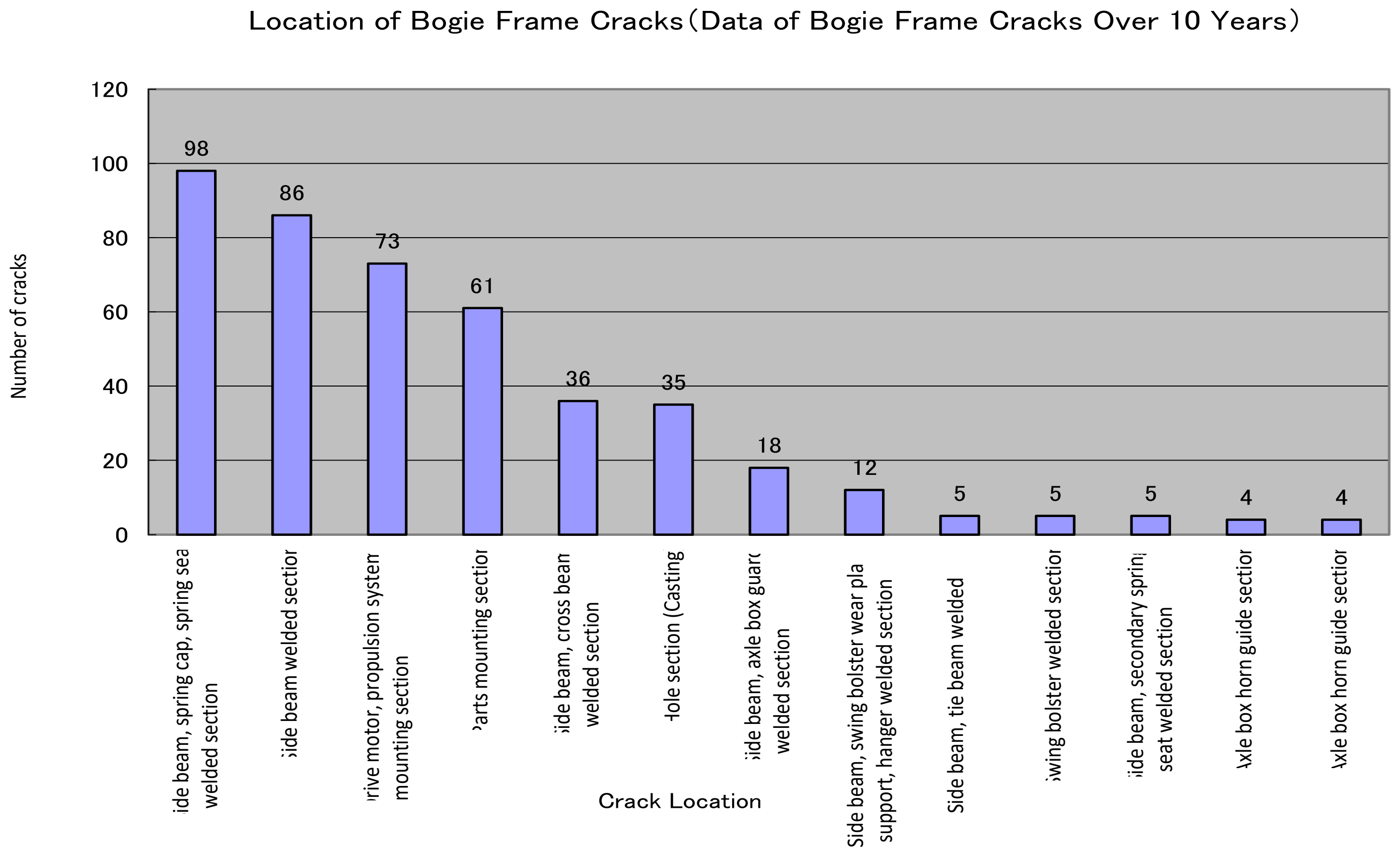
Travel (10,000 km)	130	140	150	160	170	180	190	200	210	220	230	240
Crack length (mm)	22.4	25.7	29.6	34.3	39.8	46.3	54.2	63.6	75.0	88.8	105.5	126.0
Crack length (mm)	59.2	69.7	82.3	97.7	116.4	139.3	167.5	202.3	245.5	299.2	366.6	451.3
Crack length (mm)	155.3	187.2	226.7	275.9	337.3	414.4	511.7	635.0	792.1	993.2	1252.2	1587.4
Crack length (mm)	272.2	332.7	408.6	504.3	625.7	780.2	978.0	1232.6	1561.9	1990.2	2550.4	3287.1
Crack length (mm)	404.8	499.5	619.6	772.4	968.0	1219.7	1545.2	1968.4	2521.8	3249.4	4211.5	5490.9

Part exceeding start length of plastic deformation (600mm)



The result of this simulation shows that more than 1.6 million kilometers are needed for a 30 mm crack to reach plastic deformity (600 mm or more)

Attachment 3
(Sheet 3)



Attachment 4
(Sheet 3)

Inspection issues when determining the inspection method for bogies.

1. Issues that should be investigated in the provisional manual
   - Affects from dramatic increases in car body weight caused by modifications, etc.
   - Affects from increases in speed

2. Issues that should be investigated in the final manual
   - Changes to static load (caused by dramatic increases in car body weight caused by modifications, etc.)
   - Changes in dynamic load (maximum speed, increased speed when passing through curves, etc.)
   - Affects from conditions of track used (ballast, slab track, etc.)

3. Points to continue during maintenance.
   - Thermal affect from using a gas burner for removing paint and grease.
   - Appropriate wheel tread maintenance

Attachment 5
(Sheet 3)

Recent conditions in bogie frame cracks (Bogies manufactured after 1990)

No.	Year of bogie manufac turer	Year crack discover ed	Location of crack	Cause of crack	Comm ents
1	1990	1994	Parts mounting section (Load detection link)	[4] Strength investigation and evaluation Insufficient consideration	
2	1990	1996	Side beam connection	[4] Strength investigation and evaluation Insufficient consideration	
3	1990	1998	Side beam connection	[1] Confirmation of the fusing of welding joints Not implemented	
4	1990	1999	Side beam connection	[1] Confirmation of the fusing of welding joints Not implemented	
5	1991	2000	Parts mounting section (Air piping)	[4] Strength investigation and evaluation Insufficient consideration	
6	1991	2000	Side beam, tie beam welded section	[4] Strength investigation and evaluation Insufficient consideration	
7	1991	1998	Hole section (Casting)	Others (Casting defect)	
8	1992	1996	Traction motors mounting seat	[4] Strength investigation and evaluation Insufficient consideration	
9	1992	1997	Propulsion device mounting seat	[4] Strength investigation and evaluation Insufficient consideration	
10	1993	1996	Traction motors mounting seat	[4] Strength investigation and evaluation Insufficient consideration	
11	1993	1996	Traction motors mounting seat	[4] Strength investigation and evaluation Insufficient consideration	
12	1993	1996	Traction motors mounting seat	[4] Strength investigation and evaluation Insufficient consideration	
13	1993	1997	Side beam, axle box guard welded section	[1] Confirmation of the fusing of welding joints Not implemented	
14	1993	1998	Side beam, axle box guard welded section	[4] Strength investigation and evaluation Insufficient consideration	
15	1993	1999	Traction motors mounting seat	[4] Strength investigation and evaluation Insufficient consideration	
16	1993	2000	Parts mounting section (Obstacle deflector)	[1] Confirmation of the fusing of welding joints Not implemented	
17	1993	2000	Parts mounting section (Air spring piping securing seat)	[4] Strength investigation and evaluation Insufficient consideration	
18	1994	1994	Parts mounting section (Electric wire bracket)	[4] Strength investigation and evaluation Insufficient consideration	
19	1994	1998	Side beam, axle box guard welded section	[4] Strength investigation and evaluation Insufficient consideration	
20	1994	1999	Traction motors mounting seat	[2] Removal of concentrated stress by weld surface condition defects Not implemented	

* In the above-referenced cases, with the exception of the casting defect for No. 7, implemented.
  one of the countermeasures in [1] through [4] above was not
* There are no cases of cracks occurring when [1] through [4] above have been implemented.

Attachment 6
(Sheet 3)

Items to be Recorded during Inspection of Bogie Frames

Records for the inspection of bogie frames shall be recorded using the following items.

(1) Car number
(2) Type of inspection (Overall inspection, critical inspection, routine inspection, etc.)
(3) Inspection Year Month Day
(4) Kilometers traveled for said bogie until defect was discovered
(Kilometers traveled after manufacture and kilometers traveled after previous inspection)
(5) Type of bogie
(6) Bogie manufacturer
(7) Bogie serial number or control number
(8) Year and month of bogie manufacturer
(9) Inspection method (magnetic particle, penetrant dye, visual, etc.)
* If different test methods are used for different areas, record the details.
(10) Results of inspection
(11) Location of crack
(12) Length, depth of crack
(13) Crack shape, dimensions, sketches or photographs that enable location of crack to be understood
(14) Description of methods taken to address crack
(15) Other comments

Attachment 7
(Sheet 3)

Bogie Frame Inspection Procedure (Example)

1. Securing the Bogie Frames
   - Position the bogie frame in the designated location.
2. Remove paint film and grime at the area to be inspected.
   - Use a pneumatic chisel to remove the paint film from the area of the bogie frame to be inspected.

Stripping operations for areas of bogie frame to be inspected

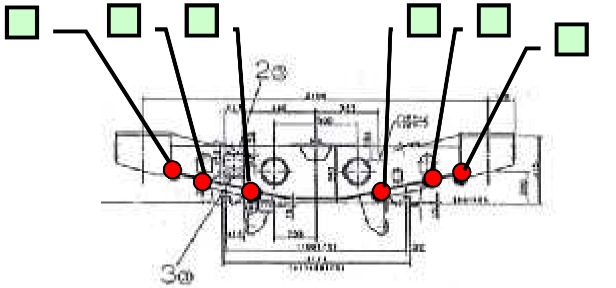
3. Inspection
   - Use flaw detection inspection methods, etc., to inspect the critical inspection areas that have been designated for each type of bogie. Conduct a visual inspection for cracks in other areas.
   - Follow a checklist when conducting the inspection.

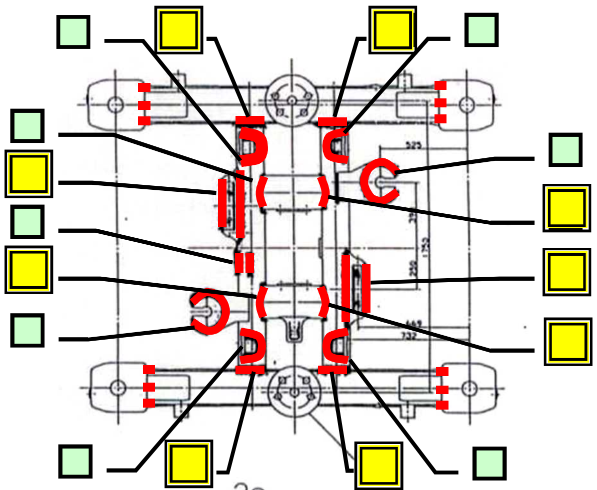
4. Recording the inspection results.
   - Enter the inspection results in the designated areas of the the inspection record sheet.

Attachment 8
(Sheet 3)

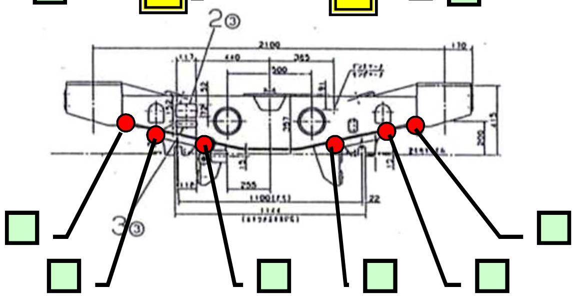
Bogie Frame Inspection Checklist (Example)

Side beam No. 1

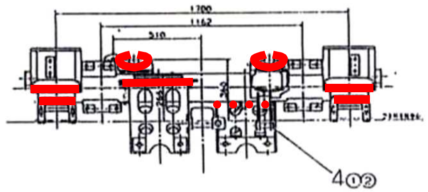


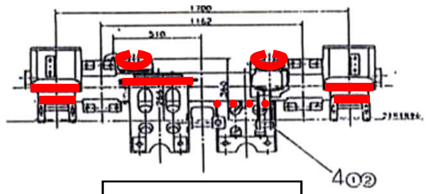


Side beam No. 2



Cross beam





Cross

Car number	xxx—xxxx
Type of Inspection	Major Inspection
spection Year Ionth Day	April 25, 2001
Type	D T○○
Manufacturer	xx Rolling stock
Serial number (Control Number)	xxxxx
Year and month of manufacture r	August 1995
Inspection Method	:Magnetic particle (Critical inspection areas) :Visual inspection
Inspector's name:	x x x x

Check ①	Check ②	Check ③
4/25	4/25	4/26

(Special Item Notes)

Sheet 4

Inspection of Cable Railways

1. Once a day, before using the cable railway, perform a test operation and inspect the condition of the cable, securing ends of the cable, the area where the cable attaches to the car, the motive power source facilities, etc.

2 The facilities to be inspected are listed on a separate sheet; perform the inspection according to the list.

3 Inspect the wheel axle for damage using the attachment related to paragraph 5 of the notification "Items and Methods for Periodic Inspection"

Separate Table

Inspection Period	Inspection Method	Inspected Equipment
Monthly	Visual inspection	Cable
Every 3 months	Visual inspection	Securing section of cable ends Cable attachment to car
	Visual inspection and confirmation of action	Motive power supply equipment (Including control equipment, power supply pulleys, etc.) Operation safety facilities Guide pulleys
Annually	Measurement	Cable Control device for motive power facilities
Perform inspection as stipulated in paragraph 5 of notification relating to the periodic inspection of the facilities and cars	Confirmation of operation and measurement	Automatic brake device for car

Notes

1. The periods for the inspection of the items shall be a total of the period used.

2. The classifications of the inspection methods are as shown below.

(1) Visual inspection: In principle, this means visually inspecting the facilities for abnormalities, such as corrosion, damage, etc., without operating it.

(2) Operation inspection: The facilities are actually operated and their functions, etc., are checked.

(3) Measurement: Use a calipers or other such mechanical instrument to measure the amount of wear, movement, etc.

3. Measurement of the cable is done at every 200 meters of the total length of the cable (at 5 or more locations when the cable length is less than 1,000 meters). Measurement should also be made at areas that, based on experience, are prone to damage.

4. The action of the automatic brake device shall be as shown below.

(1) Checking of the action when performing the condition and function inspection should be done by operating the devices when they are stopped.

(2) Checking of the action when performing the critical part inspection and overall inspection should be done while [the device] is moving by using the operating methods for said device, or by measuring the time to close the brake shoe and calculating the braking distance.

Sheet 5

Cable Replacement Standard for Cable Railways

1. Cables shall be replaced when one of the following applies.

(1) When the sectional area of the cable is 80% or less than that of a cross section of a new cable at the start of usage due to internal corrosion or broken strands.

In this case, the reduction in the cross section due to wear and/or inter nal corrosion of the cable shall be considered have a reduced cross sectio n based on a reduction in the diameter of said cable. (When the diameter reduction ratio of the cable is 11%, there reduction in cross sectional area is 20 %.) When the reduction in the cross section is due to broken strand s, this shall be the cross sectional area of the broken strands in a length that is six times the twist pitch of said cable.

(2) When the strands of a cable begin to break, there is a tendency of the b roken strands to increase in a short period of time.

(3) When surface wear of the strands causes the diameter of 50% or more o f the outer strands to become two-thirds or less than the diameter at the start of usage.

(4) When it is determined that it is difficult to continue using the cable due breakage, deformation, rust or corrosion.

2 When rust or broken strands are confirmed at the location where the cable i s secured and that section is cut out and the location where the cable is se cured is changed.

Furthermore, on socket types, when the alloy part [cannot be] pulled out of the socket, or when inspection of the connection section of the cable and the alloy section cannot be made by disassembling the socket, etc.

Sheet 6

Structure Design by Allowable Stress Method

ARTICLE 1: ALLOWABLE STRESS

1. The stress acting on the member of structure shall not exceed the allowable stress corresponding to the relevant member or otherwise their safety shall be assured by means of the structural analysis and/or the experiment.

ARTICLE 2: ALLOWABLE STRESS FOR REINFORCED CONCRETE STRUCTURE AND NON-REINFORCED CONCRETE STRUCTURE

1. The stress acting on the members of reinforced concrete structure and non-reinforced concrete structure (excluding those provided in Paragraph 1 of ARTICLE 3) shall not exceed the allowable stress provided in the following tables;

   TABLE 1 for reinforcing steel,
   TABLE 2 for ordinary concrete used for reinforced concrete,
   TABLE 3 for lightweight aggregate concrete used for reinforced concrete and
   TABLE 4 for ordinary concrete used for non-reinforced concrete.

2. In the preceding Paragraph 1, the allowable stress for the reinforced concrete which is constructed underwater and liable to result failures such as cracks, shall be applied with some reduction from the values provided in TABLE 1, taking account of concrete cover, diameter and spacing of steel-bar, etc.

3. The load combinations acting on the members of reinforced concrete structure and non-reinforced concrete structure are provided in TABLE 5; the kind of structures in the first column and load combinations in the 2nd column respectively. In this case, the allowable stress of the relevant member shall not exceed the value obtained by multiplying the allowable stress set up in the preceding Paragraphs 1 and 2 by the factor in the third column of the same table.

ARTICLE 3: ALLOWABLE STRESS FOR FOUNDATION

1. The stress acting on the members of foundation shall not exceed the allowable stress provided in the following tables;

TABLE 6 for ordinary concrete used for reinforced concrete constructed underwater,
TABLE 7 for ordinary concrete used for reinforced concrete constructed in the air (limited to those constructed under adverse conditions),
TABLE 8 for steel pile and H-shaped steel pile and
TABLE 9 for precast concrete pile.

2. The provisions of Paragraph 3 of Article 2 shall be applied correspondingly.

ARTICLE 4: ALLOWABLE STRESS FOR BRIDGE, ETC.

1. The stress acting on the members of steel bridge and steel-concrete composite girder bridge shall not exceed the allowable stress provided in the following tables;

TABLE 10 for structural steel,
TABLE 11 for weld of structural steel,
TABLE 12 for bolt,
TABLE 13 for pin and
TABLE 14 for steel bridge-support and cast iron bridge-support.

2. Regardless the provisions of the preceding Paragraph 1, where compressive force acts on the structural steel, the allowable stress of the relevant member shall be applied with some reduction to the value provided in TABLE 10, taking buckling effect into account.

3. The load combinations for the members of steel bridge and steel-concrete composite girder bridge are provided in the left column of TABLE 15, as a standard. In this case, the stress acting on the relevant member shall not exceed the allowable stress obtained by multiplying the value of the preceding Paragraph 2 by the factor provided in the right column of the same table.

ARTICLE 5: ALLOWABLE STRESS FOR PRESTRESSED CONCTETE BRIDGE

1. The stress acting on the member of prestressed concrete bridge shall not exceed the allowable stress provided in the following tables;

TABLE 16 for ordinary concrete used for prestressed concrete,

TABLE 17 for lightweight aggregate concrete used for prestressed concrete and

TABLE 18 for steel material for prestressed concrete.

2. The load combinations for the members of prestressed concrete bridge are provided in the 1st column of TABLE 19, as a standard. In this case, the stress acting on the relevant member shall not exceed the allowable stress obtained by multiplying the value of the preceding Paragraph 1 by the factor provided in the 2nd column of the same table (the factor for bending tensile stress in the 3rd to 5th columns).

ARTICLE 6: ALLOWABLE STRESS FOR OPEN-CUT TUNNEL

1. The stress acting on the member of open-cut tunnel shall not exceed the allowable stress provided in the following table;

TABLE 20 for steel pipe pile.

2. Regardless the provisions of the preceding Paragraph 1, where compressive force acts on steel pipe pile, the allowable stress of the relevant member shall be applied with some reduction to the values provided in TABLE 20, taking buckling effect into account.

