

**MINISTRY OF TRANSPORT
VIETNAM RAILWAY ADMINISTRATION
THE SOCIALIST REPUBLIC OF VIETNAM**

**THE STUDY ON BUILDING
THE NATIONAL TECHNICAL REGULATION
AND STANDARD SET FOR RAILWAY**

FINAL REPORT

Summary

June 2009

**JAPAN INTERNATIONAL COOPERATION AGENCY
JAPAN RAILWAY TECHNICAL SERVICE**

EID

JR

09-071

Preface

In response to the Government of Vietnam, the Government of Japan decided to implement a Study on Building the National Technical Regulation and Standard Set for Railway in Vietnam, and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team consisted of the Japan Railway Technical Service (JARTS) members, headed by Mr. Kiichi Takemura, nine times to Vietnam from February 2008 to April 2009.

The team held discussions with the officials concerned of the Government of Vietnam and other related agencies, and also promoted studies on important matters required on railways in Vietnam. As an outcome of these efforts, the final report has been completed for submission.

I hope that this report will contribute to the enactment and enforcement of the National Technical Regulation and Standard Set for Railway with a proper promotion of safe and stable railway businesses, as well as to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to those who have kindly extended support and cooperation to the study.

June 2009

Toshiyuki Kuroyanagi
Director General
Economic Infrastructure Department
Japan International Cooperation Agency (JICA)

June 2009

Mr. Toshiyuki Kuroyanagi
Director General
Economic Infrastructure Department
Japan International Cooperation Agency (JICA)

Submission of Final Report

Dear Mr. Kuroyanagi,

It is my great pleasure to submit herewith the final report on "Study on Building the National Technical Regulation and Standard Set for Railway (the Technical Regulation and Standard)".

The Government of Vietnam has been engaged in the development of urban railways to solve traffic problems in such large cities as Hanoi and Ho Chi Minh cities. However, since electrified railway is the first experience in Vietnam, it was absolutely necessary and urgent for the Government to build the technical regulation and standard to properly guide and supervise railway operators or business entities for the safe and stable railway transport.

This Study was conducted to prepare the draft of the Technical Regulation and Standard, and also to provide necessary support for their enactment as well as recommendation on how to enforce them including institutional settings. In preparing the draft of the Technical Regulation and Standard, the study team keeps in mind the importance of their openness, neutrality and equitability. For this purpose, the study team held seminars four times during the study to collect opinions on the Technical Regulation and Standard from the parties concerned in railway field.

The Technical Regulation and Standard is now steadily being scrutinized for their enactment by Vietnamese side. The study team wishes that the Technical Regulation and Standard really make a basis for the development of railway businesses in Vietnam.

On behalf of the study team, I would like to express my heartfelt appreciation to the officials in Japan (those in JICA Head Office and Vietnam Office, Ministry of Foreign Affairs, Japanese Embassy in Vietnam, and Railway Bureau /Ministry of Land, Infrastructure, Transport and Tourism) for their assistance and cooperation during the study.

I also would like to express my hearty thanks to Dr. Yoshihiro Suda, Professor of University of Tokyo, Mr. Satoru Onoyama, Railway Electrical Engineering Association of Japan and Mr. Nobukuni Ishii, Japan Train Operation Association, the members of JICA's advisory committee for the study, for their valuable advices kindly extended to the study team.

Finally, I express my sincere gratitude to the officials in Vietnam (those in Vietnam Railway Administration (VNRA), Department of Science and Technology (DOST) in Ministry of Transport, Ministry of Science and Technology, Vietnam Railway Corporation, Hanoi and Ho Chi Minh People Committee, and other organizations) for their favor and cooperation kindly extended to the study team during our stay in Vietnam.

Kiichi Takemura
Leader, Study Team on Building the National Technical Regulation and Standard Set for Railway
Japan Railway Technical Service (JARTS)

Composition of the Report

The final report is composed of 4 parts.

Part-I: General

This part describes the basic policy and the method of the study as well as how to apply and operate the technical regulation.

Part-II: Draft Technical Regulation

This part contains the draft of technical regulation for railway in Vietnam.

Part-III: Draft Urban Railway Standard

This part contains the draft of the technical standard for urban railways in Vietnam.

Part- IV : Draft Commentaries for Technical Regulation (Separate Volume)

This part contains the draft of the detailed explanation for the proposed Technical Regulation.

This summary report contains the above Part-I, II and III.

ABBREVIATIONS

AC	-	Advisory Committee
ADB	-	Asian Development Bank
AGT	-	Automated Guideway Transit
APEC	-	Asia and Pacific Economic Council
ATC	-	Automatic Train Control
BRT	-	Bus Rapid Transit
EN	-	European Norm
HAIDEP	-	Comprehensive Urban Development Programme in Hanoi City
HAPI	-	Hanoi Authority for Planning and Investment
HCMCPC	-	Ho Chi Minh City People's Committee
HOUTRANS	-	Study on the Urban Transport Master Plan and Feasibility Study in Ho Chi Minh Metropolitan Area
HPC	-	Hanoi People's Committee
HRB	-	Hanoi Metropolitan Rail Transport Project Board
JBIC	-	Japan Bank for International Cooperation
JICA	-	Japan International Cooperation Agency
LRT	-	Light Rail Transit
MAUR	-	Management Authority for Urban Railways
MOF	-	Ministry of Finance
MOT	-	Ministry of Transport
MOST	-	Ministry of Science and Technology
MRT	-	Mass Rapid Transit
RPMU	-	Railway Projects Management Unit
SOE	-	State-owned Enterprise
STAMEQ	-	Directorate of Standards and Quality
STRASYA	-	Standard Urban Railway System for Asia
TRICC-JSC	-	Transport Investment and Construction Consultant Joint Stock Company
TUPWS	-	Transportation and Urban Public Works Services
TWG	-	Technical Working Group
VNR	-	Vietnam Railway Corporation
VNRA	-	Ministry of Transport Vietnam Railway Administration
WTO	-	World Trade Organization

TABLE OF CONTENTS

Executive Summary	1
Chapter-1. Legal Framework of Railways.....	3
1-1 Enactment of the Railway Law	3
1-2 Railway Business in Vietnam.....	3
1-3 Technical Regulations in the Legal Framework of Railway	5
Chapter-2. Development Plans for Principal Urban Railway in Vietnam	7
Chapter-3. Technical Regulations and Standards for Railways in Major Countries	11
3-1 Technical Regulations and Standards in Japan.....	11
3-2 Technical regulations and Standards in the United States.....	12
3-3 Technical Regulations and Standards in Europe	12
3-4 Technical Regulations and Standards in China	14
Chapter-4. Implementing Structure for the Study	19
Chapter-5. Outline of the Technical Regulation and Standard in the Study	23
5-1 Scope of the National Technical Regulation and Standard Set for Railway in Vietnam.....	23
5-1-1 Performance-based Approach to Technical Regulation.....	23
5-1-2 Law on Standards and Technical Regulations (Law No.68/2006/QH11).....	24
5-1-3 Scope of the Regulation.....	24
5-1-4 Scope of the Standard	26
5-2 Outlines of Technical Working Groups	27
5-2-1 Working Groups for Tracks and Civil Engineering Structures.....	28
5-2-2 Working Groups for Electricity and Signaling/Telecommunications	28
5-2-3 Working Group for Rolling Stock	30
5-2-4 Working Group for Train Operation	30
5-3 Consultation with Related the Authorities	31
5-3-1 Consultation with the Ministry of Science and Technology	31
5-3-2 Consultation with the Ministry of Construction and Ministry of Natural Resources and Environment	31
5-3-3 Consultation with Hanoi and Ho Chi Minh Cities	32
Chapter-6. Enactment of Technical Regulations and Standards in Vietnam	33
Chapter-7. Enforcement of the Technical Regulations.....	36
7-1 Ensuring Safety of Railways by Application of the Technical Regulation	36
7-1-1 Enforcement Procedure of the Technical Standards in Japan	36
7-1-2 Appropriate Scheme for Application of the Technical Regulation in Vietnam	38
7-1-3 Organization/Institution to Enforce the Technical Regulations.....	39
7-2 Appropriate Review of the Technical Regulation	42
7-3 Flexible Application of the Technical Regulation	42
7-4 Recommendation for Enforcement of the Technical Regulation	43
Draft Technical Regulation.....	TR-1
Draft Urban Railway Standard	US-1
Appendix-1 Legal system in Vietnam.....	App1-1
Appendix-2 Railway Law (35/2005/QH11)	App2-1

LIST OF TABLES

Table 1-1 Key data of VNR.....	4
Table 1-2 Articles in the Railway Law incompatible with stipulations as urban railways.....	5
Table 2-1 Development plans for principal urban railways in Vietnam.....	7
Table 2-2 Principal Specifications for Ho Chi Minh Metro Line No. 1.....	10
Table 2-3 Principal Specifications for Hanoi Metro line No. 3.....	10
Table 3-1 Principal Laws on Railways in Japan.....	11
Table 3-2 Specifications for Major Urban Railways in Japan (Except JR companies).....	11
Table 3-3 Specifications of Subways in Principal Cities in the UK, France and Germany.....	13
Table 3-4 Examples of EN standards for railways.....	14
Table 3-5 Principal Specifications of Subways in China.....	15
Table 3-6 Comparison of Regulations in China and in Vietnam.....	16
Table 4-1 List of AC Members (Decision 1189/QD-BGTVT, as of April 29, 2008) -Original.....	20
Table 4-2 List of TWG members on the Vietnamese side.....	21
Table 4-3 Record of the Study (AC Meetings and Seminars).....	22
Table 5-1 Applicability of the Regulations.....	25
Table 5-2 Interrelated Issues in the Technical Regulation.....	27

LIST OF FIGURES

Figure 2-1 Urban Railway Plan of Hanoi City.....	8
Figure 2-2 Urban Railway Plan of Ho Chi Minh City.....	9
Figure 4-1 Implementing Structure for the Study.....	19
Figure 5-1 Concept of Technical Regulation and Standard in the Preparatory Study (October 2007)..	23
Figure 5-2 Concept of the Regulation and the Standard in the Study.....	25
Figure 6-1 Procedures for Preparation, Evaluation and Issuance of the Technical Regulation.....	34
Figure 6-2 Procedures for Preparation, Evaluation and Issuance of the Standards.....	35
Figure 7-1 Procedures for Construction and Remodeling of Railways in Japan.....	38
Figure 7-2 Organization Chart, Railway Bureau - Head Office, MLIT (FY 2008).....	40
Figure 7-3 Organization Chart of Railway Division - Regional Transport Bureau, MLIT (fiscal 2008)	41

EXECUTIVE SUMMARY

1. Background

In recent years, the Government of Vietnam (GOV) has been increasing its efforts on introducing urban railway systems to cope with chronic traffic congestions in such mega cities as Hanoi and Ho Chi Minh. Urban railways, however, are planned to be electrified, which have never been actualized in Vietnam; and it is expected that the existing railways will also be electrified in the future. Therefore, it is vital and urgent for GOV to build a technical regulation observed by railway operators (and/or business entities), as well as to prepare technical standards which are to be a model of railway specifications in line with the regulation. In this context, GOV requested the Government of Japan to support establishment of the technical regulation for railways and the standards for urban railways.

2. Objective of the Study

The objective of the study is to prepare the draft of railway technical regulation and urban railway standards for the better railway administration as well as the smooth implementation of urban railway projects in Vietnam. The study also aims to transfer relevant skills and technologies to Vietnamese counterpart and to support their legalizing process together with valuable recommendations for the enforcement of the regulation.

3. Methodology

- (1) In the Study, the technical regulation and the standards were basically drafted referring to the Japanese technical standards*. And, at the same time, by having many discussions with Vietnamese counterparts and experts, necessary modifications were made so that they will suit the actual condition in Vietnam. For the purpose of actualizing intensive discussions and effective transfer of skills/technologies in each field of specialty, Technical Working Group (TWG) was established with four sub-groups: track and civil structure; electricity and signaling/telecommunication; rolling stock; and train operation. In addition, Advisory Committee (AC) and/or technical seminars were held from time to time to disseminate the study results to the related organizations and to coordinate cross-cutting issues among them. Furthermore, some of the counterparts were trained in Japan for better understanding on the Japanese railway technologies.

**) In Japan, "standard" is often used with the meaning of "regulation".*

- (2) The period following the submission of the draft final report, i.e. the draft of the technical regulation and standards, was devoted to the assistance for the legalizing process in Vietnam. For this purpose, the study team established a contact point in Vietnam, while the study team visited Vietnam from time to time responding to technical issues as emerged in the process.
- (3) JICA also established a committee at its headquarter in Tokyo, chaired by Dr. Suda, Professor of Tokyo University, to seek technical advices on the study. A series of the study reports were reviewed and discussed by the committee members before being handed to the Vietnamese counterparts.

4. Results of the Study

(1) Railway Technical Regulation

The Railway Technical Regulation shall be compulsorily applied to railway operators (and/or business entities) to ensure the safety of railways. The regulation basically consists of performance-based prescriptions, while some important numerical values/figures are incorporated to the supplementary provisions of the regulation upon request of Vietnamese side. It should be noted that the regulation was prepared to be open to various railway specifications/standards.

(2) Commentaries on Railway Technical Regulation

The Commentaries on the Railway Technical Regulation are detailed explanations on the regulation with concrete numerical values/figures. The contents of the commentaries are not the ones which will be compulsorily applied to railway operators but will be referred as the document for the government to supervise them, or the documents for railway operators to determine their railways specifications.

(3) Urban Railway Standards

The Urban Railway Standards, which applies to railway operators on voluntary basis, is a set of typical specifications for urban railways being selected from the commentaries, and thus a model of specifications satisfying the regulation. It should be noted that the standards were formulated taking into consideration such merits as inter-operability, joint use of rolling stock as well as their depots/workshops, between different lines; those merits will be realized through the development of an integrated urban railway system under unified standards.

(4) Technology Transfer and Recommendation on the Enforcement of the Regulation

Through seminars, training in Japan and discussions in TWG, necessary skills/technologies were transferred to Vietnamese side. The study also fostered Vietnamese awareness on how to enforce the regulation in real situations.

CHAPTER-1. LEGAL FRAMEWORK OF RAILWAYS

1-1 Enactment of the Railway Law

In 2003, the former Vietnam Railways, which had been the sole railway manager and operator in Vietnam, split into two entities: Vietnam Railway Administration (VNRA) under the Ministry of Transport (MOT) who is in charge of state management for railway transport, and Vietnam Railway Corporation (VNR) functioning as a railway operator with a business-oriented manner.

Based on the above re-organization process and with the progress of railway sector reform, Railway Law (09/2005/L-CTN), the first basic law for railways in Vietnam, was enacted in 2005, which contains the following chapters. (See Appendix-1 for the full text of the law.)

- ✓ Chapter 1 General
- ✓ Chapter 2 Railway infrastructure
- ✓ Chapter 3 Railway traffic means
- ✓ Chapter 4 Railway-men directly participating in railway transport
- ✓ Chapter 5 Urban railway
- ✓ Chapter 6 Railway traffic rules and signals, ensuring railway traffic order and safety
- ✓ Chapter 7 Railway business
- ✓ Chapter 8 Implementation provisions

The law provides basic principle in railway activities that Vietnamese railways must be developed in a modern, sustainable and safe manner. For this purpose, the law clearly states that distinction between the state management and the railway business by enterprises, and between the railway infrastructure business and the railway transport business on railways must be ensured in order to create an environment for fair competition in railway business and to attract domestic and foreign investment in railway development.

The law also introduces new classification of railway with 3 categories: National railways, urban railways and specialized railways. National railways serve common transport demands of the whole country as well as international transport, while urban railways serve the daily passenger transport demands in cities and sub-urban area.

As for urban railways, the law says the State shall mobilize resources for development of urban railways as one of principal traffic modes in big cities. In face of current problems such as traffic jams, environmental pollution and traffic accidents in big cities such as Hanoi and Ho Chi Minh, urban railways as a mass-transit seems to be the best solution. In response to this, the law provides preferential policies to attract domestic and foreign investment in constructing and exploiting urban railways, including the provision of central budget supports for urban railway development.

1-2 Railway Business in Vietnam

The Railway Law contains important provisions on doing business in railway infrastructure, railway transport and railway transport support services. It also defines the rights and obligations of

organizations and individuals in railway business, including those of railway infrastructure business enterprises and railway transport enterprises.