3. The load combinations for the members of open-cut tunnel are provided in the left column of TABLE 21, as a standard. In this case, the stress acting on the relevant member shall not exceed the allowable stress obtained by multiplying the value of the preceding Paragraph 2 by the factor provided in the right column of the same table.

ARTICLE 7: ALLOWABLE STRESS FOR SHIELD TUNNEL

1. The stress acting on the member of shield tunnel shall not exceed the allowable stress provided in the following table;

TABLE 22 for steel material,

TABLE 23 for carbon steel casting and spheroidal graphite cast iron and

TABLE 24 for bolt

ARTICLE 8: SAFETY DESIGN AGAINST FATIGUE OF STRUCTURE

1. Where the members of structure are subject to cyclic stress, appropriate measures, such as reduction of allowable stress, shall be applied in order to ensure the safety of structure against fatigue considering frequency, kind of material, stress conditions, etc.

ARTICLE 9: ALLOWABLE DEFLECTION

1. The deflection of bridge due to the load of train shall not exceed the value provided in the right column of TABLE 25 corresponding to the kind of bridge provided in the left column of the same table.

ARTICLE 10: LOAD, ETC. ACTING ON BRIDGE AND CONCRETE STRUCTURE

1. The stress acting on the member of bridge and concrete structure and the deflection of bridge-girder shall be calculated considering such conditions as dead load, live load, impact, centrifugal load, horizontal load of train, braking load and traction load of train, wind load, flowing water pressure, earth pressure, earthquake effect, longitudinal load of long rail, collision load of automobile, erection load, temperature variation, drying shrinkage and creep of concrete, influence of support displacement, force due to prestress, snow load, etc.

2. The dead load shall be calculated using the unit weight provided in TABLE 26, as a standard.

3. The live load shall be calculated in accordance with the followings;

(1) The design train load shall be calculated based on the loaded condition that the axle load of the train or car operated regularly in the operating section gives the maximum effect to the structure and results the maximum stress on the member of relevant structure. In this case, the average weight of passenger shall be 600N;

a. Locomotive to be applied with the actual axle load,

b. Passenger car to be applied with the axle load with maximum number of passengers on board and

c. Freight car to be applied with the axle load corresponding to payload.

(2) The load of crowd shall be calculated in accordance with TABLE 27, as a standard.

4. The impact shall be obtained by multiplying the design train load by impact factor as follows;

(1) The impact factor for steel bridge and steel-concrete composite girder bridge (limited to 150 m span at a maximum) shall be calculated by the following formula (however 0.7 at a maximum);

$$i = \frac{V}{3.6\, n_1\, L_1} + \frac{10}{65 + L_1}$$

Where i, V, n_1 and L_1 are as follows;

i: Impact factor

V: Maximum velocity of the train operated in the relevant section (km/h)

n_1: Fundamental natural frequency of girder with the design train load (Hz)

L_1: The base line length of the influence line of same sign which gives the maximum live load stress on the member (75% of span for web-member, except hanger of through-truss, intermediate support of deck-truss, diagonal member of subdivision and similar web-member) (unit:m)

(2) The impact factor for concrete bridge (limited 100m span at a maximum) shall be calculated by the following formula (however, 0.6 at a maximum);

$$i = k_a \frac{V}{7.2\, n_2\, L_2} + \frac{10}{65 + L_2}$$

Where i, V, n_2 and L_2 are as follows;

i: Impact factor,

k_a: 10 (for locomotive, where L_2 is not greater than 10m and $\frac{V}{7.2\, n_2\, L_2}$ exceeds 0.1,

$k_a = 1.5$)

V: Same as the preceding Item (1),

n_2: Fundamental natural frequency of girder without design train load (Hz), and

L_2: Span (less than 70% of the maximum span for the continuous girder bridge, continuous rigid frame bridge and others of which each span varies, and otherwise the average of the relevant spans) (unit:m).

5. Regardless the provisions of the preceding Paragraph 4, the impact factor may be reduced depending on the conditions of structure, such as member supporting more than two railroad tracks, substructure member with overburden on the upper part and substructure member having big sectional area.

6. The centrifugal load shall be, as a standard, the value obtained by multiplying the design train load by coefficient calculated by the following formula, and in this case, the centrifugal load acts on the center of gravity of the design train load, horizontally and right-angledly to the railroad track;

$$\alpha = \frac{V^2}{127\,R}$$

Where α, V and R are as follows;

α: Coefficient,

V: Maximum speed of train running on the relevant curve (km/h), and

R: Radius of curve (unit:m).

7. The horizontal load of train shall be, as a standard, the value obtained by multiplying the traveling concentrated moving load by coefficient provided below, where the distribution of the design train load on the axles, etc., shall be taken into account, and in this case, the horizontal load of train acts at the top of rail, horizontally and right-angledly to the railroad track;

(1) 0.15 for locomotive, and

(2) 0.20 for electric car and internal combustion car.

8. In the preceding Paragraph 7, where the member supports more than two railroad tracks, it is sufficient to apply the horizontal load for one railroad track.

9. The braking load and traction load shall be applied with the following value as a standard, and in this case, the braking load and traction load acts on the center of gravity of the design train load and parallel to the railroad track;

(1) Locomotive

a. The braking load shall be obtained by multiplying the locomotive load by 0.15, where the locomotive load shall be arranged in a manner of giving the maximum effect to the member,

b. The traction load shall be obtained by multiplying the total axle load of driving wheels by 0.25, where the axle loads shall be arranged in a manner of giving the maximum effect to the member,

(2) Electric car and internal combustion car

a. The braking load shall be calculated by the following formula;

$$P_1 = (3.0 + 0.75L_1) \times \frac{T}{18} \times \frac{20}{M}$$

Where P_1, L_1, T and M are as follows;

P_1: Braking Load (kN),

L_1: Length of train with the load arranged in a manner of giving the maximum effect to the member,

T: Design axle load (kN), and

M: Design car length (unit:m).

b. The traction load shall be calculated by the following formula;

$$P_2 = (2.8 + 0.70L_2) \times \frac{T}{18} \times \frac{20}{M}$$

Where P_2, L_2, T and M are as follows;

P_2: Traction load (kN)

L_2: Length of power car with the load arranged in a manner of giving the maximum effect to the member,

T: Design axle load (kN), and

M: Design car length (unit:m).

10. The wind load shall be calculated with the following values, as a standard, and in this case, the load acts horizontally to the bridge;

(1) The wind load shall be 1.5 kN/m^2 for the right angle projection area of the bridge and the train, in the case that the train or car is on the bridge, and

(2) The wind load shall be 3.0 kN/m^2 for the right angle projection area of the bridge, in other cases.

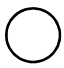
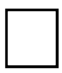
11. The flowing water load acting on the bridge pier shall be calculated by the following formula and in this case, the load acts at the 40% of water depth below the surface;

$$P = KAV^2$$

Where P, K, A and V are as follows;

P: Flowing water load (kN),

K: Coefficient provided in the following table for the cross-section shape of bridge pier,

Cross-section Shape	Coefficient
	0.3
 or 	0.25
	0.5
	0.55

A: Vertical projection area of bridge pier (m^2), and

K: Water velocity on the surface (m/s).

12. The earth pressure acting on the fixed wall shall be static earth pressure and that acting on the other structures shall be active earth pressure and passive earth pressure. In this case, the active earth pressure and passive earth pressure shall be calculated by Coulomb's Formula or the formula considering cohesion into Coulomb's Formula, or Rankine's Formula, as a standard.

13. The earthquake effect shall be in accordance with "Design Standards for Railway Structures (Seismic Design)".

14. The longitudinal load of long rail shall be 10 kN/m for one track, as a standard, but need not exceed 200 kN.

15. The collision load of automobile shall be the following values, as a standard, and in this case, the load acts at 1.8 m above the road;

(1) 100 kN for the horizontal and parallel direction to the road, and

(2) 50 kN for the horizontal and right-angled direction to the road.

ARTICLE 11: LOAD ETC. OF OPEN-CUT TUNNEL AND SHIELD TUNNEL

The stress acting on the member of structure of the open-cut tunnel and the shield tunnel shall be calculated considering load on the ground, overburden, earth pressure, water pressure, buoyancy, self-weight, internal load of tunnel, seismic effect, load under construction, effect of temperature variation and, drying shrinkage, effect of adjacent tunnel, effect of land subsidence, etc.

ARTICLE 12: CONSIDERATION OF EARTHQUAKE

The aseismic design shall be in accordance with "Design Standards for Railway Structures (Seismic Design)".

TABLE 1 Allowable Stress for Reinforced Steel (relating to ARTICLE 2)

Kind of Steel	SR235	SR295 SD295	SD345	SD390
Allowable tensile stress and Allowable compressive stress	140	180	200	220

NOTE:

(1) Unit in N/mm^2

(2) Kind of steel is in accordance with JIS (Japanese Industrial Standard) "Steel Bars for Concrete Reinforcement".

(3) Where the specified concrete strength is less than 18 N/mm^2, the allowable stress shall be as follows;

(a) 120 N/mm^2 for round steel bar

(b) 160 N/mm^2 for deformed bar

TABLE 2 Allowable stress for ordinary concrete used for reinforced concrete

(relating to ARTICLE 2)

Kind of Stress \ Specified Concrete Strength		18	24	30	40
Allowable bending compressive stress		7.0	9.0	11.0	14.0
Allowable shearing stress due to bending of the member without diagonal tension reinforcement		0.35	0.39	0.45	0.55
Allowable shearing stress due to punching of the member without diagonal tension reinforcement		0.48	0.54	0.60	0.70
Allowable shearing stress of the member with diagonal tension reinforcement		1.5	1.7	1.9	2.0
Allowable bond stress	Steel bar	0.7	0.8	0.9	1.0
	Deformed bar	1.4	1.6	1.8	2.0
Allowable bearing stress		6.0	8.0	10.0	13.0

NOTE:

(1) Unit in N/mm^2

(2) The allowable shearing stress due to bending and the allowable shearing stress due to punching, of the member without diagonal tension reinforcement, shall be obtained using the factor of 1.0 for load combination, regardless the provisions of the second sentence of Paragraph 3 of ARTICLE 2.

(3) The allowable stress of the member without diagonal tension reinforcement may be increased depending on the effective height, main reinforcement ratio, etc.

(4) The allowable shearing stress of the member with diagonal tension reinforcement, where taking torsional effect into consideration, shall be 1.3 times of the value in this TABLE 2.

(5) The allowable bearing stress, where applied with local loading, shall be calculated by the following formula. In this case, if σ_{ca} exceedsσ_{ck}, σ_{ca} shall be equal to σ_{ck};

$$\sigma_{ca} = \frac{\sigma_{ck}}{3} \sqrt{\frac{A}{A'}}$$

Where σ_{ca}, σ_{ck}, A and A' are as follows;

σ_{ca}: Allowable bearing stress (N/mm^2)

σ_{ck}: Specified concrete strength (N/mm^2)

A: Distributed area of bearing pressure (mm^2) and

A': Bearing area (mm^2).

(6) The allowable bearing stress, where the part subject to the bearing force is reinforced sufficiently with spiral hoop reinforcement, etc., may be increased as far as the safety factor is maintained more than 3.

(7) The allowable bending compressive stress for the concrete composite section of slab used for steel-concrete composite girder bridge shall be the value of the specified concrete strength divided by 3.5. In this case, the relevant specified concrete strength shall be more than 28 N/mm^2.

(8) The allowable stress for the concrete used for the shield tunnel segment shall the value of the specified concrete strength divided by 2.8.

(9) The allowable stress to the intermediate value of the specified concrete strength in this TABLE 2 shall be obtained by linear interpolation.

TABLE 3 Allowable stress for lightweight aggregate concrete used for reinforced concrete (relating to ARTICLE 2)

Kind of Stress \ Specified Concrete Strength		18	24	30	40
Allowable bending compressive stress		7.0	9.0	11.0	14.0
Allowable shearing stress due to bending of the member without diagonal tension reinforcement		0.25	0.27	0.32	0.39
Allowable shearing stress due to punching of the member without diagonal tension reinforcement		0.34	0.38	0.42	0.49
Allowable shearing stress of the member with diagonal tension reinforcement		1.1	1.2	1.3	1.4
Allowable bond stress	Steel bar	0.45	0.55	0.65	0.7
	Deformed bar	0.9	1.1	1.3	1.4
Allowable bearing stress		4.5	6.0	7.5	10.0

NOTE:

(1) Unit in N/mm^2

(2) The allowable shearing stress due to bending and the allowable shearing stress due to punching, of the member without diagonal tension reinforcement, shall be obtained using factor of 1.0 for load combination, regardless the provisions of the second sentence of Paragraph 3 of ARTICLE 2.

(3) The allowable shearing stress of the members without diagonal tension reinforcement may be increased depending on the effective height, main reinforcement ratio, etc.

(4) The allowable shearing stress of the member with diagonal tension reinforcement, where taking torsional effect into consideration, shall be 1.3 times of the value in this TABLE 3.

(5) The allowable bearing stress, where applied with local loading, shall be calculated by the following formula. In this case, if σ_{ca} exceeds $0.8\sigma_{ck}$, σ_{ca} shall be equal to $0.8\sigma_{ck}$;

$$\sigma_{ca} = \frac{\sigma_{ck}}{4}\sqrt{\frac{A}{A'}}$$

Where σ_{ca}, σ_{ck}, A and A' are as follows;

σ_{ca}: Allowable bearing stress (N/mm^2)

σ_{ck}: Specified concrete strength (N/mm^2)

A: Distributed area of bearing pressure (mm^2) and

A': Bearing area (mm^2).

(6) The allowable bearing stress, where the part subject to the bearing force is reinforced sufficiently with spiral hoop reinforcement, etc., may be increased as far as the safety factor is maintained more than 3.

(7) The allowable bending compressive stress for the concrete composite section of slab used for steel-concrete composite girder bridge shall be the value of the specified concrete strength divided by 3.5. In this case, the relevant specified concrete strength shall be more than 28 N/mm^2.

(8) The allowable stress to the intermediate value of the specified concrete strength in this TABLE 3 shall be obtained by linear interpolation.

TABLE 4 Allowable stress ordinary concrete used for non-reinforced concrete (relating to ARTICLE 2)

Kind of Stress	Allowable Stress
Allowable bending compressive stress	The value of specific concrete strength divided by 4 (5.5 at a maximum)
Allowable bending tensile stress	The value of specific concrete strength divided by 7 (0.3 at a maximum)
Allowable bearing stress	The value of specific concrete strength divided by 3 (6.0 at a maximum)

NOTE:

(1) Unit in N/mm^2

(2) The allowable bearing stress, where applied with local loading, shall be calculated by the following formula. In this case, if σ_{ca} exceeds 12 N/mm^2, σ_{ca} shall be equal to 12 N/mm^2

$$\sigma_{ca} = \frac{\sigma_{ck}}{3}\sqrt{\frac{A}{A'}}$$

Where σ_{ca},σ_{ck}, A and A' are as follows;

σ_{ca}: Allowable bearing stress (N/mm^2)

σ_{ck}: Specified concrete strength (N/mm^2)

A: Distributed area of bearing pressure (mm^2) and

A': Bearing area (mm^2).

(3) The allowable bearing stress, where the part subject to the bearing force is reinforced sufficiently with spiral hoop reinforcement, etc., may be increased up to 7.0 N/mm^2.

TABLE 5 Load combination and factor (relating to ARTICLE 2)

Kind of Structure	Load Combination.	Factor
Girder	Dead load, design train load and impact	1.0
	Dead load, design train load, impact and centrifugal load	1.0
	Dead load, design train load, impact, centrifugal load and horizontal load of train	1.15
	Dead load, design train load, impact and crowd load (only for cantilever slab)	1.15
	Dead load and wind load (only for cantilever slab)	1.25
Bridge support	Dead load, design train load, impact* and friction resistance load	1.0
	Dead load, design train load, impact* and centrifugal load	1.0
	Dead load, design train load, impact* and longitudinal load of long rail	1.0
	Dead load and longitudinal load of long rail	1.0
	Dead load, design train load, impact*, longitudinal load of long rail and braking or traction load	1.15
	Dead load, design train load, impact*, centrifugal load and horizontal load of train	1.15
Side walk	Dead load and crowd load	1.0
	Dead load and wind load	1.25
Handrail	Dead load and load of handrail	1.15
	Dead load and wind load	1.25
Abutment	Dead load, design train load, impact* and earth pressure	1.0
	Dead load, design train load, impact* and centrifugal load	1.0
	Dead load, earth pressure and longitudinal load of long rail	1.15
	Dead load, design train load, impact*, earth pressure and longitudinal load of long rail	1.15

	Dead load, design train load, impact*, earth pressure, longitudinal load of long rail and braking or traction load	1.25
	Dead load, design train load, impact*, centrifugal load, horizontal load of train and wind load	1.25
Pier	Dead load, design train load and impact*	1.0
	Dead load, design train load, impact* and centrifugal load	1.0
	Dead load and longitudinal load of long rail	1.15
	Dead load, design train load, impact* and longitudinal load of long rail	1.15
	Dead load, design train load, impact*, longitudinal load of long rail and braking or traction load	1.25
	Dead load, design train load, impact*, centrifugal load, horizontal load of train, wind load and water pressure	1.25
Rigid frame bridge and flat slab structure	Dead load, design train load and impact*	1.0
	Dead load, design train load, impact* and centrifugal load	1.0
	Dead load, design train load, impact* and longitudinal load of long rail	1.15
	Dead load, design train load, impact*, centrifugal load and horizontal load of train	1.15
	Dead load, effect of temperature variation and effect of drying shrinkage	1.15
	Dead load, longitudinal load of long rail, effect of temperature variation and effect of drying shrinkage	1.25
	Dead load, design train load, impact*, longitudinal load of long rail, and braking or traction load	1.25
Arch bridge	Dead load, design train load and impact*	1.0
	Dead load, design train load, impact* and centrifugal load	1.0
	Dead load, design train load, impact* and longitudinal load of long rail	1.15

	Dead load, longitudinal load of long rail, effect of temperature variation and effect of drying shrinkage	1.25
	Dead load, design train load, impact*, longitudinal load of long rail and braking or traction load	1.25
Culvert	Dead load, design train load, impact*, earth pressure and water pressure	1.0
Earth retaining wall	Dead load, design train load and earth pressure	1.0

NOTE:

(1) The load marked with * shall be included in the combination load as far as such combination results stress increase on the member.

(2) In the unmovable section of long rail, where the structure of bearing support is half fixed and the structure is applied with rigid frame, the longitudinal load of long rail may be excluded from combination.

TABLE 6: Allowable stress for ordinary concrete used for reinforced concrete constructed underwater (relating to ARTICLE 3)

Kind of stress / Specific Concrete strength / Application	In the natural mud water (including bentonite concentration less than 3%)			In the bentonite mud (only for bentonite concentration more than 5% and less than 10%)		
	24	28	32	21	25	28
Allowable bending compressive stress	9.0	10.0	11.0	8.0	9.0	10.0
Allowable shearing stress for the member without diagonal tension reinforcement	0.39	0.43	0.47	0.37	0.40	0.43
Allowable shearing stress for the member with diagonal tension reinforcement	1.7	1.8	1.9	1.6	1.7	1.8
Allowable bond stress (only for deformed reinforcement)	1.3	1.4	1.4	1.1	1.1	1.2
Allowable bearing stress	8.0	9.0	10.0	7.0	8.0	9.0

NOTE:

(1) Unit in N/mm^2

(2) The specific concrete strength shall be 80% of 4-week compressive strength, where constructed underwater in the natural mud water, and 70% where constructed underwater in the bentonite mud water.

(3) The allowable stress shall be corresponding to the conditions of structure, where constructed in the bentonite mud water of which concentration is more than 3% and less than 5%.

(4) The allowable stress shall be confirmed to be safe enough with the experiment, where constructed in the bentonite mud water of which concentration is more than 10%.

(5) The allowable shearing stress of the member without diagonal tension reinforcement shall be applied with the load combination factor of 1.0, regardless the provisions of the second

sentence of Paragraph 3 of ARTICLE 2 refered in Paragraph 2 of ARTICLE 3.

(6) The allowable shearing stress of the member with diagonal tension reinforcement, where taking torsional effect into account, shall be 1.3 times of the value provided in this table.

(7) The allowable bearing stress, where applied with local loading, shall be calculated by the following formula. In this case, ifσ_{ca1} exceeds the specified concrete strength, σ_{ca1} shall be equal to the specified concrete strength;

$$\sigma_{ca1} = \sigma_{ca2}\sqrt{\frac{A}{A'}}$$

Whereσ_{ca1}, σ_{ca2}, A and A' are as follows;

σ_{ca1}: Allowable bearing stress in case of local loading (N/mm^2)

σ_{ca2}: Allowable bearing stress (N/mm^2)

A: Distributed area of bearing pressure (mm^2)

A' Bearing area (mm^2)

(8) The allowable stress to the intermediate value of the specified concrete strength in this TABLE 6 shall be obtained by linear interpolation.

TABLE 7: Allowable stress for ordinary concrete used for reinforced concrete constructed in the air (relating to ARTICLE 3)

Kind of stress \ Specified concrete Strength	24
Allowable bending compressive stress	9.0
Allowable shearing stress of the member without daiagonal tension reinforcement	0.39
Allowable shearing stress of the member with daiagonal tension reinforcement	1.7
Allowable bond stress (only for deformed reinforcement	1.6
Allowable bearing stress	8.0

NOTE:

(1) Unit in N/mm^2

(2) The specified concrete strength shall be 90% of 4-week compressive strength.

(3) The allowable shearing stress of the member without diagonal tension reinforcement shall be applied with the load combination factor of 1.0, regardless the provisions of the second sentence of Paragraph 3 of ARTICLE 2 refered in Paragraph 2 of ARTICLE 3.

(4) The allowable shearing stress of the member with diagonal tension reinforcement, where taking torsional effect into account, shall be 1.3 times of the value provided in this TABLE 7.

(5) The allowable bearing stress, where applied with local loading, shall be calculated by the following formula. In this case, ifσ_{ca1} exceeds the specified concrete strength, σ_{ca1} shall be equal to the specified concrete strength;

$$\sigma_{ca1} = \sigma_{ca2}\sqrt{\frac{A}{A'}}$$

Whereσ_{ca1}, σ_{ca2}, A and A' are as follows;

σ_{ca1}: Allowable bearing stress in case of local loading (N/mm^2)

σ_{ca2}: Allowable bearing stress (N/mm^2)

A: Distributed area of bearing pressure (mm^2)

A': Bearing area (mm^2)

TABLE 8: Allowable stress for steel pile and H-shaped steel pile (relating to ARTICLE 3)

Kind of Steel Pile / Kind of Stress	Steel Pipe Pile		Steel H Pile	
	SKK400	SKK490	SHK400 SHK400M	SHK490M
Allowable tensile stress	150	200	150	200
Allowable compressive stress	When R/t is less than 50, 150 When R/t is greater than 50, 150 - 5.0(R/t - 50)	When R/t is less than 40, 200 When R/t is greater than 40, 200 - 5.0(R/t -40)	150	200
Allowable shearing stress	85	115	85	115

NOTE:

(1) Unit in N/mm^2

(2) Kind of steel pile is in accordance with JIS “Steel Pipe Piles” and “Steel H Piles”

(3) R and t are as follows;

R: Radius of steel pipe (unit:mm)

t: Plate thickness of steel pipe (unit:mm)

TABLE 9: Allowable stress for precast concrete pile (relating to ARTICLE 3)

Kind of Pile	Kind of Stress		Allowable Stress
RC pile	Allowable compressive stress for concrete		13.5
	Allowable tensile stress for reinforcement	SR235	140
		SD295	180
PHC pile	Allowable compressive stress for concrete		21.0
	Allowable tensile stress for reinforcement		0
	Allowable tensile stress for PC steel(steel for prestressed concrete)		Whichever smaller of 0.6 times of tensile strength of PC steel and 0.75 times of yield stress,

NOTE;

(1) Unit in N/mm^2

(2) The specified concrete strength for RC pile shall be 40 N/mm^2 and that for PHC pile shall be 80 N/mm^2.

(3) The kind of pile is in accordance with JIS “Centrifugal Reinforced Concrete Piles” and “Pretensioned Spun High Strength Concrete Piles”.

TABLE 10: Allowable stress for structural steel (relating to ARTICLE 4)

Kind of Steel / Kind of Stress	SS400 SM400 SMA400	SM490	SM490Y SM520 SMA490	SM570 SMA570
Allowable axial tensile stress, Allowable bending tensile stress, Allowable axial compressive stress and Allowable bending compressive stress	150	200	220	260
Allowable shearing stress	85	115	125	150
Allowable bearing stress	210	280	310	390

NOTE:

(1) Unit in N/mm^2

(2) Kind of steel is in accordance with JIS "Rolled Steels for General Structure", "Rolled Steels for Welded Structure" and "Hot-rolled Atmospheric Corrosion Resisting Steels for Welded Structure".

TABLE 11: Allowable stress for weld of structural steel (relating to ARTICLE 4)

Kind of Stress \ Kind of Steel		SS400 SM400 SMA400	SM490	SM490Y SM520 SMA490	SM570 SMA570
Groove weld	Allowable tensile stress and Allowable compressive stress	150	200	220	260
	Allowable shearing stress	85	115	125	150
Fillet weld	Allowable tensile stress and Allowable compressive stress along bead	150	200	220	260
	Allowable tensile stress, Allowable compressive stress and Allowable shearing stress of throat	85	115	125	150

NOTE:

(1) Unit in N/mm^2

(2) Kind of steel is in accordance with JIS "Rolled Steels for General Structure", "Rolled Steels for Welded Structure" and "Hot-rolled Atmospheric Corrosion Resisting Steels for Welded Structure".

(3) Allowable stress for field welding (except allowable stress and allowable compressive stress along bead) shall be 0.9 times of the value provided in this TABLE 11.

(4) When welding the steels of different strength, the allowable stress shall be the lower value of the steels.

TABLE 12: Allowable stress for bolt (relating to ARTICLE 4)

Kind of Bolt / Kind of	High Strength Bolt for Friction Grip Joint		Ordinary Bolt
	F8T	F10T	4.6
Allowable shearing stress	110	135	90
Allowable bearing stress			190

NOTE:

(1) Unit in N/mm^2

(2) Kind of bolt is in accordance with JIS “Sets of High Strength Hexagon Bolts, Hexagon Nuts and Plain Washers for Friction Grip Joints” and “Hexagon Head Bolts and Hexagon Head Screws”.

TABLE 13: Allowable stress for pin (relating to ARTICLE 4)

Kind of Steel / Kind of Allowable Stress		SS400	S30CN	S35CN
Allowable bending stress		200	230	260
Allowable shearing stress		105	120	140
Allowable bearing stress	Without	210	250	280
	Without	105	125	140

NOTE:

(1) Unit in N/mm^2.

(2) Kind of steel is in accordance with JIS “Rolled Steels for General Structure” and “Carbon Steels for Machine Structure Use”.

TABLE 14: Allowable stress for steel bridge-support and cast iron bridge-support (relating to ARTICLE 4)

<table>
<tr><th colspan="2">Kind of Steel or Cast Iron / Kind of Stress</th><th>SC450
SCW410</th><th>SC480</th><th>SCW480
SCMn1A
S30CN</th><th>SCMn2A
S35CN</th><th>FC250</th></tr>
<tr><td colspan="2">Allowable bending tensile stress</td><td>130</td><td>140</td><td>160</td><td>180</td><td>60</td></tr>
<tr><td colspan="2">Allowable bending compressive stress</td><td>140</td><td>150</td><td>170</td><td>190</td><td>120</td></tr>
<tr><td colspan="2">Allowable shearing stress</td><td>80</td><td>90</td><td>100</td><td>110</td><td>45</td></tr>
<tr><td rowspan="3">Allowable bearing stress</td><td>Line bearing</td><td colspan="4">Corresponding to allowable force obtained by the formula;
$P_a = K_1 \left(\frac{r_1 r_2}{r_1 - r_2} \right)$</td><td rowspan="3"></td></tr>
<tr><td>Roller bearing</td><td colspan="4">Corresponding to allowable force obtained by the formula;
$P_b = 0.8 K_1 r_2$</td></tr>
<tr><td>Spherical bearing</td><td colspan="4">Corresponding to allowable force obtained by the formula;
$R_a = K_2 \left(\frac{r_1 r_2}{r_1 - r_2} \right)^2$</td></tr>
</table>

NOTE:

(1) Unit in N/mm^2.

(2) Kind of steel or cast iron is in accordance with JIS "Carbon Steel Castings", "Steel Castings for Welded Structure", "High Tensile Carbon Steels and Low-alloyed Steel Castings for Structure Use", "Carbon Steels for Machine Structure Use" and "Grey Iron Castings".

(3) P_a, P_b, R_a, K_1, K_2, r_1 and r_2 are as follows;

P_a: Allowable force per unit length of contact line of line bearing (N/mm),

P_b: Allowable force per unit length of contact line of roller bearing (N/mm),

R_a: Allowable force of spherical bearing (N) and

K_1 and K_2: as shown in the following table.

Combination of material / Value (N/mm^2)	SS400 against SC450 or SCW410	SM490 or S30CN against SC480, SCW480 or SCMn1A	S35CN against SCMn2A
K_1	10	13	15
K_2	0.08	0.13	0.16

r_1 and r_2: as shown in the following figures (unit:mm)

Line Bearing   Roller Bearing   Spherical Bearing

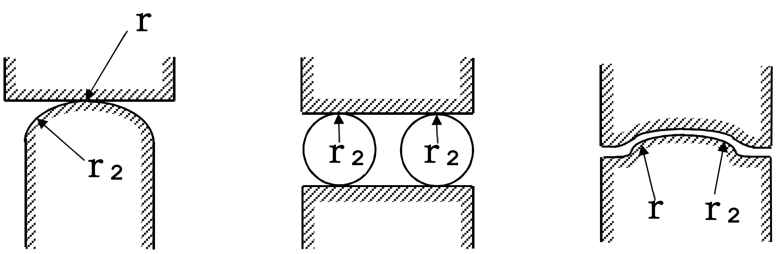


TABLE 15: Load combination and factor (relating to ARTICLE 4)

Load Combination	Factor
Dead load, design train load, impact, centrifugal load, longitudinal load of long rail and effect of temperature variation	1.15
Dead load, design train load, impact, centrifugal load, longitudinal load of long rail and horizontal load of train	1.25
Dead load, design train load, impact, centrifugal load, longitudinal load of long rail and braking or traction load	1.25 (1.35 for more than two railroad tracks)
Dead load, design train load, impact, centrifugal load, longitudinal load of long rail and wind load	1.25
Dead load, design train load, impact, centrifugal load, longitudinal load of long rail, horizontal load of train and wind load	1.35
Dead load, design train load, impact, centrifugal load, longitudinal load of long rail, wind load and braking or traction load	1.35 (1.45 for more than two railroad tracks)
Horizontal load of train and wind load	1.25
Wind load and braking or traction load	1.25 (1.35 for more than two railroad tracks)
Dead load, design train load, impact, centrifugal load, longitudinal load of long rail and collision load	1.6 (1.70 for using SM570 or SMA570)
Erection load	1.25

NOTE:

SM570 and SMA570 are in accordance with JIS “Rolled Steels for Welded Structure” and “Hot-rolled Atmospheric Corrosion Resisting Steels for Welded Structure”.

TABLE 16: Allowable stress for ordinary concrete used for prestressed concrete (relating to ARTICLE 5)

Kind of Stress	Applicable Range		30	40	50	60	80
Allowable bending compressive stress	Just after prestressing	Rectangular section	15.0	19.0	21.0	23.0	26.0
		T- and box-section	14.0	18.0	20.0	22.0	25.0
	Acting design load	Rectangular section	12.0	15.0	17.0	19.0	22.0
		T- and box-section	11.0	14.0	16.0	18.0	21.0
Allowable axial compressive stress	Just after prestressing		12.0	14.5	16.0	17.0	18.0
	Acting design load		9.0	12.0	13.5	15.0	16.5
Allowable bending tensile stress	Just after prestressing		1.2	1.5	1.8	2.1	2.4
	Acting all dead loads		0	0	0	0	0
	Acting design load		0.8	1.0	1.2	1.2	1.2
Allowable diagonal tensile stress	Acting design load	Stress due to shearing force or torsional moment	1.1	1.3	1.5	1.5	1.5
		Stress due to shearing force and torsional moment	1.4	1.7	2.0	2.0	2.0
Allowable bond stress	Steel bar		0.9	1.0	1.1	1.1	1.1
	Deformed reinforcement		1.8	2.0	2.2	2.2	2.2
Allowable bearing stress			10.0	13.0	17.0	20.0	27.0

(Header: Specified Concrete Strength spans the Kind of Stress and Applicable Range columns above the strength values.)

NOTE:

(1) Unit in N/mm^2

(2) The allowable stress just after prestressing and the allowable diagonal tensile stress shall be applied with factor of 1.0 for load combination, regardless the provisions of the second sentence of Paragraph 2 of ARTICLE 5.

(3) The allowable bearing stress, where applied with local loading, shall be calculated by the following formula. In this case, ifσ_{ca} exceeds σ_{ck} , σ_{ca} shall be equal toσ_{ck} ;

$$\sigma_{ca} = \frac{\sigma_{ck}}{3}\sqrt{\frac{A}{A'}}$$

Whereσ_{ca}, σ_{ck}, A and A' are as follows;

σ_{ca}: Allowable bearing stress (N/mm^2)

σ_{ck}: Specified concrete strength (N/mm^2)

A: Distributed area of bearing pressure (mm^2)

A': Bearing area (mm^2)

(4) The allowable stress to the intermediate value of the specified concrete strength in this TABLE 16 shall be obtained by linear interpolation.

TABLE 17: Allowable stress for lightweight aggregate concrete used for prestressed concrete (relating to ARTICLE 5)

Kind of Stress	Applicable Range		30	40	50	60	80
Allowable bending compressive stress	Just after prestressing	Rectangular section	15.0	19.0	21.0	23.0	26.0
		T- and box-section	14.0	18.0	20.0	22.0	25.0
	Acting design load	Rectangular section	12.0	15.0	17.0	19.0	22.0
		T- and box-section	11.0	14.0	16.0	18.0	21.0
Allowable axial compressive stress	Just after prestressing		12.0	14.5	16.0	17.0	18.0
	Acting design load		9.0	12.0	13.5	15.0	16.5
Allowable bending tensile stress	Just after prestressing		0.8	1.1	1.3	1.5	1.7
	Acting all dead loads		0	0	0	0	0
	Acting design load		0.6	0.7	0.8	0.8	0.8
Allowable diagonal tensile stress	Acting design load	Stress due to shearing force or torsional moment	0.8	0.9	1.1	1.1	1.1
		Stress due to shearing force and torsional moment	1.0	1.2	1.4	1.4	1.4
Allowable bond stress	Steel bar		0.65	0.7	0.7	0.7	0.7
	Deformed reinforcement		1.3	1.4	1.4	1.4	1.4
Allowable bearing stress			7.5	10.0	12.5	15.0	20.0

(Header: Specified Concrete Strength)

NOTE:

(1) Unit in N/mm^2.

(2) The allowable stress just after prestressing and the allowable diagonal tensile stress shall be applied with factor of 1.0 for load combination, regardless the provisions of the second sentence of Paragraph 2 of ARTICLE 5.

(3) The allowable bearing stress, where applied with local loading, shall be calculated by the following formula. In this case, if σ_{ca} exceeds $0.8\sigma_{ck}$, σ_{ca} shall be equal to $0.8\sigma_{ck}$;

$$\sigma_{ca} = \frac{\sigma_{ck}}{4}\sqrt{\frac{A}{A'}}$$

Where σ_{ca}, σ_{ck}, A and A' are as follows;

σ_{ca}: Allowable bearing stress (N/mm^2)

σ_{ck}: Specified concrete strength (N/mm^2)

A: Distributed area of bearing pressure (mm^2)

A': Bearing area (mm^2)

(4) The allowable stress to the intermediate value of the specified concrete strength in this TABLE 17 shall be obtained by linear interpolation.

TABLE 18: Allowable stress for PC steel (steel material for prestressing concrete)
(relating to ARTICLE 5)

Kind of Stress	Applicable Range	Allowable Stress
Allowable tensile stress	Under prestressing	0.8 times of tensile strength or 0.9 times of yield stress of PC steel, whichever smaller
	Just after prestressing	0.7 times of tensile strength or 0.85 times of yield stress of PC steel, whichever smaller
	Acting design load	0.6 times of tensile strength or 0.75 times of yield stress of PC steel, whichever smaller

TABLE 19: Load combination and factor (relating to ARTICLE 5)

Load combination \ Specified concrete strength \ Factor, etc.	Factor	Allowable bending tensile stress		
		30	40	50 and over
Dead load, design train load, impact, centrifugal load, prestressing force, effect of creep, drying shrinkage and crowd load*	1.0	0.8	1.0	1.2
Dead load, design train load, impact, centrifugal load, prestressing force, effect of creep, drying shrinkage and crowd load*, and one secondary load	1.15	1.3	1.5	1.7
Dead load, design train load, impact, centrifugal load, prestressing force, effect of creep, drying shrinkage and crowd load*, and two secondary loads	1.25	1.7	2.0	2.3

Dead load, design train load, impact, centrifugal load, prestressing force, effect of creep, drying shrinkage and crowd load*, and three secondary loads	1.5	2.2	2.5	2.8

NOTE:

(1) Unit in N/mm^2.

(2) The load marked with * shall be combined only for designing bridge side walk.

(3) The secondary loads shall include effect of temperature variation, wind load, snow load, horizontal load of train, braking load, traction load, effect of support sinkage, crowd load (to be treated as main load when designing bridge side walk) or longitudinal load of long rail.

(4) The allowable stress for PC steel shall not exceed 90% of yield stress.

TABLE 20: Allowable stress for steel pipe pile (relating to ARTICLE 6)

Kind of Steel / Kind of Stress	STK490 SM490 SCW490-CF	SC480	SCW480	SS400
Allowable tensile stress	215	155	175	160
Allowable bending compressive stress	215	165	185	160
Allowable axle compressive stress	215			

NOTE:

(1) Unit in N/mm^2.

(2) The kind of steel is in accordance with JIS "Carbon Steel Tubes for General Structure Purpose", "Rolled Steels for Welded Structure", "Centrifugal Steel Casting Pipes for Welded Structure", " Carbon Steel Castings", " Steel Castings for Welded Structure" and "Rolled Steels for General Structure".

TABLE 21: Load combination and factor (relating to ARTICLE 6)

Load combination	Factor
Load on the ground, overburden, earth pressure, water pressure, self-weight and internal load of tunnel	1.00

Load on the ground, overburden, earth pressure, water pressure, self-weight and internal load of tunnel, and effect of temperature variation and drying shrinkage	1.15

TABLE 22: Allowable stress for steel material (relating to ARTICLE 7)

Kind of Steel / Kind of Stress	SS400 SM400	SM490	SM490Y
Allowable axle tensile stress, Allowable bending tensile stress, Allowable axle compressive stress and Allowable bending compressive stress	160	215	240
Allowable shearing stress	90	125	140

NOTE:

(1) Unit in N/mm^2.

(2) The kind of steel is in accordance with JIS "Rolled Steels for General Structure" and "Rolled Steels for Welded Structure".

(3) The allowable stress for field welding shall be 0.9 times of the value in this TABLE 22.

(4) When welding the different kind of steel, the lower value of the allowable stresses shall be adopted.

TABLE 23: Allowable stress for carbon steel casting and spheroidal graphite cast iron (relating to ARTICLE 7)

Kind of Steel and Casting / Kind of Stress	SC450	FCD450	FCD500
Allowable bending tensile stress	145	150	160
Allowable bending compressive stress	155	180	190
Allowable shearing stress	90	110	120

NOTE:

(1) Unit in N/mm^2.

(2) The kind of steel and casting is in accordance with "Carbon Steel Castings" and "Spherical graphite iron castings".