Real business has not yet realized for urban railways, but on the other hand, national railways has been managed and operated exclusively by VNR with railway transport business undertaken by three affiliated companies: Hanoi Railway Passenger Transport Company, Saigon Railway Passenger Transport Company and Railway Freight Transport Company. All those companies' accounts are consolidated with VNR. Table 1-1 shows the key data of VNR.

Table 1-1 Key data of VNR

Item	Contents
Length of revenue service lines	2,600 km
Yearly volume of passenger transport	10.78 million passengers 3.7 billion passenger-kilometers
Yearly volume of freight transport	6.94 million tons, 2.3 billion ton-kilometers
Number of employees	43,751 persons
Income and expenditure	Income: 1 trillion 460.9 million VND Expenditure: 1 trillion 4,532 VND

Source: World's Railways (Japan Railway Technical Service)

In terms of regulations/rules for railway business, the Ministry of Transport (MOT) issued two Decisions: Decision No.01/2006/QD-BGTVT dated 4 January 2006 referring to "regulations on the transport of passenger, baggage and sending luggage on the national railway", and Decision No. 05/2006/QD-BGTVT dated 13 January 2006 referring to "regulations on the transport of goods on the national railway", which supplements basic provisions stipulated in the Railway Law.

Article 91 of the law states the principle of establishing a transport contract saying "Passenger ticket is an evident for signing a passenger transport contract. Passenger ticket is issued by passenger transport enterprises in accordance with forms registered with state authority."

Clause 2 of Article 97 stipulates that railway operators shall "publicly post up necessary operating rules for passengers transport." Based on this clause, VNR sets forth their operating rules for transport of passenger and goods in May 2007.

Regarding fares, Article 93 prescribes that "Transport fares must be publicized and posted up at railway stations before the implementation dates at least five days for passenger, luggage and cargo luggage transportation and ten days for cargo transportation, except for fare reduction."

As for tickets, Clause 2 of Article 99 stipulates that "Train travelers must have regular passenger and luggage tickets and take care of their accompanied luggage by themselves. Train travelers having no tickets or irregular tickets must buy supplementary tickets and pay a fine as regulated by railway transport enterprises." According to the above VNR's operating rule, the amount of fine will be five times the due amount of the ticket.

For reference, Major urban railways in Asian countries normally sell monthly tickets for students and

commuters, but VNR does not have such ticket system, which indicates that VNR lines or national railways are not functioning as commuting lines as urban railways will be. Commuter tickets are sold only for buses in Hanoi city.

1-3 Technical Regulations in the Legal Framework of Railway

The Railway Law specifies a framework for railway management and operation, and contains some basic technical provisions. However, “Law” is the second highest rank in the legislative hierarchy in Vietnam (refer to Appendix-1), and thus, the law does not go into detail about technical regulations.

On the other hand, the former VNR had developed internal technical norms/rules including special procedures for train operation at stations, maintenance manuals for facilities and equipment etc. Based on these norms/rules, “Norms of Railway Operation in Vietnam” was issued in December 2005, and some of them have been in force as MOT decisions/instructions through legal procedure.

However, these norms/rules were developed for non-electrified single-track railways and accordingly could be applied only for existing national railway, because they does not include items on new systems such as electrified equipment and ATC introduced in the future.

Considering that VNRA should play a key role in supervising VNR and other railway business entities including local autonomous bodies, establishment of technical regulations and standards for railways is crucial and urgent not only for VNRA but also for various railway operators and business entities to realize safe and sustainable railway management and operation especially for electrified double-track urban railways in the future.

As for the technical provisions in the Railway Law, the Study Team found it contains some clauses incompatible with urban railway management and/or operation, as shown in the table below.

Table 1-2 Articles in the Railway Law incompatible with stipulations as urban railways

Article	Contents
Article 47 - Clause 3 (c)	The applicant for the train-driving license must fulfill continuous working period of, not less than 24 months as driving assistant. (Whereas the system of assistant driver does not exist for urban railways.)
Article 63	Signal systems are limited to color light, semaphore and ground signals. (Whereas stipulations on new cab signals such as those of ATC are must for urban railways.)
Article 68 - Clause 1 (a)	When operating a train at stations such for starting, running though, stopping, giving ways or overtaking, etc, train drivers shall obey the orders of station train controllers. (Whereas in the normal case of urban railways, the driver never starts the train before he/she checks the opening and closing of train doors by himself/herself.)

VNRA expressed their view and stated that the above issues are not so critical because VNRA will be

able to revise the Railway Law when required. In this regard, VNRA also added that the existing decisions/instructions by Ministers will be revised or abolished if they are not consistent with the technical regulation which is to be legalized in the future based on the Study.

CHAPTER-2. DEVELOPMENT PLANS FOR PRINCIPAL URBAN RAILWAY IN VIETNAM

In recent years, vehicle traffic in urban area is increasing dramatically and such trend is more noticeable for motorcycle traffic in big cities, which causes chronic traffic jams, air pollution and other problems. In order to improve this situation, the Vietnamese government has been making every effort to develop urban railways in such mega cities as Hanoi and Ho Chi Minh in accordance with the master plan of urban railway network (Table2-1). A financial agreement for the Ho Chi Minh metro line No. 1, the first urban railway in Vietnam, has been concluded with the Japanese government by the Special Terms for Economic Partnership (STEP) scheme in 2007. Table2-2 summarizes the principal specifications for the Ho Chi Minh metro line No. 1 and those for Hanoi metro line No. 3 in Table 2-3.

Table 2-1 Development plans for principal urban railways in Vietnam

City	Line	Outline and present status of the plan
Hanoi city	Line No. 1	<p>This line will be developed utilizing the existing national railway line of VNR. Compatibility between the system as an urban railway and the existing system of national railway is now under discussion, because the existing line is a 1,000 mm-gauge single-track system. If it is treated as an urban railway, the standards of urban railways examined in the Study will be applied.</p> <p>The total length is 28.8 km, which is broadly divided into the following three sections.</p> <p>Section 1: Ngoc Hoi to Giap Bat (9.6 km including 6.1 km of elevated tracks)</p> <p>Section 2: Giap Bat to Gia Lam (11.5 km of elevated tracks)</p> <p>Section 3: Gia Lam to Yen Vien (7.7 km including 4.5 km of elevated tracks)</p>
	Line No. 2	<p>The total length is 41.5 km, which is broadly divided into the following three sections.</p> <p>Section 1: Noi Bai to Nam Thang Long (13.2km)</p> <p>Section 2: Nam Thang Long to Thuong Dinh (17.2km including 3.1km of elevated tracks)</p> <p>Section 3: Thuong Dinh to Ha Dong (11.1km)</p> <p>A survey for Special Assistance for Project Formation (SAPROF) has been implemented by JICA (the former Japan Bank for International Cooperation (JBIC)). A financial agreement has been concluded with the Japanese government in 2009.</p>
	Line No. 3	<p>A financial agreement has been concluded with the French government, and feasibility study has started.</p>

City	Line	Outline and present status of the plan
Ho Chi Minh city	Line No. 1	A financial agreement has been concluded with the Japanese government. Technical specifications for tender are going to be prepared.
	Line No. 2	Several surveys have been implemented by the Asian Development Bank (ADB), Germany and Japan. However, financing scheme has not yet been determined.
	Line No. 3	