TABLE 24: Allowable stress for bolt (relating to ARTICLE 7)

Kind of Bolt / Kind of Stress	4.6	8.8	10.9	12.9
Allowable tensile stress	120	240	300	330
Allowable shearing stress	80	150	190	210

NOTE:

(1) Unit in N/mm^2.

(2) The kind of bolt is in accordance with JIS "Hexagon Head Bolts and Hexagon Head Screws".

TABLE 25: Allowable deflection (relating to ARTICLE 9)

Kind of Bridge		Allowable Deflection
Steel truss bridge		one 1,000th of span
Other bridges	Span length of more than 50m	one 800th of span
	Span length of more than 50m	one 700th of span

TABLE 26: Dead load (relating to ARTICLE 10)

Kind of Material	Weight
Steel or casting	77
Cast iron	71
Reinforced concrete	24.5
Concrete	23
Lightweight aggregate concrete	More than 14.5 and less than 16.5
Mortar cement	21

Asphalt for waterproofing	11
Gravel or crushed stone for roadbed	19

NOTE:

(1) Unit in N/mm^3.

TABLE 27: Crowd load (relating to ARTICLE 10)

<table>
<tr><th colspan="2" rowspan="2">Kind of Structure</th><th colspan="2">Crowd load</th></tr>
<tr><th>Normal</th><th>Earthquake</th></tr>
<tr><td rowspan="2">Slab</td><td>Overbridge (only for high crowd density),
Middle-level slab of the viaduct in way of station,
Cantilever slab (only for ballast bed),
Bridge side walk (only for ballast bed), and
similar structure</td><td>5.0</td><td></td></tr>
<tr><td>Platform (except for high crowd density),
Cantilever slab (except for ballast bed),
Bridge side walk (except for ballast bed) and
similar structure</td><td>3.0</td><td></td></tr>
<tr><td rowspan="3">Beam and Pillar</td><td>Overbridge, platform (only for high crowd density)</td><td>3.5</td><td>1.5</td></tr>
<tr><td>Middle-level beam of the viaduct in way of station and similar structure</td><td>3.5</td><td>2.1</td></tr>
<tr><td>Platform (except for high crowd density)</td><td>2.0</td><td>1.0</td></tr>
</table>

NOTE:

(1) Unit in kN/mm^2.

Sheet 7

The required exhaust capacity, etc., of a smoke exhaust system for an underground station shall be determined on the basis of the following confirmation procedures, etc.

I. Smoke control for platform floor and concourse floor

1. Fire assumptions and methods for checking evacuation safety

The fire assumptions for rolling stock and at station shall be classified into two categories: ordinary fire and major fire.

The checking of evacuation safety shall be based on passengers being able to safely escape to the evacuation area (ultimately to ground level), which is checked by the following procedure that corresponds to the characteristics of the fire and the nature of smoke flow

TABLE-1 Fire Assumptions

Fire	Type	Fire Source
Ordinary Fire	Train	From underfloor equipment on rolling stock
	Kiosk	Arson using lighter, etc.
Major Fire	Train	Arson using gasoline
	Kiosk	Arson using gasoline

(1) In case of an ordinary fire, checking shall be based on smoke density (fading coefficient) at the platform level: Cs, or smoke diffusion volume at the concourse level: V.

(2) In case of a major fire, checking shall be based on the time required for smoke to descend to the height where it will impede evacuation.

Then, the allowable values for checking shall be as follows;

(i) In case of an ordinary fire at platform level, smoke density Cs shall be less than 0.1 (1/m),

(ii) In case of an ordinary fire at platform level, smoke diffusion volume shall be greater than the value derived from the evacuation time, and

(iii) In case of a major fire, the bottom of the obstructive smoke layer shall be 2.0 (m) higher than the floor.

2. Calculation of evacuation time

Dwell time, for the purpose of calculating the evacuation time, shall be calculated by the following formula.

$T=Q / (N \times B)$

T: Dwell time (unit:sec)

Q: Number of evacuees (unit:person)

N: Crowd flow rate (unit:person/m/sec)

B: Breadth of stairway, etc. (unit:m)

The evacuees' walking speed and flow rate, for the purpose of calculating the elapsed walking time (t) and dwell time (T) on the evacuation route shall be as follows;

Walking speed: 1.0 (m/sec) for horizontal sections and 0.5 (m/sec) for stairways, and

Flow rate: 1.5 (person/m/sec) for horizontal sections and 1.3 (person/m/sec) for stairways

3. Calculation method of number of evacuees

The number of evacuees to check the evacuation safety shall be as follows corresponding to the fire assumption categories

When the assumed fire is in the concourse, the number of evacuees of the station without kiosks in the concourse shall be 0 (zero).

(1) Stations located in the three major metropolitan areas (of Japan)

(i) Stations having island platforms

Possible Fire		Passenger Load Factor (%)			Total Passenger Load Factor (%)	
		Train	Waiting Passenger		Without Starting Train	With Starting Train
			Without Starting Train	With Starting Train		
Rolling Stock	Ordinary	200	—	—	200	200
	Major	200	75 (150)	125 (200)	275 (350)	325 (400)
Platform Kiosk	Ordinary	200	75 (150)	125 (200)	275 (350)	325 (400)
	Major	200	75	125	275 (350)	325 (400)

			(150)	(200)		
Concourse	Ordinary	—	75 (150)	125 (200)	75 (150)	125 (200)
	Major	—	75 (150)	125 (200)	75 (150)	125 (200)

(ii) Station having opposing platforms and single platforms

Possible Fire		Passenger Load Factor (%)			Total Passenger Load Factor (%)	
		Train	Waiting Passenger		Without Starting Train	With Starting Train
			Without Starting Train	With Starting Train		
Rolling Stock	Ordinary	200	—	—	200	200
	Major	200	50 (100)	100 (150)	250 (300)	300 (350)
Platform Kiosk	Ordinary	200	50 (100)	100 (150)	250 (300)	300 (350)
	Major	200	50 (100)	100 (150)	250 (300)	300 (350)
Concourse	Ordinary	—	50 (100)	100 (150)	50 (100)	100 (150)
	Major	—	50 (100)	100 (150)	50 (100)	100 (150)

(2) The stations located outside of the three major metropolitan areas (in Japan)

(i) Stations having island platforms

Possible Fire	Passenger Load Factor (%)			Total Passenger Load Factor (%)	
	Train	Waiting Passenger		Without Starting Train	With Starting Train
		Without Starting Train	With Starting Train		

Rolling Stock	Ordinary	150	—	—	150	150
	Major	150	60 (115)	95 (150)	210（265）	245（300）
Platform Kiosk	Ordinary	150	60 (115)	95 (150)	210（265）	245（300）
	Major	150	60 (115)	95 (150)	210（265）	245（300）
Concourse	Ordinary	—	60 (115)	95 (150)	60（115）	95（150）
	Major	—	60 (115)	95 (150)	60（115）	95（150）

(ii) Station having opposing platforms and single platform

Possible Fire		Passenger Load Factor (%)			Total Passenger Load Factor (%)	
		Train	Waiting Passenger		Without Starting Train	With Starting Train
			Without Starting Train	With Starting Train		
Rolling Stock	Ordinary	150	—	—	150	150
	Major	150	40 (75)	75 (115)	190（225）	225（265）
Platform Kiosk	Ordinary	150	40 (75)	75 (115)	190（225）	225（265）
	Major	150	40 (75)	75 (115)	190（225）	225（265）
Concourse	Ordinary	—	40 (75)	75 (115)	40（75）	75（115）
	Major	—	40 (75)	75 (115)	40（75）	75（115）

(NOTE)

1. The figures in ( ) of the tables are the set values for the terminal stations.
2. Terminal station means a station in which number of passengers per day is more than 100, 000 in average.

3. Three major metropolitan areas include;

The existing urban area (the special wards, Musashino-city and Mitaka-city in Tokyo; Yokohama-city and Kawasaki-city in Kanagawa Prefecture; and Kawaguchi-city in Saitama Prefecture) according to Article 2 of Metropolitan Area Readjustment Act (Act No. 83 of 1956),

The existing urban area (Kyoto-city in Kyoto Prefecture; Osaka-city, Moriguchi-city, Fuse-city, Higashiosaka-city and Sakai-city in Osaka Prefecture; and Kobe-city, Amagasaki-city, Nishinomiya-city and Ashiya-city in Hyogo Prefecture) according to Article 2 of Kinki Area Adjustment Act (Act No. 129 of 1963), and

The area (Nagoya-city in Aichi Prefecture) defined in the annex table of the Enforcement Ordinance to Act on State's Special Financial Measures on Arrangement of Suburban Development and Redevelopment Areas, etc., in Tokyo Metropolitan Area, Kinki Area and Chubu Area, and the urban area according to Article 2 of Chubu Area Development and Improvement Act (Act No. 102 of 1966).

4. Checking procedure for ordinary fire

4.1. Checking of smoke density of the platform level

Smoke density (Cs) at the evacuation time (t) shall be calculated using the following formulas that correspond to the fire assumptions and the evacuation time, with calculating the fire block volume at the platform level, which is then rounded off to two decimal places. It shall be confirmed that the calculated smoke density (Cs) does not exceed the allowable value of 0.1 (1/m),

(1) Rolling stock fire

(i) Where the evacuation time is less than 7 minutes,

$$Cs=21 \cdot (1-e^{-Ve \cdot t / V}) / Ve$$

(ii) Where the evacuation time is more than 7 minutes,

$$Cs=(66 \cdot V \cdot e^{-Ve \cdot (t-7) / V} - 21 \cdot Ve \cdot e^{-Ve \cdot t / V}+66 \cdot Ve \cdot t - 441 \cdot Ve - 66V) / Ve^2$$

(2) Kiosk fire

(i) Where the evacuation time is less than 10 minutes,

$$Cs=2.1 \cdot (Ve \cdot t - V + V \cdot e^{-Ve \cdot t / V}) / Ve^2$$

(ii) Where the evacuation time is more than 10 minutes and less than 11 minutes,

$$Cs=\{(24 \cdot V - 21 \cdot Ve) \cdot e^{-Ve \cdot (t-10) / V} + 24 \cdot Ve \cdot t - 198 \cdot Ve - 26.1 \cdot V$$

$+ 2.1 \cdot V \cdot e^{-10 \cdot Ve / V}\} / Ve^2$

(iii) Where the evacuation time is more than 11 minutes,

$Cs=\{(1.8 \cdot V - 45 \cdot Ve) \cdot e^{-Ve \cdot (t - 11) / V} + 1.8 \cdot Ve \cdot t + 91.2 \cdot Ve - 27.9 \cdot V$
$+ 2.1 \cdot V \cdot e^{-10 \cdot Ve / V} + (24 \cdot V - 21 \cdot Ve) \cdot e^{-Ve / V}\} / Ve^2$

Cs: Smoke density (1/m)

V: Fire block volume (m^3)

t: Evacuation time (min.)

Ve: Exhaust rate of the smoke exhaust system per fire block volume (m^3/min.)

Where there is no kiosk on the platform floor, t = 0 (Cs = 0).

(3) Fire block volume

The fire block volume means a certain space where smoke density is estimated to be the highest level within the platform space filled with smoke at the time of train fire.

The fire block volume shall be determined taking the following conditions into account.

a. The section right angled to the railway shall be per the figures below and that of different type stations shall be determined in similar way.

b. The sectional area filled with smoke shall be of hatched part as shown in the figures with reduction of the sectional area of train.

c. The longitudinal length shall be 20 m.

d. The fire block volume shall be calculated by the following formulas;

$V = (A_0 - A_V) \times 20$

$A_0 = (V_a - V_m) / L$

V: Fire block volume (m^3)

A_0: Sectional area right angled to the railway (m^2)

A_V: Sectional area of the train (including under floor) (m^2)

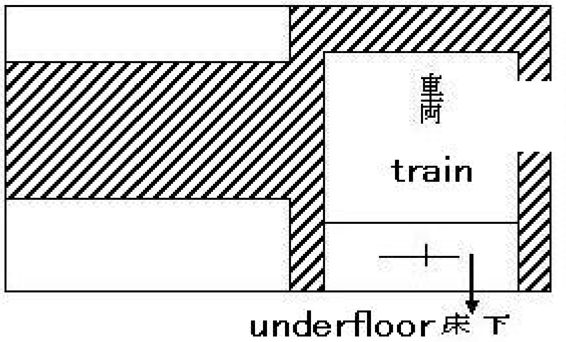
V_a: Total volume calculated by the setting fire block section and the effective length of platform (m^3)

V_m: Volume of the parts not filled with smoke within V_a, such as pillars, stairways, etc. (m^3)

L: Effective length of the platform

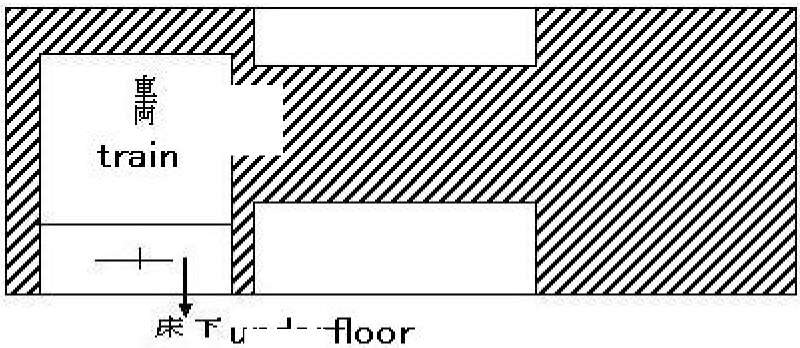
Figures: Sectional area right angled to the railway for setting up the fire block

(A) Platform with single track



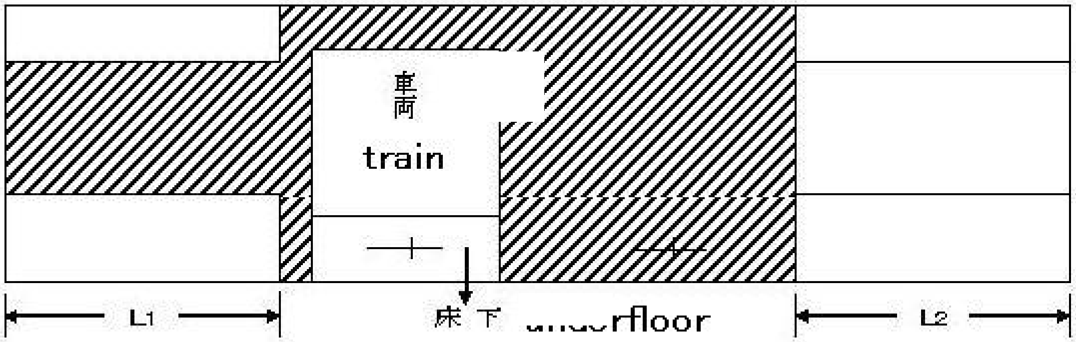
(CONCEPT) Smoke is assumed to spread all over the sectional area.

(B) Island platform with double track



(CONCEPT) Smoke is assumed to spread over the adjacent platform and the opposite track due to the up-draft caused by heating.

(C) Opposing platforms with double track



(CONCEPT) Smoke does not spread over the platform on the opposite side of the burning train, because the platform ceiling is lower than that in way of the track, but smoke spreads over the adjacent platform. The two sectional areas shall be calculated with the burning train on either track, and whichever is smaller shall be adopted, (e.g. on the above figure (C), the hatched part shall be adopted when the breadth of platform L1 is equal to or smaller than L2.)

(NOTE) Smoke is assumed to spread within the hatched part.

(4) Minimum smoke exhaust rate

The platform story shall be equipped with the smoke exhaust system of not less than 5,000 m^3/h for the fire block volume.

4.2 Checking of the smoke diffusion volume required for the concourse (excluding the case of the concourse level being independently separated into two or more areas)

The required smoke diffusion volume (V_0) corresponding to evacuation time (t) shall be calculated by the following formulas and rounded off to one decimal place. Smoke diffusion volume (V) calculated separately shall not be less than the required smoke diffusion volume (V_0).

(i) Where evacuation time is less than 10 minutes:

$$V_0 = 10.5t^2$$

(ii) Where evacuation time is more than 10 minutes and less than 11 minutes:

$$V_0 = 120t^2 - 2190t + 10950$$

(iii) Where evacuation time exceeds 11 minutes:

$$V_0 = 9t^2 + 252t - 2481$$

V_0: Required smoke diffusion volume (m^3)

t: Evacuation time (min.)

In addition, the smoke diffusion volume (V) shall be calculated by the following formula;

$$V = V' + t \times V_e'$$

$$V' = (Af - At) \times (H - 2)$$

$V_e' = V_e \times (H - 2) / H$

V': Smoke diffusion volume without considering the exhaust rate of the smoke exhaust system (m^3)

Ve': Effective exhaust rate (unit:m^3/min.)

Af: Floor area of the concourse story (unit:m^2)

At: Floor area of the concourse story where smoke does not spread, such as pillars (unit:m^2)

H: Ceiling height of the concourse story (unit:m)

Ve: Exhaust rate of the smoke exhaust system of the concourse story (unit:m^3/min.)

5. Checking procedure for major fires

The elapsed time (t_0) for smoke, etc., to descend to the obstructive level of 2 m above the floor shall be calculated by the following formula, and shall be confirmed that the calculated elapsed time (t_0) is greater than the evacuation time (t) separately calculated.

(1) In case of train fire or kiosk fire on the platform story

$t_0 = V_E / (V_S - V_e')$

$V_E = (A_E - A_V') \times L$

$V_e' = V_e \times (A_E - A_V') / (A_0 - A_V)$

where (V_S - Ve') is 0 or negative, $t0 = \infty$,

V_E: Effective volume of whole platform story, 2.0 m above the platform top (m^3)

V_S: Smoke flow rate and generation rate, both are 300 (m^3/min.)

V_e': Effective smoke exhaust rate against the effective volume (V_E) of whole platform story (m^3/min.)

A_E: Sectional area of the platform story right angled to the railway, 2.0 m above the platform top excluding pillars, stairways, etc., where smoke does not spread (m^2)

A_V': Sectional area of train 2.0 m above the platform top (m^2)

V_e: Exhaust rate of smoke exhaust system of whole platform story (m^3/min.)

A_0: Sectional area right angled to the railway in calculation of fire block volume (m^2)

A_V: Sectional area of train (including under-floor area) (m^2)

(2) In case of concourse story fire (excluding the case of the concourse story being independently separated into two or more)

$t_0 = V' / (V_S - Ve')$

$V' = (Af - At) \times (H - 2)$

$V_e' = V_e \times (H - 2) / H$

where $(V_S - V_e')$ is 0 or negative, $t_0 = \infty$, and in case of the concourse story without kiosk, if t_0 is equal to or greater than 3, $t_0 = \infty$

V': Smoke diffusion volume without considering the exhaust rate of the smoke exhaust system (unit:m^3)

V_S: Generation rate of smoke, etc. = 300.0 (unit:m^3/min.)

V_e': Effective exhaust rate (unit:m^3/min.)

Af: Floor area of the concourse story (unit:m^2)

At: Area of pillars, etc., of the concourse story, where smoke does not spread (unit:m^2)

H: Ceiling height of the concourse story (unit:m)

V_e: Exhaust rate of the smoke exhaust system for the concourse story (unit:m^3/min.)

In the subway station having the ceiling of the platform story provided with blow-by and the same ceiling height as the concourse story, or similar conditions, where complicated smoke flow is foreseeable, “Two layer zone smoke transport prediction” may be applied for calculating t_0.

6. Countermeasures

The following countermeasures shall be applied if the capacity of the smoke exhaust system is not enough as a result of checking for Big Fire;

(1) To provide new evacuation route or to widen the route in order to shorten the evacuation time,

(2) To enlarge the smoke diffusion volume,

(3) To make kiosk, where fire may start, fire- and smoke-proofed and to install sprinkler type fire-extinguishing system,

(4) Not to install kiosk from which fire may start, and/or

(5) To install other arrangements to secure passengers’ evacuation safety.

If (1), (2), and/or (5) are applied, rechecking shall be carried out, and if (3) or (4) are applied, rechecking shall be carried out excluding kiosk.