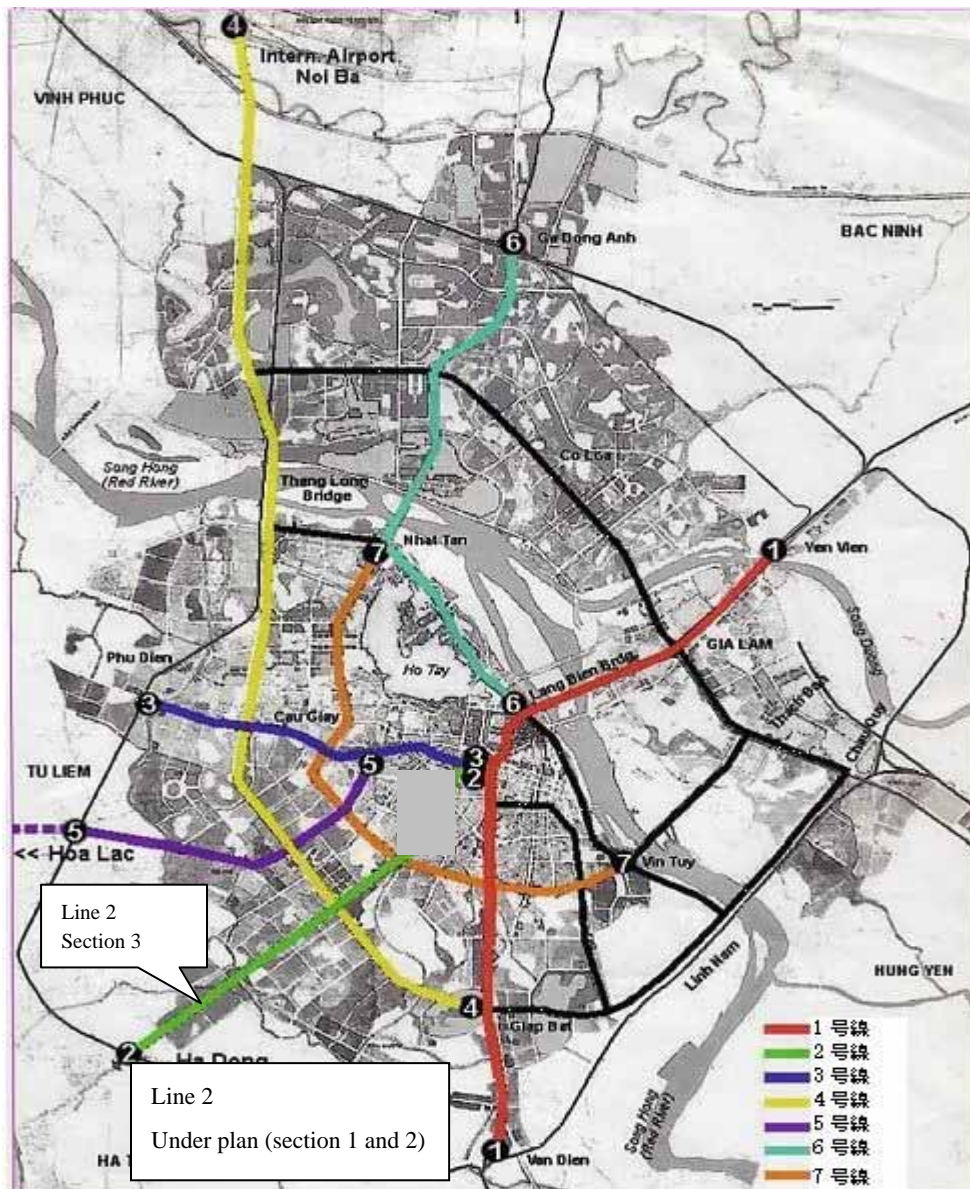


Figure 2-1 Urban Railway Plan of Hanoi City

Source: Master plan of Hanoi Urban Railways. October 2007

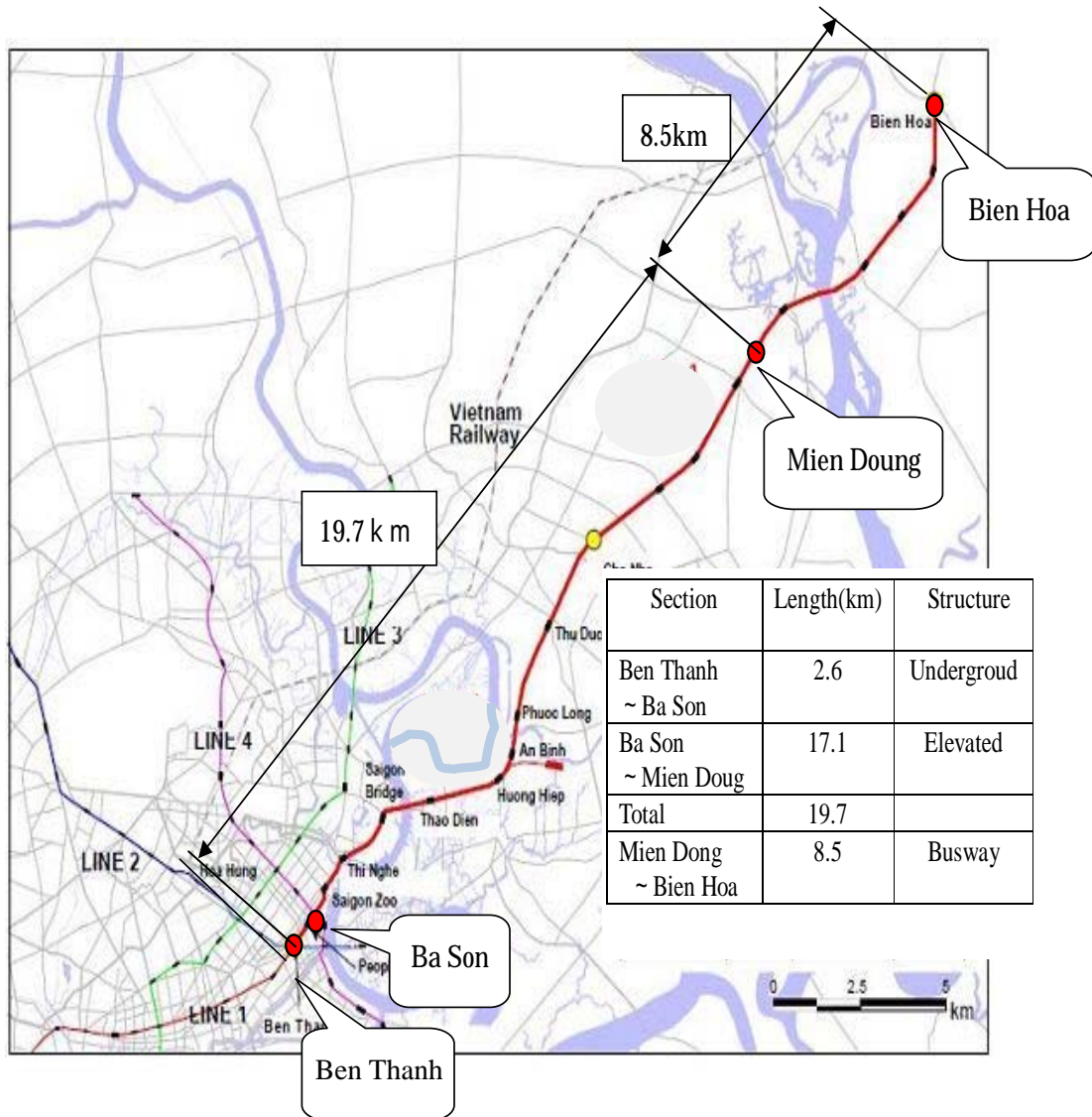


Figure 2-2 Principal Specifications for Ho Chi Minh Metro Line No. 1

Source: Special Assistance for Project Formation (SAPROF) for
Ho Chi Minh City. September 2006

Table 2-2 Principal Specifications for Ho Chi Minh Metro line No. 3

Item	Contents	Remarks
Fundamental concept	by Standard Urban Railway System for Asia (STRASYA)	STRASYA is a set of recommended specifications for urban railways by Japan
	1,435 mm	
Contact wire system	Overhead contact line system	
Feeding voltage	DC1500 V	
Maximum design speed	110 km/h	
Length of car	20 m	
Signaling	ATC	Adoption of CBTC under discussion
Driving system	ATO	
Platform door type	Underground: Platform screen door On the surface: Not determined	
Disaster prevention measures at underground stations	Based on ministerial ordinances and standards in Japan	

Note: As of November 2008, including items under discussion

Table 2-3 Principal Specifications for Hanoi Metro line No. 3

Specification	Contents	Remarks
Gauge	1,435 mm	
Contact wire system	Third rail	
Feeding voltage	DC750 V	
Maximum design speed	80 km/h	
Signaling	ATP	Automatic Train Protection system
Driving system	ATO	

Source: Hanoi Metropolitan Rail Transport Project Board (HRB)

Note: As of November 2008, including items under discussion

CHAPTER-3. TECHNICAL REGULATIONS AND STANDARDS FOR RAILWAYS IN MAJOR COUNTRIES

The Study team examined typical technical regulations and standards for railways in major countries. The following are their outlines, while the details were introduced to the Vietnamese-side at their request in the course of the Study.