II. Smoke control for living quarters

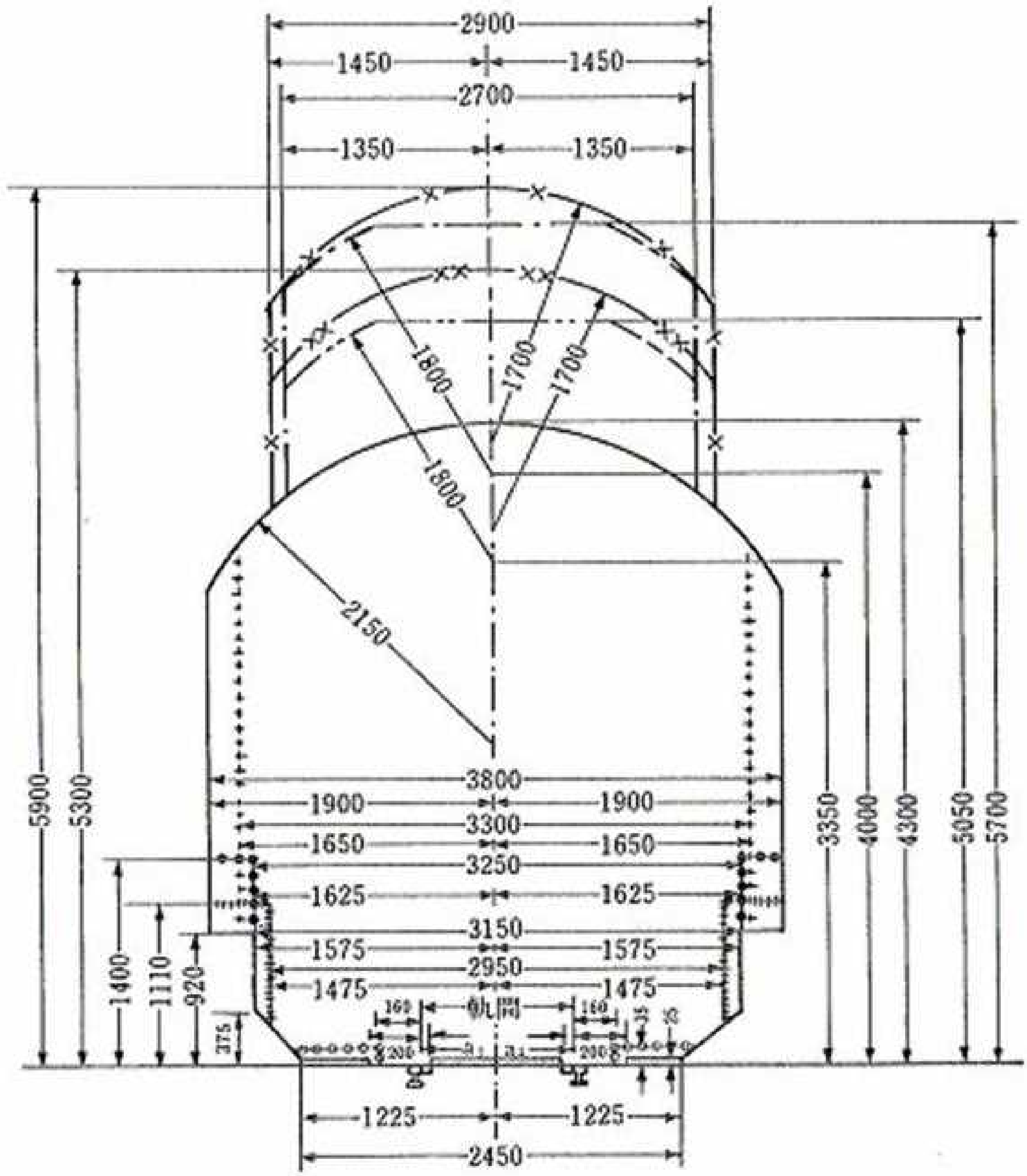
The living quarters shall be installed with smoke exhaust system.

The smoke exhaust system shall be automatically actuated when a smoke exhaust outlet is opened, and shall be capable of exhausting at the rate of more than 120 m^3/min. and more than 1 m^3/min. for 1 m^2 of smoke-proof compartment floor area (the system working for more than two (2) smoke-proof compartments, shall have the exhaust rate of more than 2 m^3/min. for 1 m^2 of the largest floor area among the relevant compartments).

As for other structures, Paragraph 3 of Article 126 of the enforcement ordinance to the Building Standard Law shall be conformed.

FIG. 1 STRUCTURE GAUGE (ORDINARY RAILWAY EXCLUDING SUPER EXPRESS RAILWAY) (RELATING TO ARTICLE 20)

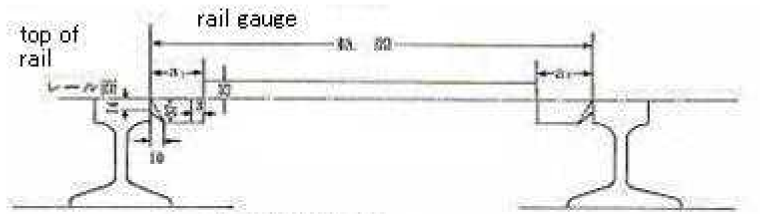
STRUCTURE GAUGE (unit in mm.)



————————	basic structure gauge.
—・—・—・—	structure gauge for the contact line, its tension devise and others excluding insulated stiffeners of the railway fed with direct current through the overhead contact line.
—・・—・・—	structure gauge for the contact line, its tension devise and others excluding insulated stiffeners of the railway fed with direct direct through the overhead contact line, if necessary in way of tunnel, bridge, overbridge, snowshed, platform-building and in their vicinity.
———x———	structure gauge for the contact line, its tension devise and others excluding insulated stiffeners of the railway fed with alternate current through the overhead contact line.
———xx———	structure gauge for the contact line, its tension devise and others excluding insulated stiffeners of the railway fed with alternate current through the overhead contact line, if necessary in way of tunnel, bridge, overbridge, snowshed, platform-building and in their vicinity.
—●●—	structure gauge for signal, indicator and sign device, as well as for special tunnel and bridge.
—○○—	structure gauge for run-over type turnout
++++++++	structure gauge for the fuel and water stations and the signal post on the main and side tracks, and for the turn table, the weighing station, the washing station, the entrance and inside facility of car shed, and the pillars of cargo handling shed on the side tracks, where only freight train is operated.

LOWER STRUCTURE GAUGE DETAIL (unit in mm.)

General case

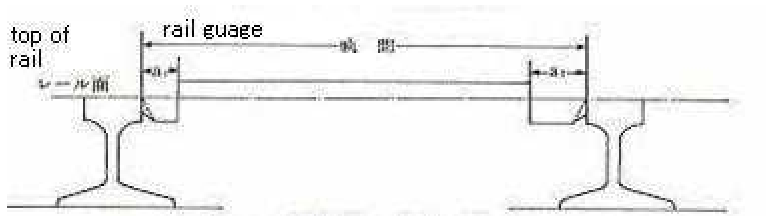


$a_1 = a_2 = 76 +$ (gauge widening)

a_1 or $a_2 = 100$ for tip of tongue rail

a_1 or $a_2 = 80$ for tip of movable rail

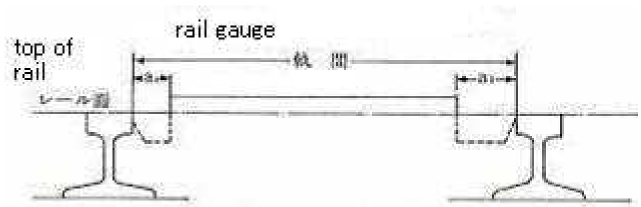
The railroad track with guardrail on one side



$a_1 = 38 +$ (gauge widening) for guardrail side

$a_2 = 76 +$ (gauge widening) for the other side

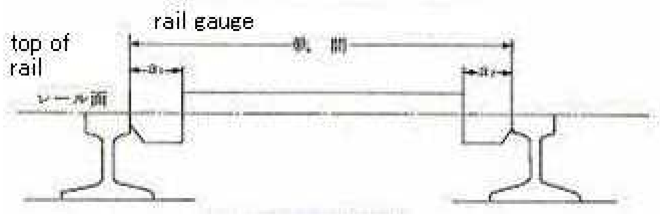
The railroad track with guardrail on both sides in way of switch and crossing



a_1 or $a_2 \geqq 38 +$ (gauge widening)

$a_1 + a_2 = 84 +$ (gauge widening)

The railroad track with guardrail in way of level crossing



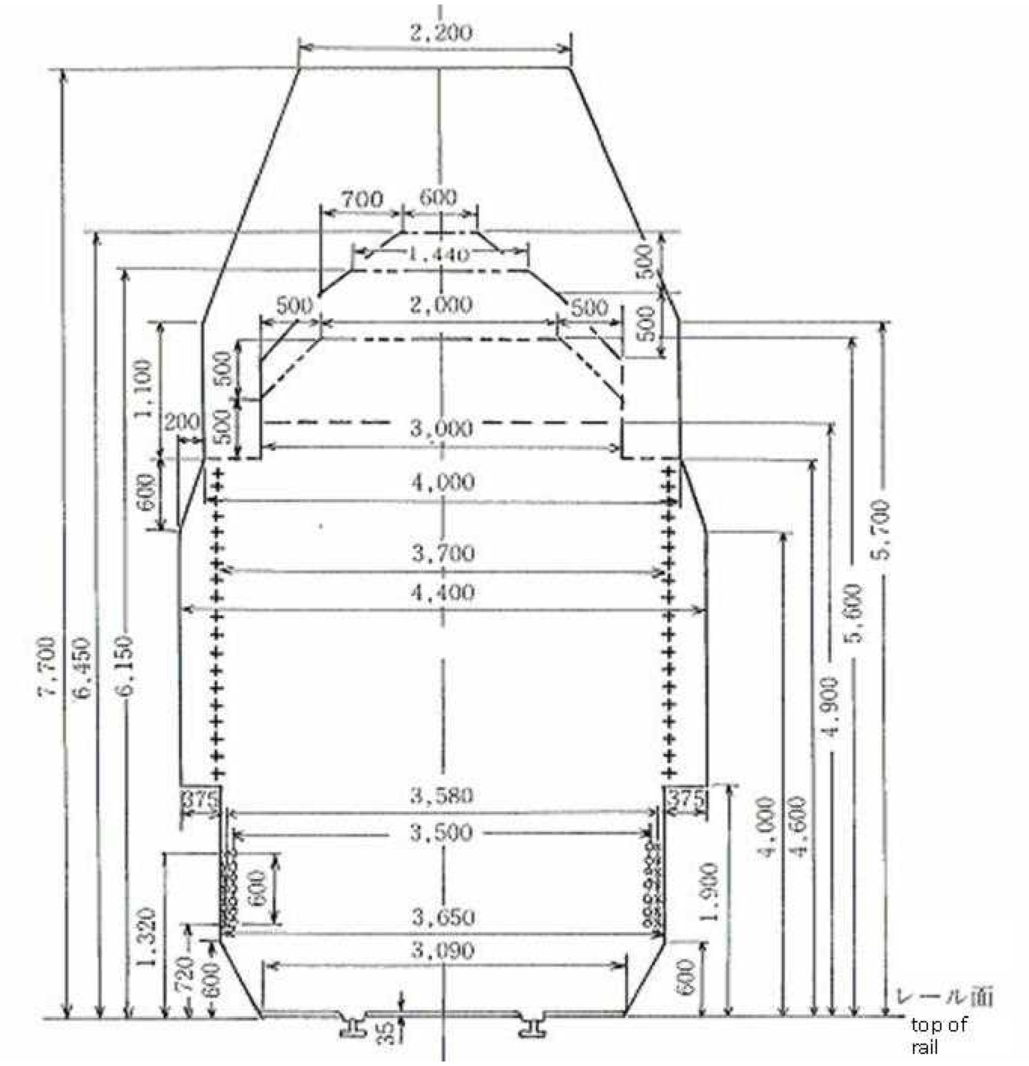
$a_1 = a_2 = 44 +$ (gauge widening)

———————— basic structure gauge.

----------------- structure gauge in way of switch and crossing

FIG. 2 STRUCTURE GAUGE (SUPER EXPRESS RAILWAY (EXCLUDING SUPERCONDUCTING MAGNETIC LEVITATION RAILWAYS)) (RELATING TO ARTICLE 20)

STRUCTURE GAUGE (unit in mm.)



———————— basic structure gauge.

—・—・—・— structure gauge for tunnel, bridge, overbridge, platform shed, fixed beam of overhead contact line, and others

—・・—・・— structure gauge for overbridge located at the center of messenger wire sagging.

—・・・—・・・ structure gauge for tunnel, bridge, overbridge platform-building and others in the operating section at speed less than 120km/h where applied with special overhead conductor system.

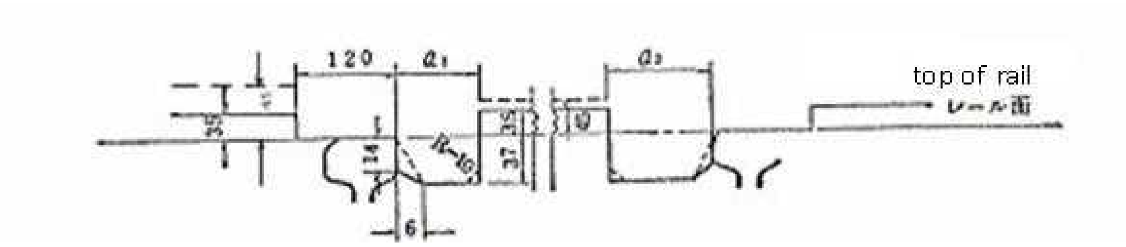
----------------- structure gauge without overhead contact line

o o o o structure gauge for platform (only for station of no train passing through), crew's boarding platform, car-washing platform and others.

x x x x structure gauge for platform (only for station of train passing through).

＋ ＋ ＋ ＋ structure gauge for facilities of train maintenance and inspection shop and signs in train depot.

LOWER STRUCTURE GAUGE DETAIL (unit in mm.)



———————— basic structure gauge.

----------------- structure gauge in way of turnout

1) a_1 or a_2 ＝ 75 ＋ (gauge widening)

for tip of tongue rail and movable rail

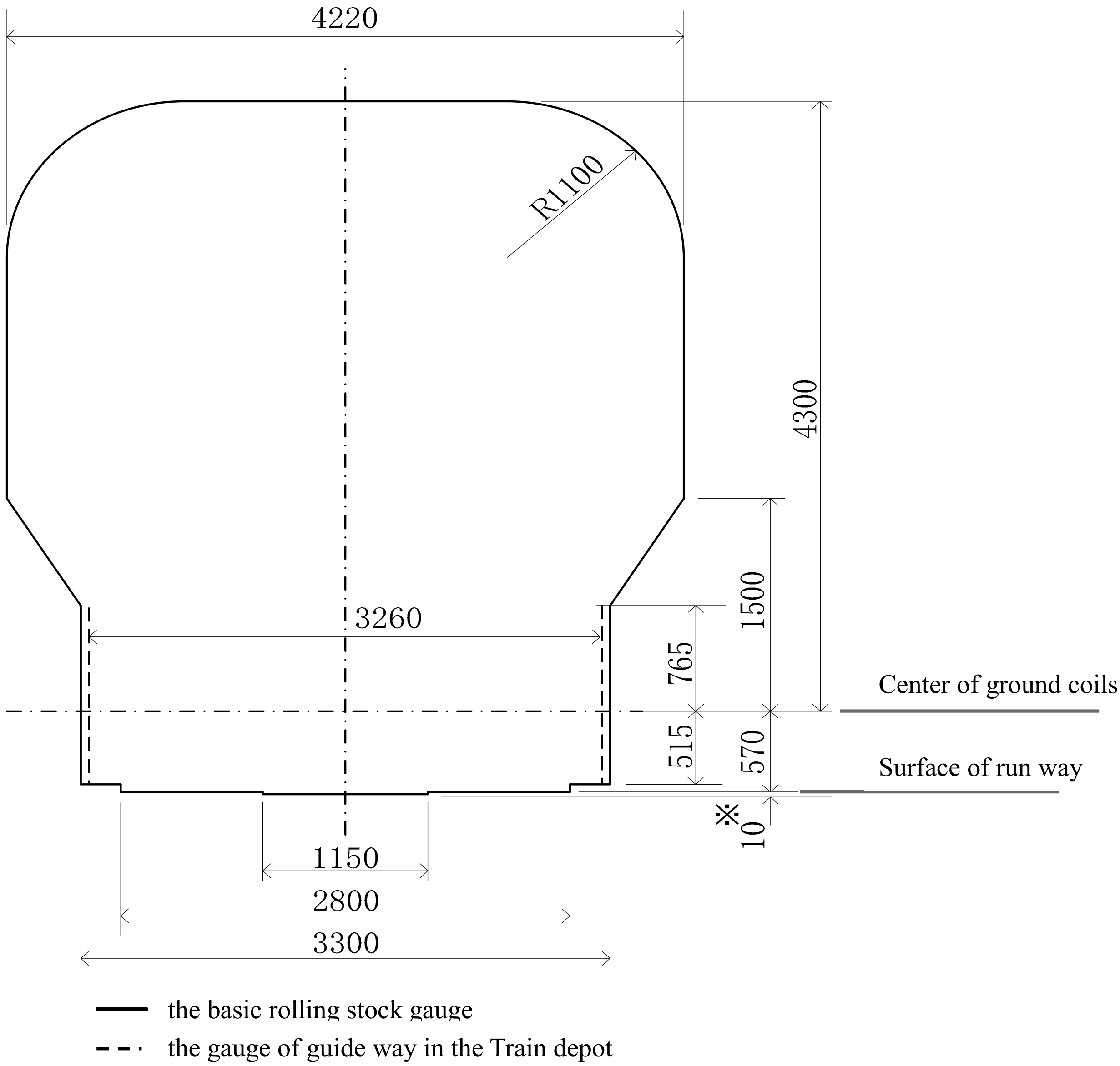
2) a_1 or a_2 ＝ 38 ＋ (gauge widening)

a_1 ＋ a_2 ＝ 83 ＋ (gauge widening)

for guardrail and wing rail

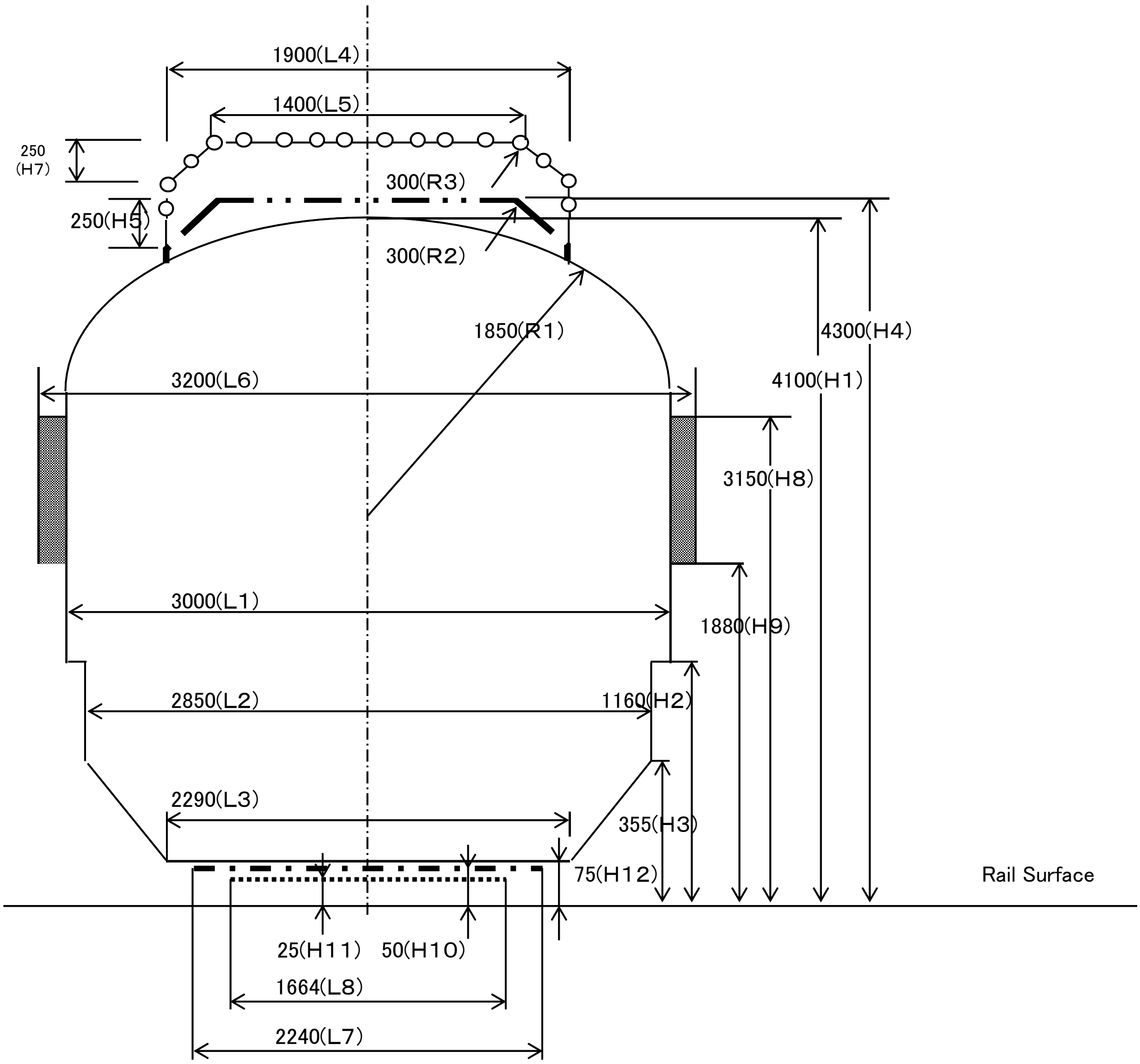
FIG. 3 STRUCTURE GAUGE (SUPERCONDUCTING MAGNETIC LEVITATION RAILWAYS)
(RELATING TO ARTICLE 20)

STRUCTURE GAUGE (unit in mm.)



＊When the upper vertical, increase the gauge in relation to the circular

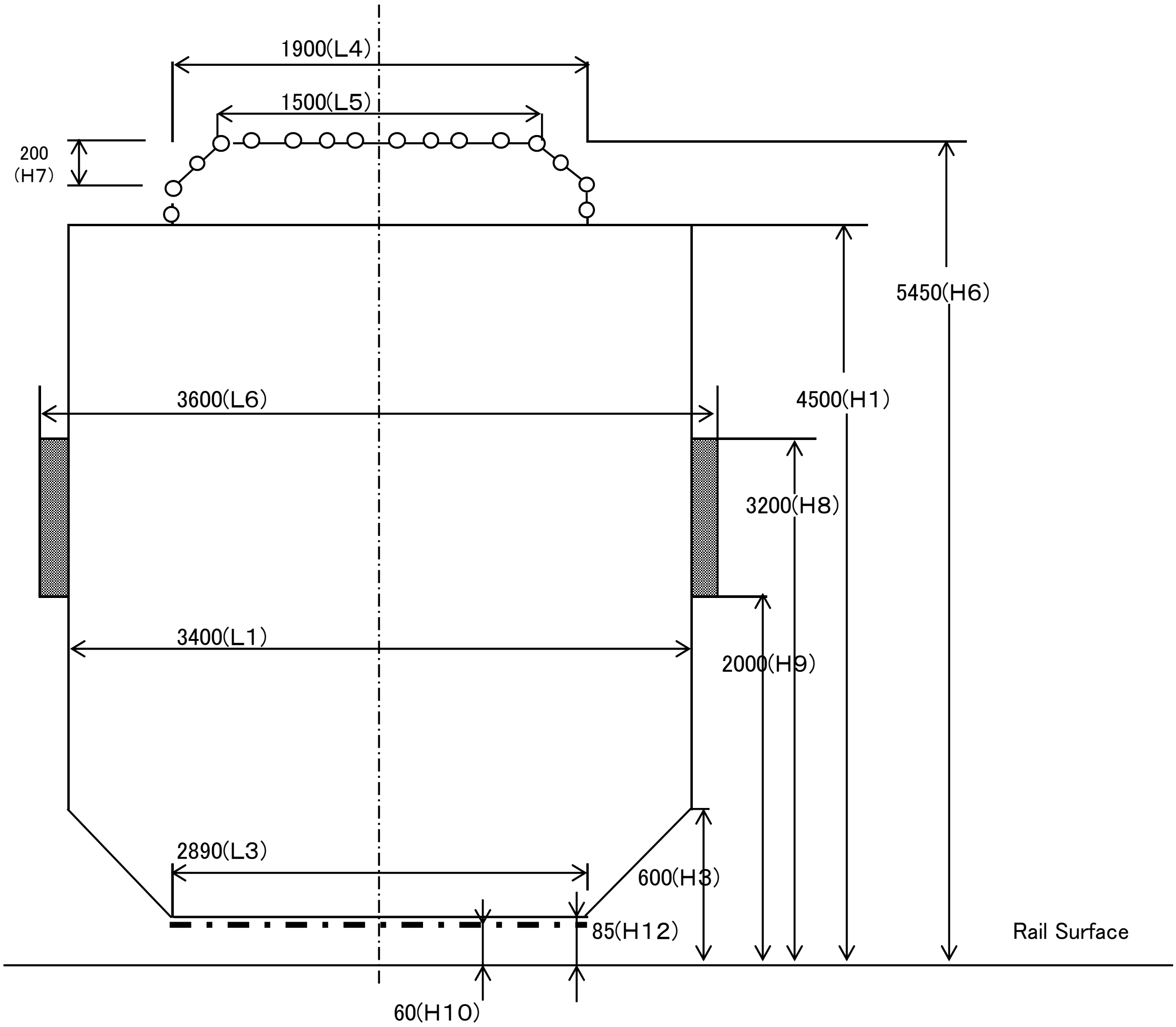
FIG 4 ROLLING STOCK GAUGE (ORDINARY RAILWAYS, EXCLUDING SHINKANSEN) (RELATING TO ARTICLE 64)



	Gauge Items				
————————	Basic Gauge	H1 L1	H2 L2	H3 L3	H12 R1
— · · — · · —	Gauge when current collector is folded	H4 R2	H5	L4	L5
—○—○—○—○—○—○—	Gauge in relation to top of roof when current collector is operated.	H7	L4	L5	R3
▒▒▒▒	Gauge in relation to signs, marker lamps, car side lamps.	H8	H9	L6	
— · — · — · —	Gauge in relation to parts that do not move vertically due to action of springs.	H10	L7		
··················	Gauge in relation to sanding pipe, obstacle deflector, brake shoe and other parts that do not exceed the rim width.	H11	L8		

※Dimensions shown in millimeters,

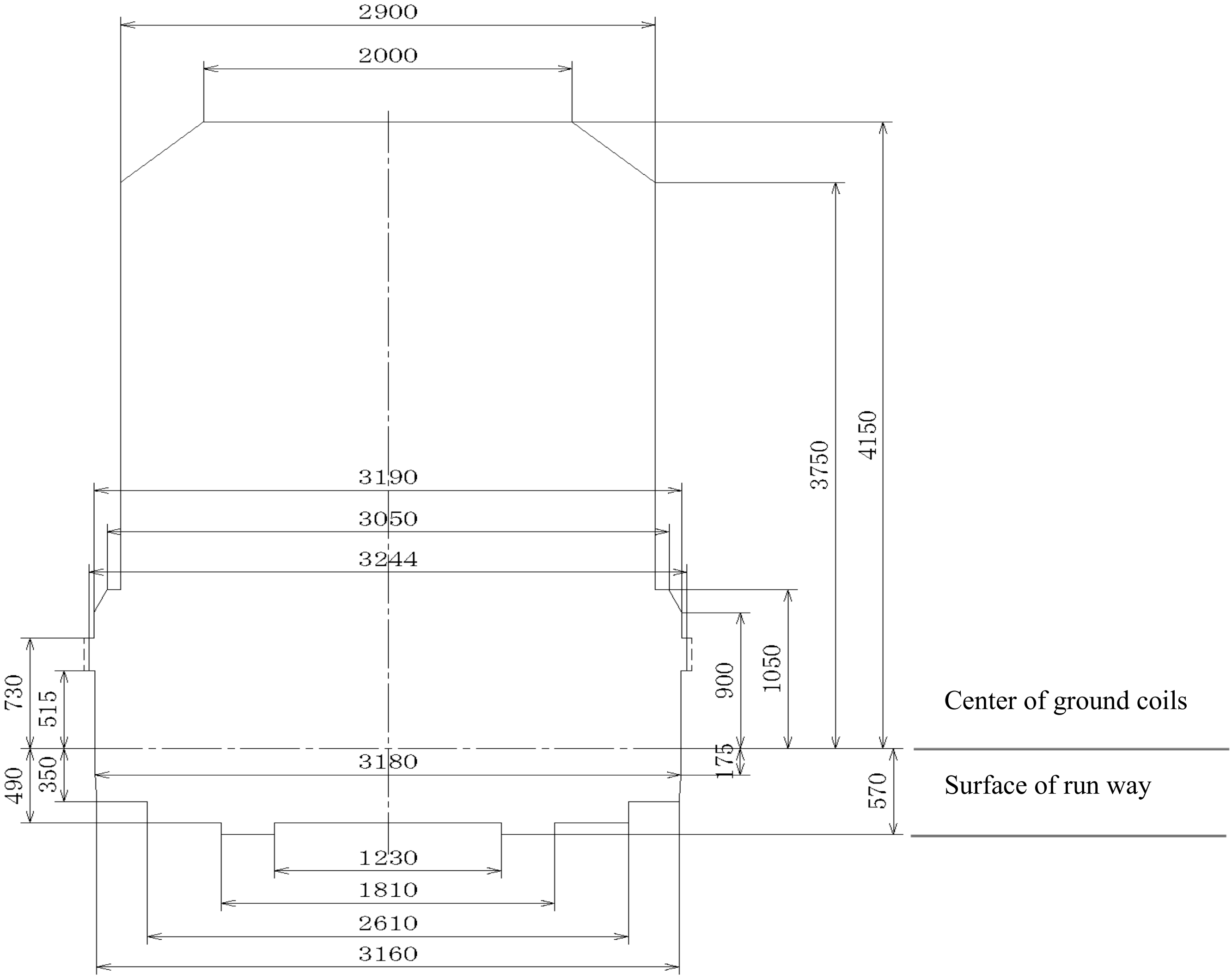
FIG. 5 STRUCTURE GAUGE (SUPER EXPRESS RAILWAY (EXCLUDING SUPERCONDUCTING MAGNETIC LEVITATION RAILWAYS)) (RELATING TO ARTICLE 64)



	GAUGE ITEMS	
———————	Basic guage	H1 H3 H12 L1 L3
—○—○—○—○—○—○—	Limit for rooftop equipment when current collector is operated	H6 H7 L4 L5
(shaded)	Limits for signs, marker lights, car side lights	H8 H9 L6
▬ · ▬ · ▬ · ▬ ·	Limit for section that does not move vertically due to spring action	H10 L3
Sanding pipe may exceed rolling stock gauge when a device that is within the wheel rim width corresponds to the rolling stock characteristics and is 40 mm above the rail surface		

※Dimensions shown in millimeters,

FIG. 6 STRUCTURE GAUGE (SUPERCONDUCTING MAGNETIC LEVITATION RAILWAYS)
(RELATING TO ARTICLE 64)



the basic rolling stock gauge

the gauge, when the guidance wheels contact the guide way.

＊Dimensions shown in millimeter

(No. 1): Items and Methods for Periodic Inspection (Electric locomotives and trains)

Classification			Type	Inspection Item	Inspection Method
I. Running Gear, etc.	A. Bogies	(1) Bogie frame and swing bolster		(a) Deformation, cracks, and/or corrosion of frame assembly, swing bolster, equalizer, etc. (b)Damage or wear of sliding part Wear (c) Damage or wear to traction motor mounting section, gear box. hanger, swing bolster or swing bolster pin (d) Damage or wear of tilting roller (e) Damage or defect of the air reservoir	Defect inspection
		(2) Centering plate and side bracket		(a)Damage or wear of friction surfaces (b) Amount of lubricant	
		(3) Axle and axle support device		(a) Damage, wear, discoloration and clearance of bearings, etc. (b)Amount of lubricant and contamination (c)Clearance between axle box guard and axle box	Measurement.
		(4) Wheels and axles		(a) Damage to tread surface of wheel (b) Shape of wheel a: Wheel diameter or tire width b: Flange thickness and height c: Back gauge (3) Damage to axles	Measurement Defect inspection
		(5) Dampening of suspension		(a) Spring damage, wear or deformation (b) Oil damper function or oil leakage (c) Air spring height adjustment valve, differential pressure operating valve, etc., according to 5-B (1)	
		(6) Damage, deformation or mounting condition of obstacle deflector or snow plow.		Wear, deformation and mounting condition of body.	
		(7) Sander		(a) Damage, wear, deformation and mounting condition of main unit. (b) Solenoid valve is according to 4-B (4)	

	B. Propulsion system	(1) Gears		(b) Cracks, deformation, wear, chipped or mounting condition (b) Meshing condition	
		(2) Gear box		(a) Wear, deformation and mounting condition of body (b)Amount of lubricant and contamination (c) Damage and mounting condition of oil level gauge and magnetic plug (d) Damage, wear and clearance of bearings	
		(3) Joints		(a) Cracks, damage, deformation or wear of body. (b) Amount of lubricant	
		(4) Grounding device		(a)Damage or wear of sliding surfaces. (b) Wear, deformation, damage, pressure or clearance of flange and brush holder	
II. Equipment (Including main control circuit)	C. Current collection device	(1) Pantograph and attached equipment		(a) Damage, deformation or corrosion of mounting frame, main shaft, frame assembly tubing, pan head, friction plate, etc. (b) Wear or deformation of pin or bearing section (c) Functions of supporting device (d) Damage or corrosion of cylinder, air piping or air air hose (e) Contamination or damage to insulators, etc. (f) Solenoid valve is according to 4-B (4) (g) Raising and lowering functions (h) Insulation characteristics	Insulation resistance test
		(2) Current collector shoe and supports		(a) Wear or damage to current collect shoe (b) Function of movable parts (c) Deformation, degradation and mounting condition of body of supports and dampening rubber. (d) Damage or wear of pin or bearing section	

				(e) Insulation	Insulation resistance test and dielectric strength test
	B. Traction motors	(1) Motor elements (Including armature)		(a) Damage, contamination or discoloration of commutator surface (Limited to armature) (b) Damage, wear or deformation of shaft, fan, etc.	
		(2) Frame, field, etc.		(a) Damage, wear, deformation and mounting condition of each section (b) Damage, wear, deformation, pressure and mounting condition of brush holder (c) Damage, fitting condition and oil feed condition	
		(3) Assembly test		(a) Insulation characteristics (b) Rotation function	Insulation resistance test and dielectric strength test
	C. Control circuit equipment	(1) Line switch (Including breaker) and main contactor		(a)Damage or wear of movable or sliding parts (b) Damage, wear, contact pressure and mounting condition of contact,finger and chip (c) Damage and mounting condition of spark chute. (d) Solenoid valve is according to IV-B. (4) cylinder is according to III-(A) (2). (e) Contamination or damage to insulation (f) Mounting condition of each section. (g) Function (i) Wipe of contact and finger (ii) Linkage operation between main contact section and auxiliary contact section (h) Operation characteristics (i) Operating air pressure (ii) Operation pressure	Measurement
		(2) Cam shaft, cam shaft operation mechanism		(a) Damage, wear and mounting condition of cam, cam shaft and star wheel	

		control (including control cylinder)		(b)Damage or wear of movable or sliding parts (c) Damage, wear, contact pressure and mounting condition of contact,finger and chip (d) Damage to bearing section (e) Contamination or damage to insulation (f) Solenoid valve is according to IV-B. (4) cylinder is according to III-(A) (2) (g) Operating motor is according to II B. (Excluding dielectric strength test) (h) Mounting condition of each section. (i) Functions (i) Wipe of contact and finger (ii) Linkage operation between main contact section and auxiliary contact section (iii) Rotation and stop position	
		(3) Reverser and changeover		(a) Damage, wear and mounting condition of cam, cam shaft and star wheel (b)Damage or wear of movable or sliding parts (c) Damage, wear, contact pressure and mounting condition of contact, finger and chip (d) Contamination or damage to insulation (e) Solenoid valve is according to IV-B (d) cylinder is according to III-B. (f) Mounting condition of each section. (g) Function (i) Wipe of contact and finger (ii) Linkage operation between main contact section and auxiliary contact section (iii) Changeover	
				(a)Damage or wear of movable or sliding parts	

		(4) Main controller, (including direct controller)		(b) Damage, wear, contact pressure and mounting condition of contact,finger and chip. (c) Contamination or damage to insulation (d) Mounting condition of each section	
		(5) Main resistor including (including field resistor)		(a) Contamination, damage or deterioration of insulator (b) Damage, discoloration,deformation and mounting condition of resistors and connecting parts. (c) Mounting condition of each section (d) Insulation characteristics	Insulation resistance test
		(6) Contactors (Items other than main contactor and relay)		According to IV-B (3)	
		(7) Semiconductors for main circuit		(a) Contamination or damage to semiconductor elements, insulation, heat sink fins, etc. (b) Mounting condition of each section	
		(8) Main circuit semiconductor control device		(a) Contamination or damage to semiconductors, etc. (b) Mounting condition of each section	
		(9) Reactor and filter		(a) Contamination or damage of each section (b) Insulation characteristics	Insulation resistance test and dielectric strength test
	D. Main transforme r and attached parts Other attached devices	(1) Main transformer		(a) Contamination or damage to insulators, etc. (b) Oil leakage (c) Insulation characteristics	Insulation resistance test and dielectric strength test (Oil resistance test after changing oil)

		(2) Main rectifier		(a) Contamination or damage to insulators, etc. (b) Oil leakage (c) Insulation characteristics (d) Element performance	 Insulation resistance test and dielectric strength test (Oil resistance test after changing oil) Reverse current test and distribution voltage test among each element
		(3) Reactor and filter		(a) Contamination or damage of each section. (b) Insulation characteristics	 Insulation resistance test and dielectric strength test
		(4) Tap switch		(a) Damage to each section (b) Switching function (c) Operation time (d) Insulation characteristics	 Measurement Insulation resistance test and dielectric strength test
III Brake device	A. Foundation brake device	(1) Lever, rods, etc.		(a) Wear, cracks, deformation of levers and rods (b)Damage or wear of movable or sliding parts (c) Cracks, wear and mounting condition of brake disc	
		(2) Brake cylinder, including brake diaphragm		(a) Damage, cracks or wear to inner surface of cylinder, pistons and rubber bellows (b) Amount of lubricant	
		(3) Automatic clearance adjustor		(a) Damage, wear or deformation (b) Function	
	B. Hand brake device			(a)Damage or wear of movable or sliding parts	

				(b) Function	
	C. Air brake control device	(1) Brake valve, including brake controller		(a)Damage or wear of movable or sliding parts (b) Valve and valve seat contact and spring damage (c) Damage, degradation or deformation of membrane plate or packing (d) Electric parts shall be according to II C (4)	
		(2) Control valve (including relay valve, conductor's valve, etc.)		According to III-C.	
		(3) Solenoid direct controller and electric/air controller (including converter)		According to III-C.	
		(4) Load compensating device		According to III-C. (1)	
IV. General electric devices	A. Auxiliary power supply devices and auxiliary motors	(1) Electric power generators and electric blowers. (Static inverter)		(a) According to II-B (b) Damage to rectifiers, condensers, etc. (c) Output characteristics (Limited to electric power generators) (i) Generated voltage (ii) Frequency	Measurement
		(2) Electric power converter		(a) Contamination or damage to insulation (b) Leakage of refrigerant (c) Mounting condition of each section. (d) Insulation characteristics (Except semiconductor section) (e) Output Characteristics	Insulation resistance test and dielectric strength test Measurement