3-1 Technical Regulations and Standards in Japan

Table 3-1 summarizes the principal laws on railway facilities and rolling stock structures in Japan, which are under the responsibility of Ministry of Land, Infrastructure, Transport and Tourism (MLIT).

Table 3-1 Principal Laws on Railways in Japan

Responsible Ministry	Law	Contents
Ministry of Land, Infrastructure, Transport and Tourism	Railway Operation Law	Duties of railway operators, employees and users
	Railway Business Law	Procedures and rules to ensure safe and sound railway businesses
	Building Standards Law	Standards for structure of buildings other than railway facilities, as well as their installation rules and procedures

In accordance with Article 1 of the Railway Business Law, MLIT prescribes technical details for railway operators and business entities by the Ministerial Ordinance on the technical standards for railways (hereinafter referred to as “the standards”). (Note that the term of “standards” in the technical standards corresponds to the term of “regulations” in Vietnam.)

The standards have legal force stipulating the performance-based requirements, but not providing numerical instruction to be observed. Numerical values in accordance with the standards are described in the commentaries on the standards for reference and/or voluntary application. Therefore, the railway operators and business entities shall determine their own implementation criteria including specifications for equipment and rolling stock, procedures for train operation, and other necessary provisions referring to the commentaries. When introducing new systems with original specifications and/or figures that are not specified in the commentaries, it should be certified by the Minister (MLIT) that they conform to the standards. Table 3-2 shows examples of technical specifications for major urban railways in Japan.

Table 3-2 Specifications for Major Urban Railways in Japan (Except JR companies)

City	Operator	Crew	Year/month of inauguration	No. of lines	Gauge (mm)	Electrical system	Current collection system	Operation security	Min. headway
Tokyo	Tokyo Subway (Tokyo Metro)	D/C&D	1927/12	9	1435/1067	600/1500 VDC	Third rail/Overhead	ATC	1'50"
	Transport Bureau, Tokyo Metropolis (Metropolitan subway)	D/C&D	1960/12	4	1435/1372/1067	1500 VDC	Overhead	ATS/ATC	2'30"

City	Operator	Crew	Year/month of inauguration	No. of lines	Gauge (mm)	Electrical system	Current collection system	Operation security	Min. headway
Osaka	Transport Bureau, Osaka	D/C&D	1933/5	7	1435	750/1500 VDC	Third rail/Overhead	ATC	2'00"
Nagoya	Transport Bureau, Nagoya	C&D	1957/11	6	1435/1067	600/1500 VDC	Third rail/Overhead	ATS/ATC	2'00"
Sapporo	Transport Bureau, Sapporo	C&D	1971/12	3	2150 (Lane center distance)	750/1500 VDC	Third rail/Overhead	ATC/ATO	3'00"
Yokohama	Transport Bureau, Yokohama	C&D	1972/12	2	1435	750 VDC	Third rail	ATC	4'20"
Kobe	Transport Bureau, Kobe	D/C&D	1977/3	2	1435	1500VDC	Overhead	ATC	3'00"
Kyoto	Transport Bureau, Kyoto	D/C&D	1981/5	2	1435	1500VDC	Overhead	ATC	3'30"
Fukuoka	Transport Bureau, Fukuoka	D	1981/7	3	1435/1067	1500VDC	Overhead	ATC/ATO	3'00"
Sendai	Transport Bureau, Sendai	D	1987/7	1	1067	1500VDC	Overhead	ATC	3'00"
Hiroshima	Hiroshima High-speed Railway	D	1994/8	1	1700(Running wheel center distance)	750 VDC	Double rigid third rails	ATC	2'30"
Saitama	Saitama High-speed Railway	D	2001/3	1	1067	1500VDC	Overhead	ATS/ATO	4'00"

Source: Subways in the world, Japan Subway Association, March 2005

3-2 Technical regulations and Standards in the United States

In the United States, the Department of Transportation (DOT) supervises railways as a whole, and the Federal Railroad Administration (FRA) under DOT is in charge of railways operated across state boundaries (inter-state railways). FRA sets forth regulations (hereinafter referred to as "FRA Regulations") to be observed by railway operators, which prescribe rules and procedures for the safety management of railways.

In the case of railways operated within a state including urban railways, application of the FRA regulation is non-compulsory and technical specification can be determined by railway operators and business entities.

3-3 Technical Regulations and Standards in Europe

In Europe, urban railways have been developed in different specifications by respective countries/cities for many years. Table 3-3 shows the specifications of subways in major cities in the UK, France and Germany.

- However, since the establishment of the EU, European Norms (ENs) have been introduced in various fields including those on signaling systems and rolling stock. Table 3-4 shows some examples of EN standards for railways.

These EN standards are not compulsory and railway business entities can choose the specifications selectively for relevant matters.

Table 3-3 Specifications of Subways in Principal Cities in the UK, France and Germany

Country	City	Operator	Crew	Year/month of inauguration	No. of lines	Gauge	Electrical system	Current collection system	Operation security	Minimum headway	Operating lane
UK	London	London Underground Limited (LUL)	Driver	1863/1	12	1435	630 VDC	Third-rail system	ATC/ATO	2'00"	Left
	Glasgow	Strathclyde Passenger Transport (SPT)	Driver	1896/12	1	1220	600 VDC	Third rail	ATO	4'00"	Left
	Newcastle	Tyne & Wear Passenger Transport Executive (Nexus)	Driver	1980/8	2	1435	1 500 VDC	Overhead	ATS	7'00"	Left
	Liverpool	Merseyrail	Driver/conductor	1886	2	1435	750 VDC	Third rail	ATC	15'00"	Left
France	Paris	Regie Autonome des Transports Parisiens (RATP)	Driver, driver-less	1900/7	14	1435	750 VDC	Third rail	ATC/ATO	1'35"	Right
	Lyon	Societe Lyonnaise de Transports en Commun (SLTC)	Driver, driver-less	1978/5	4	1435	750 VDC	Third rail/overhead	ATC/ATO	2'30"	Right
	Marseille	Regie des Transports de Marseille (RTM)	One-man	1977	2	1435	750 VDC	Third rail	ATP/ATO/ATS	3'00"	Right
	Lille	Transpole	Driver-less	1983/4	2	2060	750 VDC	Guide bar	CTC/ATO	1'00"	Right
	Toulouse	SA d'Economie Mixte des Transports Publics de Voyageurs de l'Agglomeration Toulousaine (SEMVAT)	Driver-less	1993/6	1	2060	750 VDC	Guide bar	CTC	1'00"	Right
	Rennes	Service de Transports de L'Agglomeration Rennaise (STAR)	Driver-less	2002/3	1	1620	750 VDC	Guide bar	CTC/ATO	2'00"	Right
	Rouen	Transports en Commun de L'Agglomeration Rouennaise (TCAR)	One-man	1994/12	2	1435	750 VDC	Overhead		3'00"	Right
Germany	Berlin	Berliner Verkehrsbetriebe GmbH (BVG)	One-man	1902/8	9	1435	750 VDC	Third rail	PTC/ATO	3'00"	Right
	Hamburg	Hamburger Hochbahn AG (hha)	One-man	1912/3	3	1435	750 VDC	Third rail	Autoblock	2'00"	Right
	Munich	Stadtwerke Munchen GmbH, Unternehmensbereich Verkehr (MVG)	One-man	1971/10	8	1435	750 VDC	Third rail	ATC	2'30"	Right
	Frankfurt	Verkehrsgesellschaft Frankfurt am Main (vgf)	One-man	1968/10	7	1435	600 VDC	Overhead	Autoblock	2'30"	Right
	Stuttgart	Stuttgarter Strassenbahnen AG (SSB)	One-man	1966	16	1435	750 VDC	Overhead	Autoblock	7'30"	Right
	Nurnberg	Verkehrs-Aktiengesellschaft Nurnberg (vag)	One-man	1972/3	2	1435	750 VDC	Third rail	Autoblock	3'20"	Right
	Koln	Kolner Verkehrs Betriebe AG (KVB)	One-man	1968	15	1435	750 VDC	Overhead		2'00"	Right
	Bonn	Stadtwerke Bonn (SWB) / Elektrische Bahnen der Stadt Bonn und Rhein-Sieg Kreises (ssb)	One-man	1991	6	1435	750 VDC	Overhead		4'00"	Right
	Bochum	Bochum Gelsenkirchener Strassenbahnen (BOGESTRA)		1 989/9	1	1435	750 VDC	Overhead	Autoblock	5'00"	Right
	Duisburg	Duisburger Verkehrsgesellschaft AG (DVG)		1 992/7	1	1435	600 VDC	Overhead		10'00"	Right
	Dusseldorf	Rheinische Bahngesellschaft AG	One-man	1981/10	7	1435	750 VDC	Overhead	ATC/ATO	10'00"	Right
	Essen	Essener Verkehrs AG (EVAG)	One-man	1977/5	3	1435	750 VDC	Overhead	ATC	4'00"	Right
	Mulheim	Mulheimer Verkehrs Gesellschaft mbH (MVG)	One-man	1979/11	1	1435	750 VDC	Overhead		10'00"	Right
	Dortmund	Dortmunder Stadtwerke AG (DSW)	One-man	1983	7	1435	750 VDC	Over head	ATC/ATS	12'00"	Right
	Bielefeld	moBiel GmbH	One-man	1991/4	4	1000	750 VDC	Overhead		5'00"	Right
	Hannover	Ustra Hannoversche Verkehrsbetriebe AG	One-man	1975	12	1435	600 VDC	Overhead	ATC	1'53"	Right
Mannheim	MW-Verkehr AG (MW)		1969/5	8	1000	750 VDC	Overhead		10'00"	Right	