				(i) Generated voltage (ii) Frequency	
		(3) Storage battery and charger		(a) Corrosion, damage mounting condition of storage battery unit, jumper, terminals, etc. (b) Weight and specific gravity of electrolyte (c) Mounting condition of charger and functions	
	B. Relays・Solenoid valve・Wiring	(1) Auxiliary resistors		(a)Damage, discoloration and deformation of resistor body (b) Mounting condition	
		(2) Fuses, switches, etc.		(a) Contamination or damage of contact section (b) Mounting condition	
		(3) Contactors and relays		(a) Contamination or damage to insulation (b)Damage or wear of movable or contact parts (c) Mounting condition of each section. (d) Functions	
		(4) Solenoid valve		(a) Broken wires or burns on coil (b) Valve and valve seat contact and valve lift (c) Mounting condition of each section. (d) Functions	
		(5) Lightning deflector		(a) Contamination or damage to insulators, etc. (b) Mounting condition	
		(6) Wiring		(c) Damage and mounting condition of wires, connection boxes and other attached parts (b) Insulation characteristics	Insulation resistance test
V. General pneumatic devices	A. Air compressors and attached components and other attached devices	(1) Air compressors		(a) Motors shall be according to II-B. (b) Damage to crank chamber, cylinder, piston, etc. (c) Valve and valve seat contact and valve lift (d) Damage to propulsion transfer device (e) Oil volume, leaking air, leaking oil	

				(f) Functions	
		(2) Regulators and switches		According to III-C. (1)	
		(3) Safety valve		Valve seat contact	
		(4) Dehumidifier		(a)Deterioration of absorbent (b) Solenoid valve is according to IV-B (4) (c) Discharge valve is according to V-B(1)	
	B. Valves・Air tank ・Air piping, etc.	(1) Supply air valve and pressure reduction valve		(a) Valve and valve seat contact and spring damage (b) Damage, degradation or deformation of membrane plate or packing (c) Functions	
		(2) Other valves		(a) According to V-B. (1) (b) Electric parts shall be according to IV-B	
		(3) Air tank		Corrosion and mounting condition of body and protective hardware	
		(4) Air piping, etc.		(a) Damage and mounting condition of air pipe, hose and strainer (b) Opening and closing and mounting condition of cock	
VI. Car body and car rooms	A. Underframe			Damage, deformation, cracks, or corrosion of beams, hanger beam, etc.	
	B. Interior/exterior of car rooms			(a) Damage or corrosion of ceiling, floor, external sheeting,interior panels, gang plank (b) Damage and mounting condition of window, diaphragm, seats, sliding doors and other amenity parts (c) Contamination or peeling of paint	
	C. Roof			(a) Damage, deterioration or peeling of roof covering (b) Damage, corrosion and mounting condition of running board, ventilators, air conditioner covers and gutters	

	D. Automatic door operator(Including security device)			(a) Damage, wear, deformation and mounting condition of door operator, belts, arms, links, rollers and slides (b) Electric parts for solenoid valves, door closed switch, door closed security device shall be according to 4-RO (c) Leaking air, leaking oil from door operator, air pipes, etc. (d) Open/closing operation	
	E. Lighting			(a) Damage and mounting condition of lights and fixtures (b) Solenoid valve is according to IV-B. (3)	
VII. Other devices	A. Signal・Communication and public address device	(1) Signal device, air horn device, including emergency notification device		Damage, contamination and mounting condition of each section.	
		(2) Communication and public address device (Including security communication facilities)		Damage and mounting condition of each section.	
	B. Various display devices			Damage and mounting condition of lights, fixtures, etc.	
	C. Instruments			(a) Damage and mounting condition of body (b) Function of pressure gauge (c) Function of speedometer (d) Function of electrical instruments (voltmeter, ammeter, etc.)	 Measurement Measurement

D. Coupler	(1) Automatic couplers (Including bar type couplers)		(a) Cracks, damage, deformation or wear of body, lock, joints, pins, etc. (b) Inner surface distance of elbows and guide arm (c) Functions	Measurement
	(2) Buffing and draw gear		Damage, wear, deformation and mounting condition of frame, buffing spring, follower plate, follower plate guide	
	(3) Shank guide		Damage, wear, deformation and mounting condition	
	(4) Air coupler		Damage or degradation of hoses, packing, etc.	
	(5) Electric coupler		(a) Contamination or damage to body, insulation, packing, wires, etc. (b) Function	
E. Automatic train stop device, automatic train control device, train selection device (including automatic train operation device)	(1) Onboard elements and receptacles		Damage contamination and mounting condition	
	(2) Speed detector (Including speed generator)		Damage and mounting condition of each section	
	(3) Main body, logic section and power supply (Reciever and verification section)		Damage and mounting condition of each section	
F. Operator abnormality train stop device and emergency protection device	(1) Operator abnormality train stop device (Deadman device and EB device)		Damage and mounting condition of each section.	

		(2) Emergency protection device (TE device)		Damage and mounting condition of each section.	
	G. Operating condition recording device			Damage and mounting condition of each section.	
VIII. Overall inspection				(a) Mounting condition of each unit of equipment. (b) Obstacle deflector and height of sander pipe (c)Operating function of current collector (d) Control circuit equipment control and protection functions (e) Insulation characteristics of electrical circuits (Except circuits used by battery, semiconductor, etc.) (f) Functions of brake device (g) Leakage of air brake control device and general air devices (h) Capability of compressor and function of attached devices (including pressure regulator and safety valve) (i) Car body tilt (j) Function of automatic door closing device (k) Lighting function of lighting devices (l) Function of signal, communication and public address devices (m) Functions of each display device (n) Height of coupler (o) Operating characteristics and functions of automatic train stop device and automatic train brake device. (p) Function of operator abnormality train stop device and emergency protection device	 Measurement Insulation resistance test and dielectric strength test Measurement Measurement Measurement Measurement Measurement

				(q) Static wheel load condition (Limited to trains)	
IX Test operation				(a) Starting, accelerating and decelerating performance (b) Main functions of brake device (c) Abnormal sounds and swaying (d) Indication condition of instruments (e) Function of automatic train operation device (f) Condition of equipment, etc., after testing (i) Condition of bearings on traction motors (ii) Condition of equipment for main circuit (iii) Heat or oil leakage of wheel axle bearing (g) Function of operating condition recording device	

(No. 2): Items and Methods for Periodic Inspection (Internal combustion engine locomotives and internal combustion railcars)

Classification			Type	Inspection Item	Inspection Method
I. Running Gear, etc.	A. Bogies	(1) Bogie frame and swing bolster		(a) Deformation, cracks, and/or corrosion of frame assembly, swing bolster, equalizer, etc. (b)Damage or wear of sliding surfaces. (c) Damage or wear to swing bolster or swing bolster pin. (d) Damage or defect of the air reservoir. (d) Damage or wear of reverser bar and reduction unit support bar	
		(2) Centering plate and bracket		(a)Damage or wear of friction surfaces. (b) Amount of lubricant	
		(3) Axle box and axle box support device		(a) Damage, wear, discoloration and clearance of bearings, etc. (b)Amount of lubricant and contamination. (c)Clearance between axle box guard and axle box.	 Measurement
		(4) Wheels and axles		(a) Damage to tread surface of wheel. (b) Shape of wheel (i) Wheel diameter or tire width (ii) Flange thickness and height (iii) Back gauge (c) Damage to axles	 Measurement. Measurement.
		(5) Dampening of suspension		(a) Spring damage, wear or deformation (b) Oil damper function or oil leakage (c) Air spring height adjustment valve, differential pressure operating valve, etc., according to VI-B. (1).	
		(6) Damage, deformation or mounting condition of obstacle		Wear, deformation and mounting condition of body.	

		deflector or snow plow.			
		(7) Sander		(a) Damage, wear, deformation and mounting condition of main unit. (b) Solenoid valve is according to V-C. (3)	
II. Propulsion system	A. Locomotive main body	(1) Crank chamber		(a) Damage, deformation or wear of body. (b) Mounting condition, deformation, stud bolt looseness and thread condition (c) Damage to crank bearings and cam bearings (d) Gaps between crank bearings and cam bearings (e) Damage or wear of cylinder liner (f) Protrusion dimension of cylinder liner	 Measuement Measurement.
		(2) Crank shaft		(a) Damage, wear or deformation (b) Damage, wear or deformation of vibration absorber joint and gears	Defect Inspection
		(3) Pistons		(a)Damage or wear (b) Mounting condition of piston rings	Defect Inspection
		(4) Connecting rod		(a) Damage, deformation or wear (b) Wear, contact and mounting condition of connecting rod bearings (c) Friction and looseness of small-end bushing (d) Bearing clearance of thick end of connecting rod	 Measurement
		(5) Cylinder head		(a) Damage, deformation or wear of body, combustion chamber and injection port (b) Damage, deformation or wear of each part of the valve devices (c) Valve and valve seat contact	Defect
				(a) Damage, deformation or wear of each part	

		(6) Action valve device		(b) Condition of each contact surface (c) Valve gap	Defect Inspection (Limited to cam shaft)
		(7) Adjustment gear device		(a) Cracks, deformation, wear, chipped or mounting condition (b) Damage, wear and mounting condition of gears, shafts and bearings	
	B. Intake and exhaust device	(1) Intake and exhaust manifold		(a) Damage, corrosion deformation mounting surface (b) Damage and mounting condition of intercooler	
		(2) Supercharger		(a) Damage, deformation or wear of impeller, shaft or bearings (b) Damage or deformation of main body or intake and exhaust chambers	
		(3) Damage, deformation, corrosion and mounting condition of exhaust silencer pipe and each part		Damage, deformation and mounting condition of each part	
		(4) Air cleaner and intake pipe		(a) Damage, corrosion or deformation of each part (b) Contamination or damage to filter	
	C. Fuel devices	(1) Fuel tank filter and piping		(a) Damage or corrosion of fuel tank and piping (b) Contamination or damage to filter (c) Contamination or damage to oil level gauge (d) Damage or deformation of fuel high-pressure piping (e) Oil leakage of each part	
				(a) Damage, wear and function of main body	

	(2) Fuel injectors		(b) Damage, wear and function of fuel supply pump (c)Damage or wear of rack drive linkage	
	(3) Fuel injection valve		(a) Damage, wear or oil leakage of nozzles and holders (b) Spray shape and function of nozzles	
D. Fuel control device	(1) Speed adjuster		(a)Damage or oil leakage (b) Function	
	(2) Fuel control device		(a)Damage or leakage (b) Function	
	(3)Advancer		Damage	
	(4) Fuel injector pump drive device		(a)Damage (b) Injection timing	
E. Lubricator	(1) Lubricant valve, pipe and filter		(a) Damage or blockage of oil pan or piping (b) Contamination or damage to filter (c) Damage and function of safety valve and pressure regulator valve (d) Oil leakage of each part	
	(2) Lubricant pump		(a) Damage to body, gears, shaft or bearings (b) Function	
	(3) Oil cooler		Leakage, contamination or damage to cooler device.	
F. Cooling Equipment	(1) Water tank, piping filter		(a) Damage or corrosion of fuel tank and piping (b) Contamination or damage to water tank, piping or valve (c) Contamination or damage to water level gauge (d) Water leakage of each part	
	(2) Water pump		Damage, wear and mounting condition of impeller, gears, shafts and bearings	
	(3) Blower		(a) Damage, wear and mounting condition of impeller, gears, shafts and bearings	

				(b) Damage, wear and mounting condition of drive shaft, joints or bearing device (c) Damage, wear and mounting condition of fluid coupling and hydraulic transmission. (d) Functions of brake device	
		(4) Heat sink		Leakage, deformation, corrosion and mounting condition	
		(5) Engine pre-heater		(a) Damage, leakage and mounting condition of each section. (b) Function	
				(a) Engine starting and stopping functions (b) Abnormal noise, vibration, heat or leakage from each part (c) Mounting condition and function of intake/exhaust device, fuel device, fuel control device, lubricator, cooling device and electric devices (d) Operation characteristics	Load test and fuel control test
III. Propulsion transfer device	A. Hydraulic transmission			(a) Damage or deformation of main body or impeller or guide impeller (b) Damage or wear to clutch device and free oil. (c) Damage or wear of gears, shaft or bearings (d) Damage to piping, valves and filters (e) Damage or wear of input/output shaft coupling (f) Leakage of each part	
	B. Propulsion shaft			Damage or deformation of shaft, spline or cross joint	Flaw Inspection (Limited to spline shaft section)
	C. Reverser and reduction unit			(a) Damage or wear of body, gears, shaft or bearings (b) Reverser function (c) Leakage of each part	

IV. Brake device	A. Foundation brake device	(1) Lever, rods, etc.		(a) Wear, cracks, deformation of levers and rods (b)Damage or wear of movable or sliding parts (c) Cracks, wear and mounting condition of brake disc	
		(2) Brake cylinder, including brake diaphragm		(a) Damage, cracks or wear to inner surface of cylinder, pistons and rubber bellows (b) Amount of lubricant	
		(3) Automatic gap adjuster		(a) Damage, wear or deformation of each part (b) Function	
	B. Hand brake device			(a)Damage or wear of movable or sliding parts (b) Function	
	C. Air brake control device	(1) Brake valve		(a)Damage or wear of movable or sliding parts (b) Valve and valve seat contact and spring damage (c) Damage, degradation or deformation of membrane plate or packing (d) Electric parts shall be according to V-A. (1)	
		(2) Control valve (including relay valve, conductor's valve, etc.)		According to IV-C. (1)	
		(3) Electropneumatic controller		According to IV-C. (1)	
		(4) Load compensating device		According to IV-C. (1)	
V. General electric devices	A. Control device	(1) Main controller, control circuit cut out switch, selection switch		(a)Damage or wear of movable or sliding parts (b)Damage or wear of contact, finger and chip (c) Contamination or damage to insulation (d) Mounting condition of each section.	

	B. Power supply devices and motors	(1) Engine and attached devices		(a) Damage or wear of each part (b) Engine starting and stopping functions (c) Abnormal noise, vibration, heat or leakage from each part (d) Mounting condition of intake/exhaust device, fuel device, fuel control device, lubricator, cooling device and electric devices (e) Functions	
		(2) Generator		(a) Damage to each section (b) Function (c) Insulation characteristics	Insulation resistance test and dielectric strength test
		(3) Excitation regulator		Damage and mounting condition of each section.	
		(4) Motors (Including starter motors) and charger generator motors		(a) Damage and mounting condition of body (b) Function (c) Insulation characteristics	Insulation resistance test
		(5) Charger regulator		(a) Mounting condition (b) Function	
		(6) Battery		(a) Corrosion, damage and mounting condition of jumper, terminals, etc. (b) Weight and specific gravity of electrolyte	
	C. Relays・Solenoid valve・Wiring	(1) Fuses and switches		(a) Contamination or damage of contact section (b) Mounting condition	
		(2) Contactors and relays		(a) Contamination or damage to insulation (b)Damage or wear of movable or contact parts (c) Mounting condition of each section. (d) Functions	
				(a) Broken wires or burns on coil (b) Valve and valve seat contact and valve lift	

		(3) Solenoid valve and solenoid		(c) Mounting condition of each section. (d) Functions	
		(4) Wiring		(c) Damage and mounting condition of wires, connection boxes and other attached parts (b) Insulation characteristics	Insulation resistance test
VI. General pneumatic devices	A. Air compressors and attached components	(1) Air compressors		(a) Damage to crank chamber, cylinder, piston, etc. (b) Valve and valve seat contact and valve lift (c) Damage to propulsion transfer device (d) Oil volume, leaking air, leaking oil (e) Functions	
		(2) Pressure regulator and pressure switch, etc.		According to IV-C. (1)	
		(3) Safety valve		Valve seat contact	
		(4) Dehumidifier		(a)Deterioration of absorbent (b) Solenoid valve is according to V-C (3) (c) Discharge valve is according to VI-B. (1)	
	B. Valves・Air tank・Air piping	(1) Supply air valve and pressure reduction valve		(a) Valve and valve seat contact and spring damage (b) Damage, degradation or deformation of membrane plate or packing (c) Functions	
		(2) Other valves		(a) According to VI-B. (1) (b) Electric parts shall be according to V-C.	
		(3) Air tank		Corrosion and mounting condition of body and protective hardware	
		(4) Air piping, etc.		(a) Damage and mounting condition of air pipe, hose and strainer. (b) Opening and closing and mounting condition of cock	

VII. Car body and car rooms	A. Underframe			Damage, deformation, cracks, or corrosion of beams, hanger beam, etc.	
	B. Interior/exterior of car rooms			(a) Damage or corrosion of ceiling, floor, external sheeting,interior panels, gang plank (b) Damage and mounting condition of window, diaphragm, seats, sliding doors and other amenity parts (c) Contamination or peeling of paint	
	C. Roof			(a) Damage, deterioration or peeling of roof covering (b) Damage, corrosion and mounting condition of running board, ventilators, air conditioner covers and gutters	
	D. Automatic door operator (Including door security device)			(a) Damage, wear, deformation and mounting condition of door operator, belts, arms, links, rollers and slides (b) Electric parts for solenoid valves, door closed switch, door closed security device shall be according to V-B. (c) Leaking air, leaking oil from door operator, air pipes, etc. (d) Open/closing operation	
	E. Lighting			(a) Damage and mounting condition of lights and fixtures (b) Solenoid valve is according to V-C. (2)	
VIII. Other devices	A. Signal・Communication and public address device	(1) Signal device, air horn device, including emergency notification device		Damage, contamination and mounting condition of each section.	

		(2) Communication and public address device (Including security communication facilities)		Damage and mounting condition of each section.	
	B. Various display devices			Damage and mounting condition of lights, fixtures, etc.	
	C. Instruments			(a) Damage and mounting condition of body (b) Function of pressure gauge (c) Function of speedometer (d) Function of electrical instruments (voltmeter, ammeter, etc.)	 Measurement. Measurement.
	D. Coupler	(1) Automatic couplers (Including bar type couplers)		(a) Cracks, damage, deformation or wear of body, lock, joints, pins, etc. (b) Inner surface distance of elbows and guide arm. (c) Functions	 Measurement.
		(2) Buffer device		Damage, wear, deformation and mounting condition of frame, buffing spring, follower plate, follower plate guide	
		(3) Shank guide		Damage, wear, deformation and mounting condition	
		(4) Pneumatic coupler		Damage or degradation of hoses, packing, etc.	
		(5) Electric coupler		(a) Contamination or damage to body, insulation, packing, wires, etc. (b) Function	
	E. Automatic train stop device	(1) Onboard element		Damage, contamination and mounting condition	
		(2) Receiver		Damage and mounting condition of each section.	

	F. Operator abnormality train stop device and emergency protection device	(1) Operator abnormality train stop device (Deadman device and EB device)		Damage and mounting condition of each section.	
		(2) Emergency protection device (TE device)		Damage and mounting condition of each section.	
	G.Operating condition recording device			Damage and mounting condition of each section.	
IX. Overall inspection				(a) Mounting condition of each unit of equipment. (b) Obstacle deflector and height of sander pipe (b) Engine starting and stopping functions (d) Functions of brake device (e) Insulation characteristics of electrical circuits (Except circuits used by battery, semiconductor, etc.) (f) Leakage of air brake control device and general air devices (g) Capability of compressor and function of attached devices (including pressure regulator and safety valve) (h) Car body tilt (i) Function of automatic door operator (j) Lighting function of lighting devices (k) Function of signal, communication and public address devices (l) Functions of each display device (m) Height of coupler	Measurement. Insulation resistance test and dielectric strength test Measurement. Measurement. Measurement.