Source: Subways in the world, Japan Subway Association

Table 3-4 Examples of EN standards for railways

Standard No.	Title
EN 286-3	Simple unfired pressure vessels designed to contain air or nitrogen - Part 3: Steel pressure vessels designed for air braking equipment and auxiliary pneumatic equipment for railway rolling stock
EN ISO 3095:2005	Railway applications - Acoustics - Measurement of noise emitted by rail bound vehicles (ISO 3095:2005)
EN ISO 3381:2005	Railway applications - Acoustics - Measurement of noise inside rail-bound vehicles (ISO 3381:2005)
EN 12080	Railway applications - Axleboxes - Rolling bearings
EN 12081	Railway applications - Axleboxes - Lubricating greases
EN 12082	Railway applications - Axleboxes - Performance testing
ENV 12299	Railway applications - Ride comfort for passengers - Measurement and evaluation
EN 12507	Transport services - Guidance notes on the application of EN ISO 9001:2000 to the road transport, storage, distribution and railway goods industries
EN 12561-1	Railway applications - Tank wagons - Part 1: Making of tank wagons for the carriage of dangerous goods
EN 12561-2	Railway applications - Tank wagons - Part 2: Bottom emptying devices of tank wagon for liquefied products including vapor return
EN 12663	Requirement on formation of railway vehicle bodies
EN 13452-2	Railway applications - Braking - Mass transit brake systems - Part 1: Performance requirement
EN 13103	Railway applications – Wheelsets and bogies - Non-powered axles - Design guide

3-4 Technical Regulations and Standards in China

Urban railways in China, which are similar to JR suburban lines and subways in Japan, are now rapidly being developed. There used to be subways only in four cities, Beijing, Shanghai, Tienjin and Guangzhou, but other cities such as Chungching, Shenzhen, Nangching, Dalian, Changchun and Wuhan are making strong efforts to develop urban railways.

Table 3-5 shows principal specifications in the regulations and standards for Subways which was enacted in 2003. In addition to the Design Standards for Subways, China issued general Rules on Railway Technology Management for railways in 2006.

Table 3-5 Principal Specifications of Subways in China

		Type A	Type B
Maximum speed		100 km/h	
Design life		100 years	
Gauge		1435 mm	
Operation density		40 trains per hour	
Scheduled speed		35 km/h	
Operation speed		80 km/h	
Car length		22100 mm	19000 mm
Car width		3000 mm	2800 mm
Minimum radius of curve for main lines	V<80 km/h	350 m	Minimum radius of curve for main lines
	80<V<100 km/h	550 m	
	In case not applicable	300 m	
Minimum radius of curve for non-main lines		200 m	
Vertical radius of curve	General	5000 m	
	In case not applicable	3000 m	
	At end of station (general)	3000 m	
	At end of station (in case not applicable)	2000 m	
Rail		60 kg/m, 50 kg/m	
Automatic barrier (passing capability)	Rotating gate type	Magnetic card	1500 p/h
		Non-contact type	1800 p/h
	Open gate	Magnetic card	1800 p/h
		Non-contact type	2100 p/h
Durability of platform door		One million times	
Feeding voltage	750 VDC	900–500 VDC	
	1500 VDC	1800–1000 VDC	
ATC system	Fixed block type, semi-moving block type, moving block type		
Fire prevention equipment	All passengers on the train shall be able to escape to the exit through staircases in six minutes.		
	Communication passages shall be installed at intervals of 600 m in parallel with two single-track sections		
	Reference standard: US NFPA130		

Source: Standards for the design of subways (2003/05/30)

In view of the historic relation between China and Vietnam, Vietnamese railways are largely affected by the railway regulations in China. Table 3-6 is the comparison between the Rules on Railway Technology Management in China and Norms of Railway Operation in Vietnam.

Table 3-6 Comparison of Regulations in China and in Vietnam

Item	Norms of railway operation in Vietnam (issued on December 30th, 2005)	Rules on railway technology management in China (issued on September 27th, 2006)	Remarks																																																																		
1. Track facilities	Excerpts from "The grades of railway technologies in Vietnam" (issued on July 25, 2007)																																																																				
(1) Radius of curve	(1) Minimum radius of curve Minimum radius of curve (m) <table border="1"> <thead> <tr> <th colspan="2">Classification of railway</th> <th>High speed</th> <th>Semi-high speed</th> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td rowspan="3">1,435 mm gauge</td> <td>Design speed km/h</td> <td>350</td> <td>200</td> <td>150</td> <td>120</td> <td>70</td> </tr> <tr> <td>General</td> <td>5,000</td> <td>2,000</td> <td>1,200</td> <td>800</td> <td>400</td> </tr> <tr> <td>Difficult</td> <td>Adjustment</td> <td>600</td> <td>400</td> <td>300</td> <td>200</td> </tr> <tr> <td rowspan="3">1,000 mm gauge</td> <td>Design speed km/h</td> <td></td> <td></td> <td>120</td> <td>100</td> <td>60</td> </tr> <tr> <td>General</td> <td></td> <td></td> <td>800</td> <td>600</td> <td>300</td> </tr> <tr> <td>Difficult</td> <td></td> <td></td> <td>400</td> <td>250</td> <td>150</td> </tr> </tbody> </table>	Classification of railway		High speed	Semi-high speed	1	2	3	1,435 mm gauge	Design speed km/h	350	200	150	120	70	General	5,000	2,000	1,200	800	400	Difficult	Adjustment	600	400	300	200	1,000 mm gauge	Design speed km/h			120	100	60	General			800	600	300	Difficult			400	250	150	(1) Minimum radius of curve (m) for lines common to passenger and freight transport																						
Classification of railway		High speed	Semi-high speed	1	2	3																																																															
1,435 mm gauge	Design speed km/h	350	200	150	120	70																																																															
	General	5,000	2,000	1,200	800	400																																																															
	Difficult	Adjustment	600	400	300	200																																																															
1,000 mm gauge	Design speed km/h			120	100	60																																																															
	General			800	600	300																																																															
	Difficult			400	250	150																																																															
(2) Max. gradient	(2) Maximum gradient (%) <table border="1"> <thead> <tr> <th colspan="2">Classification of railway</th> <th>High speed</th> <th>Semi-high speed</th> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td rowspan="3">1,435 mm gauge</td> <td>Design speed km/h</td> <td>350</td> <td>200</td> <td>150</td> <td>120</td> <td>70</td> </tr> <tr> <td>General</td> <td>25</td> <td>25</td> <td>12</td> <td>18</td> <td>25</td> </tr> <tr> <td>Difficult</td> <td>30</td> <td>30</td> <td>18</td> <td>25</td> <td>30</td> </tr> <tr> <td rowspan="3">1,000 mm gauge</td> <td>Design speed km/h</td> <td></td> <td></td> <td>120</td> <td>100</td> <td>60</td> </tr> <tr> <td>General</td> <td></td> <td></td> <td>12</td> <td>18</td> <td>25</td> </tr> <tr> <td>Difficult</td> <td></td> <td></td> <td>18</td> <td>25</td> <td>30</td> </tr> </tbody> </table>	Classification of railway		High speed	Semi-high speed	1	2	3	1,435 mm gauge	Design speed km/h	350	200	150	120	70	General	25	25	12	18	25	Difficult	30	30	18	25	30	1,000 mm gauge	Design speed km/h			120	100	60	General			12	18	25	Difficult			18	25	30	(2) Maximum gradient (for lines common to passenger and freight transport) Maximum gradient (%) <table border="1"> <thead> <tr> <th colspan="2" rowspan="2">Classification of railway</th> <th colspan="2">I</th> <th colspan="2">II</th> </tr> <tr> <th>General</th> <th>Difficult</th> <th>General</th> <th>Difficult</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Type of traction motor</td> <td>Electric engine</td> <td>6.0</td> <td>15.0</td> <td>6.0</td> <td>20.0</td> </tr> <tr> <td>Diesel engine</td> <td>6.0</td> <td>12.0</td> <td>6.0</td> <td>15.0</td> </tr> </tbody> </table>	Classification of railway		I		II		General	Difficult	General	Difficult	Type of traction motor	Electric engine	6.0	15.0	6.0	20.0	Diesel engine	6.0	12.0	6.0	15.0	
Classification of railway		High speed	Semi-high speed	1	2	3																																																															
1,435 mm gauge	Design speed km/h	350	200	150	120	70																																																															
	General	25	25	12	18	25																																																															
	Difficult	30	30	18	25	30																																																															
1,000 mm gauge	Design speed km/h			120	100	60																																																															
	General			12	18	25																																																															
	Difficult			18	25	30																																																															
Classification of railway		I		II																																																																	
		General	Difficult	General	Difficult																																																																
Type of traction motor	Electric engine	6.0	15.0	6.0	20.0																																																																
	Diesel engine	6.0	12.0	6.0	15.0																																																																
(3) Track center distance (straight section)	(3) Track center distance (m) <table border="1"> <thead> <tr> <th colspan="2">Classification of railway</th> <th>High speed</th> <th>Semi-high speed</th> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td rowspan="2">1,435 mm gauge</td> <td>Design speed km/h</td> <td>350</td> <td>200</td> <td>150</td> <td>120</td> <td>70</td> </tr> <tr> <td>Between main lines</td> <td>5.0</td> <td>4.3</td> <td>4.0</td> <td>4.0</td> <td>4.0</td> </tr> <tr> <td rowspan="2">1,000 mm gauge</td> <td>Design speed km/h</td> <td></td> <td></td> <td>120</td> <td>100</td> <td>60</td> </tr> <tr> <td>Between main lines</td> <td></td> <td></td> <td>4.0</td> <td>4.0</td> <td>3.8</td> </tr> </tbody> </table>	Classification of railway		High speed	Semi-high speed	1	2	3	1,435 mm gauge	Design speed km/h	350	200	150	120	70	Between main lines	5.0	4.3	4.0	4.0	4.0	1,000 mm gauge	Design speed km/h			120	100	60	Between main lines			4.0	4.0	3.8	(3) Track center distance (for lines common to passenger and freight transport), straight section Straight section <table border="1"> <thead> <tr> <th colspan="2">Name</th> <th>Track center distance (mm)</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Double-track section</td> <td>V ≤ 120 km/h</td> <td>4,000</td> </tr> <tr> <td>120 km/h < v ≤ 160 km/h</td> <td>4,200</td> </tr> <tr> <td>160 km/h < v ≤ 200 km/h</td> <td>4,400</td> </tr> <tr> <td colspan="2">Between the 2nd and 3rd lines in three- or four-track sections</td> <td>5,300</td> </tr> <tr> <td colspan="2">Between the departure/arrival line and the adjacent main line in the station yard</td> <td>5,000</td> </tr> </tbody> </table>	Name		Track center distance (mm)	Double-track section	V ≤ 120 km/h	4,000	120 km/h < v ≤ 160 km/h	4,200	160 km/h < v ≤ 200 km/h	4,400	Between the 2 nd and 3 rd lines in three- or four-track sections		5,300	Between the departure/arrival line and the adjacent main line in the station yard		5,000																		
Classification of railway		High speed	Semi-high speed	1	2	3																																																															
1,435 mm gauge	Design speed km/h	350	200	150	120	70																																																															
	Between main lines	5.0	4.3	4.0	4.0	4.0																																																															
1,000 mm gauge	Design speed km/h			120	100	60																																																															
	Between main lines			4.0	4.0	3.8																																																															
Name		Track center distance (mm)																																																																			
Double-track section	V ≤ 120 km/h	4,000																																																																			
	120 km/h < v ≤ 160 km/h	4,200																																																																			
	160 km/h < v ≤ 200 km/h	4,400																																																																			
Between the 2 nd and 3 rd lines in three- or four-track sections		5,300																																																																			
Between the departure/arrival line and the adjacent main line in the station yard		5,000																																																																			
2. Signaling	* Signal equipment shall be as per the "Rule on railway signals" (issued on December 30, 2005).																																																																				
(1) Type of railway signals	(1) Railway signals are classified into Signal, Sign and Sign Marker.	(1) } Same as the left	* Cab relay signals and protection signals are prescribed in the Vietnam regulations, but are not used actually.																																																																		
(2) Method of signal and aspect	(2)-1 Color light signal * <i>Automatic block section</i> Home signal: G (proceed), Y (caution, with departure signal stop), GY (proceed with departure signal stop), YY (speed restriction, entry into arrival siding) Starting signal: G (proceed, two sections clear ahead), Y (caution, one section clear ahead), R (stop), GG (proceed into a branch line) Block signal: R (stop, permitting signal on, non-blocking operation at 20 km/h) * <i>Semi-automatic block section</i> Home signal: (same as the automatic block section) Departure signal: G (proceed), Y (caution, the next departure signal aspect stop), R (stop) * <i>Cab signal:</i>	(2) }																																																																			

Item	Norms of railway operation in Vietnam (issued on December 30th, 2005)	Rules on railway technology management in China (issued on September 27th, 2006)	Remarks
	<p>G (ground signal G), Y (ground signal Y), YY (ground signal YY, route clear to departure/arrival track), YR (cab indicators dimly on ... approaching signal R), R (train passed an R aspect ground signal)</p> <p>* <i>Protection signal</i>: G (proceed), R (stop)</p> <p>* <i>Braking color light signal</i>: R (stop), off (proceed)</p> <p>* <i>Distant signal</i>: G (master signal G), Y (master signal R)</p> <p>* <i>Brake warning signal</i>: (braking signal R)</p> <p>* <i>Shunting color light signal</i>: white light on (route clear), purple (indigo-blue) light on (stop)</p> <p>* <i>Call-on signal</i>: white light on at home signal R (proceeding at 15 km/h allowed)</p> <p>(2)-2 Semaphore signal (<i>Home signal</i>) Main signal arm 45°, passing signal arm 45° (passing the station) Main signal arm 45°, passing signal arm level (stop at the main line of the station) Main line arm 45°, auxiliary arm 45°, passing signal level (stop at the departure/arrival line of the station) Main signal arm level, passing signal arm level (home signal stop)</p> <p>(<i>Starting signal</i>) Main signal arm 45° (departure signal proceed) Main signal arm level (departure signal stop)</p> <p>(<i>Distant signal</i>) Distant signal arm 45° (proceed, home signal proceed) Distant signal arm level (caution, home signal stop)</p> <p>(2)-3 Moving signal (moving signal indicating to stop) Daytime: rectangular red plate; night-time: red light on a post (posted at inspection and preparation tracks)</p> <p>(2)-4 Speed reducing signal, speed release signal</p>		
(3) Signal visibility distance	(3) 800 m for home, passing, protection and braking signals * 400 m for starting signal on main line * 200 m for starting signal of departure/arrival track, shunting signal	(3) R aspect 800 m, Y and YG aspects 400 m Procedure to use fuses and detonation caps	
(4) Special signal	(4) Procedure to use fuses and detonation caps	Items (4) and (5) common to Vietnam and China	
(5) Hand signal	(5) Aspect of hand signal		
3. Operation			
(1) Types of trains	(1) Special trains, trains for through-operation between countries, express trains, shuttle service trains, ordinary passenger trains, military, mixed and employee transport trains, shuttle freight trains, short-distance freight trains, specialized trains		
(2) Station boundaries	(2) Single-track section: Position of home signal Double-track section: Position of home signal for entry and a position 50 m distant from the turnout for exit	(2) Single-track section: Position of home signal Double-track section: Position of home signal or the boundary of station for the line	
(3) Classification	(3) Main line, sideline and special line	(3) Station equipment * Departure/arrival line,	