				(n) Operating characteristics and functions of automatic train stop device and automatic train brake device. (o) Function of operator abnormality train stop device and emergency protection device (p) Static wheel load condition (Limited to trains)	Measurement. Measurement.
X. Test operation				(a) Starting, accelerating and decelerating performance (b) Operating condition of engine (c) Main functions of brake device (d) Abnormal sounds and swaying (e) Indication condition of instruments (f) Condition of equipment, etc., after testing (i) Leakage of each engine part (ii) Heat or oil leakage of wheel axle bearing (e) Function of operating condition recording device	

(No. 3): Items and Methods for Periodic Inspection (Steam locomotives)

Classification		Type	Inspection Item	Inspection Method
I. Running Gear, etc., Car body, etc.	A. Main frame		(a) Wear, cracks or looseness (b) Cracks or looseness of boiler base, coal box, cross stay, boiler body support, etc. (c) Wear, cracks and looseness of axle box guard and axle box guard cover brace (d) Difference in centerline distance between left and right cylinders	 Measurement
	B. Intermediate buffer		(a) Wear, cracks, deformation of buffer seat and bracket (b) Wear or cracks of head, slider or spring (c) Wear, cracks, deformation of intermediate draw bar	
	C. Bogie frames		Cracks and looseness of frame assembly and attached parts	
	D. Center pin		Wear, cracks or clearance of lead bogie center pin and center pin guide	
	E. Centering plate and bracket		(a)Damage or wear of friction surfaces. (b) Amount of lubricant	
	F. Centering device		Wear or cracks on roller, roller frame, shaft retainer , swing bolster, swing heart block, heart block bracket, link and centering rod.	
	G. Drive wheel axle box		(a) Wear or cracks to axle box, axle box wedge, axle box wedge bolt or oil pan. (b) Mounting condition of drive wheel (c) Clearance between bracket hardware and journal	 Measurement
	H. Axle box and axle box guard		(a) Damage,wear, discoloration and clearance of bearings, etc. (b)Amount of lubricant and contamination. (c)Clearance between axle box guard and axle box.	 Measurement
	I. Wheels and axles		(a) Damage to tread surface of wheel. (b) Shape of wheel	 Measurement

				(i) Wheel diameter or tire width (ii) Flange thickness and height (iii) Back gauge (3) Damage to axles	Flaw inspection
	J. Spring device			(a) Spring damage, wear or deformation (b) Wear and deformation of spring hanger, spring center hanger, equalizer beam, spring seat and spring housing (c) Wear or deformation of pin or bushing (d) Damage of secondary spring hanger pin	
	K. Obstacle deflector			Wear, deformation and mounting condition of body.	
	L. Sander			(a) Damage, wear, deformation and mounting condition of main unit.	
	M. Rail water sprinkler			Leakage for cocks, pipings or joints	
	N. Underframe			Deformation, wear, cracks or looseness of underframe	
	O. Water tank			Corrosion, cracks, mounting condition and leakage	
II. Propulsion system	A. Boiler and attached devices	(1) Fire box		(a) Corrosion, cracks, blistering or scale on the fire box exterior plate, rear plate, throat plate, inner fire chamber, ceiling plate and fire chamber pipe plate. (b) Heavy corrosion, cracking or blistering of plates (c) Cracks or deformation of base plate (d) Leaking air or damage of arch pipe	
		(2) Braces		(a) Leaking air or damage (b) Clogging or damage of telltale hole	
		(3) Chimney		Corrosion, cracks, or leakage	Water Pressure Test
		(4) Melt-activated plug		Wear or leakage of threaded sections	
		(5) Washer port plug		Leakage of threaded sections	

		(6) Boiler body		(a) Corrosion, cracks, or leakage of body plates (b) Corrosion, cracks, or leakage of each steam pipe	
		(7) Smoke Chamber		(a) Damage, deformation or corrosion of smoke chamber front plate, smoke chamber door or smoke chamber body (b) Sealing condition of door (c) Air leakage from discharge pipe and penetrating sections of the main steam pipe (d) Corrosion, cracks, blistering or leakage of smoke chamber pipe plates (e) Looseness of discharge nozzle (f) Corrosion or damage to spark guard (g) Damage and mounting condition of blower nozzle and blower pipe (h) Looseness, cracks, or leakage of each superheater pipe header and main steam pipe (g) Corrosion, cracks, or leakage of each superheater pipe	Water Pressure Test
		(8) Control valve		(a) Wear, mating, gaps, lift and opening/closing operations of main body, main valve, auxiliary valve, etc. (b) Wear or leakage of control valve pull rod in fitted insert section of steam distribution chamber (c) Valve lift operation	
		(9) Safety valve		(a) Wear, cracks, or gaps in main body or valve (b) Wear or damage to valve push rod end	
		(10) Water supply control valve and blow off valve		Wear or damage to main body or valve	

		(11)Injector		Wear or damage to main body, steam valve, check valve, nozzle or cock	
		(12) Stop valve and cock		Wear or cracks to main body or valve	
		(13) Gauge cock		(a) Wear or damage to upper cock body, lower cock body, discharge cock body, cock plug or nut (b) Contamination or leakage of glass	
		(14) Stud bolt		Damage, looseness wear or leakage	
		(15) Firebox door		(a) Damage or deformation of firebox opening frame, firebox door bracket, etc. (b) Damage to attached parts	
		(16) Grate equipment		Damage or deformation	
		(17) Ash box		(a) Wear, deformation and sealing condition (b) Condition of ash flow device	
				Condition of plate and leakage of chimney, brace, bottom frame, steam dome and attached parts	Water Pressure Test
	B. Cylinder and its attached parts	(1) Cylinder		(a) Looseness and cracks of main body (b) Damage of inner wall and looseness of bushing (c) Looseness, cracks, or wear of cover	
		(2) Bypass pipe		(a) Wear or cracks of cylinder or piston (b) Wear or of spring or piston	
		(3) Bypass cock		Wear, cracks or mating of cylinder or piston	
		(4) Cylinder safety valve		(a) Wear or cracks to valve body or valve (b) Wear or damage to push rod end (c) Spring damage	
		(5) Cylinder drain cock		Wear, cracks, or opening/closing operation of main body or valve	
		(6) Air piping valves		(a) Wear or cracks to body or valve, etc. (b) Damage to cover or screen	

		(7) Pistons		(a) Gaps, wear, deformation or damage to piston rod or piston body (b) Sealing condition of taper section of piston rod and contact section of cock (c) Cracks, wear or deformation of main body of lead rod support , receiver and wedge	
		(8) Steam chamber		(a) Wear or damage of valve seat and interior wall of bushing (b) Looseness of cover	
		(9) Oil pump		(a) Wear or damage of main body, slider cylinder or crank shaft (b) Wear or damage of oil feeder valve body, plunger or piston (c) Damage to gear box, gears, control screw, check valve, etc. (d) Damage to each part of propulsion transfer device	
	C. Valve device	(10)Monitor Oil Feeder		Damage to steam stop valve, oil control valve, oil nozzle, etc.	
		(1) Slide valve and pistons		(a) Wear or cracks to slide valve, strip or equalizer plate (b) Wear, cracks, deformation or gaps in valve frame or valve center rod (c) Mounting condition of valve center rod, gaps between main body and steam chamber bushing (d) Wear, damage or deformation of piston valve body and valve center rod (e) Gaps in ring fitting (f) Looseness in ring stop screw	
		(2) Link device		(a) Wear or deformation of valve center rod cross head or valve center rod cross head slider (b) Wear or deformation of control ring or control ring slider	

				(c) Wear or deformation of return crank (d) Wear or deformation of reverse screw and reverse screw slider (e) Wear, damage or deformation of eccentric rod, radial rod, combination lever, link ring, reverser shaft, reverser rod, etc. (f) Wear or damage of eccentric bushing (g) Mounting condition of bolts (h) Wear or damage to pins	
III. Propulsion transfer device	A. Cross heads			(a) Wear or damage of main body, slider cylinder or cross head pin, etc. (b) Gap between cross head slider hardware and slider rod (c) Reciprocal sealing among cross head pin hole, cross head pin tapered section and wedge bushing (d) Mounting condition of cross head	
	B. Slider rod			(a) Damage or wear of body (b) Cracks on slider rod bracket (c) Mounting condition of slider rod	
	C. Main link rod			(a) Deformation or cracks of main body (b) Wear of fitting sections of bracket hardware (c) Sealing condition of frame or wedge	
	2 Coupler rod			(a) Deformation or cracks of main body (b) Wear of fitting hole or forked section	
	D. Knuckle pin			(a) Deformation or damage of main body (b) Reciprocal sealing among coupler rod knuckle pin hole, elbow pin tapered section or wedge ring	
	E. Crank pin			(a) Looseness, wear, damage or deformation of main body (b) Crank pin deviation	Measurement
IV. Brake device	A. Foundation brake device	(1) Levers・Rods, etc.		(a) Wear, cracks, deformation of levers and rods	

				(b)Damage or wear of movable or sliding parts	
		(2) Brake cylinder		(a) Damage, cracks or wear to inner surface of cylinder, pistons (b) Amount of lubricant	
	B. Hand brake device			(a)Damage or wear of movable or sliding parts (b) Function	
	C. Air brake device	(1) Brake valve		(a)Damage or wear of movable or sliding parts (b) Valve and valve seat contact and spring damage (c) Damage, degradation or deformation of membrane plate or packing	
		(2) Air compressors		(a) Wear or damage of steam cylinder, air cylinder, piston, etc. (b) Gap between cylinder and piston (c) Wear or damage to steam chamber, steam valve, reverser valve, reverser rod, air valve, etc. (d) Oil volume, leaking air, leaking oil	
		(3) Regulator		According to IV-C. (1)	
		(4) Supply air valve and pressure reduction valve		According to IV-C. (1)	
		(5) Distribution valve		According to IV-C. (1)	
		(6) Air tank		Corrosion and mounting condition of body or protective hardware	
		(7) Air piping, etc.		(a) Damage and mounting condition of air pipe, hose or strainer. (b) Opening and closing and mounting condition of cock	

	D. Steam brake device			(a) Wear of inner wall of cylinder, piston, piston ring and piston rod and damage to spring (b) Air leakage or wear at brake valve and valve seat	
V. Other devices	A. Whistle			Damage, contamination and mounting condition of each section.	
	B. Various display devices			Damage and mounting condition of each section.	
	C. Instruments			(a) Damage and mounting condition of body (b) Function of pressure gauge (c) Function of speedometer (c) Function of speedometer	 Measurement Measurement
	D. Coupler	(1) Automatic coupler		(a) Cracks, damage, deformation or wear of body, lock, joints, pins, etc. (b) Inner surface distance of elbows and guide arm. (c) Functions	 Measurement
		(2) Buffing and draw gear		Damage, wear, deformation and mounting condition of frame, buffing spring, follower plate, follower plate guide	
		(3) Shank guide		Damage, wear, deformation and mounting condition	
		(4) Pneumatic coupler		Damage or degradation of hoses, packing, etc.	
		(5) Water supply hose		Damage or degradation of hoses, packing, etc.	
	E. Automatic train stop device	(1) Onboard element		Damage, contamination and mounting condition	Damage, contamination and mounting condition
		(2) Main body of receiver, logic section, power supply section		Damage and mounting condition of each section.	

	F. Lighting devices			(a) Wear or damage turbine frame, shaft, bearing, roller wheels, speed adjuster, piston valve, valve cage, etc.	
				(b) Wear or damage to generator frame, cover, bearings, armature field coil	
				(c) Wear, damage or looseness of brushes, brush holders and commutator surface	
				(d) Rotating characteristics	Rolling test
				(e) Contamination, damage and mounting condition of fixtures, globes, lenses, reflector mirrors, receptacles and switches	
				(f) Damage and mounting condition of wires, connection boxes and other attached parts	
				(g) Insulation characteristics	Insulation resistance test
VI. Overall inspection				(a) Mounting condition of each unit of equipment.	
				(b) Car body tilt	Measurement
				(c) Height of obstacle deflector, sander pipe and rail water sprinkler	Measurement
				(d) Condition of fired equipment, etc.	
				(i) Function of boiler safety valve and sealing	
				(ii) Mounting condition of injector and air leakage of pipe joints	
				(iii)Injector temperature and action of water leveler and water filler	
				(iv) Action of bypass pipe	
				(v) Air leakage of bypass valve air piston	
				(vi) Mounting condition of reverser	
				(vii) Air leakage of cylinder and steam chamber	Measurement
				(e) Leakage of air brake control device	
				(f) Functions of brake device	

				(g) Capability of compressor and function of regulator (h)Function of whistle (i) Function of each display device (j) Insulation characteristics of electrical circuits (Except circuits used by battery, semiconductor, etc.) (k) Height of coupler (l) Operating characteristics and functions of automatic train stop device and automatic train brake device. (m) Lighting function of lighting devices	 Insulation resistance test Measurement
	G. Operating condition recording device			Damage and mounting condition of each section.	
VII. Test operation				(a) Starting, accelerating and decelerating performance (b) Condition at time of cutoff (c) Combustion condition during air feeder operation, air flow condition and pressure elevation functions of the steam (d) Air and water supply and air leakage at piston rod packing (e) Main functions of brake device (f) Abnormal sounds and swaying (g) Indication condition of instruments (h) Heat or leakage of bearings and movable parts after test operation (i) Function of operating condition recording device	

(No. 4): Items and Methods for Periodic Inspection (Passenger cars, freight cars and baggage cars)

Classification			Type	Inspection Item	Inspection Method
I. Running Gear, etc.	A. Bogies	(1) Bogie frame and swing bolster		(a) Deformation, cracks, and/or corrosion of frame assembly, swing bolster, equalizer, etc. (b)Damage or wear of sliding surfaces (c) Damage or wear to swing bolster or swing bolster pin. (d) Damage or defect of the air reservoir	
		(2) Centering plate and bracket		(a)Damage or wear of friction surfaces. (b) Amount of lubricant	
		(3) Axle box support and xxx		(a) Damage, wear, discoloration and clearance of bearings, etc. (b)Amount of lubricant and contamination. (c)Clearance between axle box guard and axle box.	 Measurement
		(4) Wheels and axles		(a) Damage to tread surface of wheel. (b) Shape of wheel a: Wheel diameter or tire width b: Flange thickness and height c: Back gauge (3) Damage to axles	 Measurement Defect Inspection
		(5) Dampening of suspension		(a) Spring damage, wear or deformation (b) Oil damper function or oil leakage (c) Air spring height adjustment valve, differential pressure operating valve, etc., according to IV-B (1).	
II. Brake device	A. Foundation brake device	(1) Levers・Rods, etc.		(a) Wear, cracks, deformation of levers and rods (b)Damage or wear of movable or sliding parts	
		(2) Brake cylinder, including brake diaphragm		(a) Damage, cracks or wear to inner surface of cylinder, pistons and rubber bellows (b) Amount of lubricant	
		(3) Automatic gap adjuster		(a) Damage, wear or deformation of each part (b) Function	

	B. Manual brakes (including foot brakes)			(a)Damage or wear of movable or sliding parts (b) Function	
	C. Air brake control device	(1) Control valve (including relay valve, conductor's valve, etc.)		(a)Damage or wear of movable or sliding parts (b) Valve and valve seat contact and spring damage (c) Damage, degradation or deformation of membrane plate or packing	
		(2)Load compensating device		According to II-C (1)	
III. General electric devices	A.. Power supply devices and motors	(1) Axle generator device		(a) Damage and mounting condition of each section. (b) Function (c) Insulation characteristics	Insulation resistance test
		(2) Engine and attached devices		(a) Damage or wear of each part (b) Engine starting and stopping functions (c) Abnormal noise, vibration, heat or leakage from each part (d) Mounting condition of intake/exhaust device, fuel device, fuel control device, lubricator, cooling device and electric devices (e) Functions	
		(3) Generator and electric blower		(a) Damage to each section (b) Function (c) Insulation characteristics	Insulation resistance test and dielectric strength test
		(4) Excitation regulator		Damage and mounting condition of each section.	
				(a) Mounting condition	

		(5) Auxiliary transformer		(b) Insulation characteristics	Insulation resistance test and dielectric strength test
		(6) Rectifier (Including charger device)		(a) Mounting condition of each section. (b) Function (c) Insulation characteristics	Insulation resistance test
		(7) Battery		(a) Corrosion, damage and mounting condition of jumper, terminals, etc. (b) Weight and specific gravity of electrolyte	
	B. Relays・Solenoid valve・Wiring	(1) Fuses, switches, etc.		(a) Contamination or damage of contact section (b) Mounting condition	
		(2) Contactors and relays		(a) Contamination or damage to insulation (b)Damage or wear of movable or contact parts (c) Mounting condition of each section. (d) Functions	
		(3) Solenoid valve		(a) Broken wires or burns on coil (b) Valve and valve seat contact and valve lift (c) Mounting condition of each section. (d) Functions	
		(4) Wiring		(a) Damage and mounting condition of wires, connection boxes and other attached parts (b) Insulation characteristics	Insulation resistance test
IV. General pneumatic devices	A. Air compressors and attached components	(1) Air compressors		(a)Motors shall be according to II-B (b) Damage or wear of each part (c) Oil volume, leaking air, leaking oil (d) Functions	
		(2) Regulator and safety valve		(a) Damage or wear of each part (b) Function	
		(1) Pressure reduction valve, etc.		(a) Valve and valve seat contact and spring damage	

	B. Valves・ Air tank・ Wiring, etc.			(b) Damage, degradation or deformation of membrane plate or packing (c) Functions	
		(2) Other valves		(a) According to IV-B (1) (d) Electric parts shall be according to III-B.	
		(3) Air tank		Corrosion or mounting condition of body or protective hardware	
		(4) Air piping, etc.		(a) Damage and mounting condition of air pipe, hose or strainer. (b) Opening and closing and mounting condition of cock	
V. Car body and car rooms	A. Underframe			(a) Damage, deformation, cracks, or corrosion of beams,hanger beam, etc.	
	B. Interior/exterior of car rooms			(a) Damage or corrosion of ceiling, floor, external sheeting,interior panels, gang plank (b) Damage and mounting condition of window, diaphragm, seats and other amenity parts (c) Damage and mounting condition of sliding doors, folding doors, hinged doors, locks, etc. (d) Contamination or peeling of paint (e) Damage, corrosion or mounting condition of tank and its other devices and equipment	
	C. Roof			(a) Damage, deterioration or peeling of roof covering (b) Damage, corrosion and mounting condition of ventilators, air conditioner covers and gutters	
	D. Automatic door operator (Including door security device)			(a) Damage, wear, deformation and mounting condition of door operator, arms, links, rollers and slides (b) Electric parts for solenoid valves, door closed switch, door closed security device shall be according to III-B.	

				(c) Leaking air, leaking oil from door operator, air pipes, etc. (d) Open/closing operation	
	E.. Lighting devices			(a) Damage and mounting condition of lights and fixtures (b) Solenoid valve is according to III-B. (2)	
VI. Other devices	A. Signal・Communication and public address device	(1) Signal device, including emergency notification device		Damage, contamination and mounting condition of each section.	
		(2)Communication and public address device		Damage and mounting condition of each section.	
	B. Various display devices			Damage and mounting condition of lights, fixtures, etc.	
	C. Instruments			(a) Damage and mounting condition of body (b) Function of pressure gauge (c) Function of electrical instruments (voltmeter, ammeter, etc.)	Measurement
	D. Coupler	(1) Automatic Coupler		(a) Cracks, damage, deformation or wear of body, lock, joints, pins, etc. (b) Inner surface distance of elbows and guide arm. (c) Functions	Measurement
		(2) Buffing and draw gear		Damage, wear, deformation and mounting condition of frame, buffing spring, follower plate, follower plate guide	
		(3) Shank guide		Damage, wear, deformation and mounting condition	
		(4) Pneumatic coupler		Damage or degradation of hoses, packing, etc.	
		(5) Electric coupler		(a) Contamination or damage to body, insulation, packing, wires, etc. (b) Function	

	E. Container locking device			Damage, wear, deformation and mounting condition of each unit.	
7 Overall inspection				(a) Mounting condition of each unit of equipment. (b) Leakage of air brake control device and general air devices (c) Functions of brake device (d) Insulation characteristics of electrical circuits (Except circuits used by battery, semiconductor, etc.) (e) Car body tilt and side bearing gap (f) Function of automatic door closing device (g) Lighting function of lighting devices (h) Function of signal, communication and public address devices (a) Function of each display device (j) Height of coupler (k) Wheel load condition (on freight cars and baggage cars, this is limited to two-axle rolling stock using bogies with bogie frames having the same level of high torsional rigidity as passenger cars).	 Measurement Insulation resistance test and dielectric strength test Measurement Measurement Measurement
8 Test operation				(a) Abnormal sounds or swaying (b) Heat or oil leakage of wheel axle bearing after testing	