Item	Norms of railway operation in Vietnam (issued on December 30th, 2005)	Rules on railway technology management in China (issued on September 27th, 2006)	Remarks
of tracks at stations (4) Transport of dangerous articles (5) Braking distance (6) Simultaneous entry	(4) Explosives, combustibles, poisons, liquefied gas, connection of intervening cars for cars carrying dangerous articles (5) 800 m for air brakes (6) Prohibited simultaneous entry when a safety siding or a detailer is not available	shunting/composing line, draw-out line, locomotive storage line, equipment of signal, interlocking and block systems (4) Procedure to deal with push-off prohibited cars and cars carrying dangerous articles	
4. Block system (1) Regular block system (2) Substitute block system	(1) Automatic block system, semi-automatic block system (*), tablet block system (2) Telegraph block system, time interval method (at interruption of telecommunication)	(1) Same as on the left (2) Same as on the left	* The semi-automatic block system in Vietnam and China is the same as the tokenless block system in Japan.
5. Operation speed (1) Push operation (2) At entry of the head into station	(1) Speed of push operation with 20 km/h or less (2) Operation speed with 10 km/h or less	* Y aspect: Speed to stop before the next signal * Push operation: 30 km/h or less * Backward operation: 15 km/h or less * Head entry speed: 15 km/h or less	
6. Operation of relief train	Operating by train dispatcher	Rescue train is operated in block section by dispatcher	
7. Duty of staff (1) Procedures by staff related to operation (2) Power car steerer (3) Norm of staff in charge of operation (4) Training	The Vietnam Railway Law specifies the qualifications of staff directly involved in operation.	(1) Employees shall pass the relevant examination when they take duties in a new job or change duties. (2) Shall pass the examination for the driver license. (3) Shall wear the specified uniform and identification badge. * Prohibition of service under the influence of alcohol (4) Regular implementation of safety training * The leader shall be responsible for serious accidents caused by employees not given safety training.	

CHAPTER-4. IMPLEMENTING STRUCTURE FOR THE STUDY

The objectives of the Study were to establish the national technical regulation for railway as well as national standard set for urban railways and to transfer relevant skills and technologies to Vietnamese counterparts. In order to attain these purposes and carry out the study smoothly, the Study Team set up implementing structure as shown in Figure 4-1.

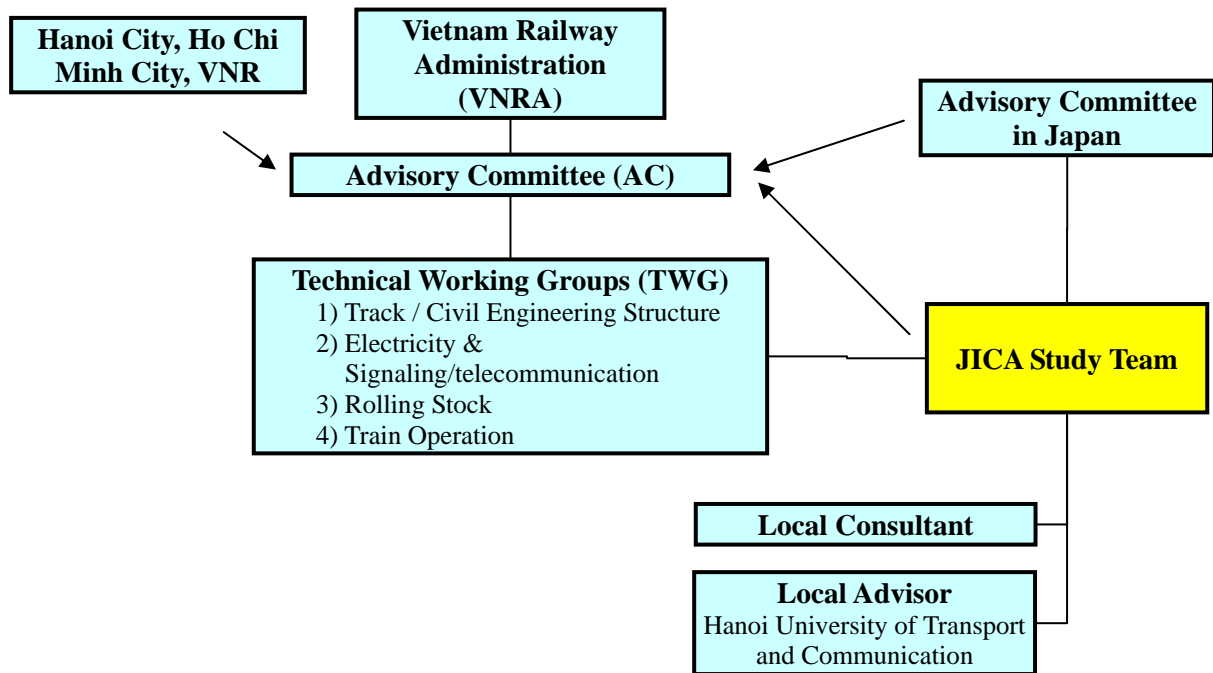


Figure 4-1 Implementing Structure for the Study

Technical Working Groups (TWG) was consisted of 4 sub-groups: Tracks and civil engineering structures, Electricity and signaling/telecommunications, Rolling stock, and Train operation. Meetings in each sub-group were held to discuss and coordinate technical matters intensively with the Vietnamese counterparts. Furthermore, meetings among representatives from each sub-group were also held to discuss cross-cutting issues.

Advisory Committee (AC) was held to give necessary instructions and/or advices to TWG and to coordinate the study work with relevant external organization including Ministry of Science and Technology (MOST), Hanoi city, Ho Chi Minh City and VNR.

Regarding the Ministry of Science and Technology, the Ministry of Construction and the Ministry of Natural Resources and Environment, they were not invited directly to AC, but were asked for their opinions individually on the advice of VNRA.

In addition to the AC and TWG, a special advisory committee was established in JICA for special instructions/advices to the Study Team. The members of the committee were Dr. Yoshihiro Suda,

Professor of University of Tokyo, Mr. Satoru Onoyama, Railway Electrical Engineering Association of Japan and Mr. Nobukuni Ishii, Japan Train Operation Association.

Table 4-1 and Table 4-2 are the members list for AC and TWG respectively and Table 4-3 shows the records of AC and other meetings throughout the Study.

Table 4-1 List of AC Members (Decision 1189/QD-BGTVT, as of April 29, 2008) -Original

No.	Name	Position
1	Ms. Duong Khue Anh	Vice Director, Department of Science and Technology - Ministry of Transport
2	Mr. Duong Van Thao (Mr. Tran Phi Thuong)	Vice Chairman, Vietnam Railway Administration
3	Mr. Hoang Ngoc Minh	Section Chief, Quality Assessment and Technological Management, Department of Traffic and Public Business, Hanoi City
4	Mr. Phung Duc Tuong	Expert of Quality Assessment and Technological Management Department, Hanoi City Public Service Traffic Bureau
5	Mr. Bui Xuan Cuong	Chief of Surface Traffic Management Department , Ho Chi Minh City Public Service Traffic Bureau
6	Mr. Nguyen Duc Huy	Chief of Engineering, Quality and Progress Division, Management Authority for Urban Railway (MAUR), Ho Chi Minh City
7	Mr. Ninh Viet Cuong	Deputy Director, Board of Railway Infrastructure Management, VNR
8	Mr. Nguyen Ngoc Vien	Deputy Director, Division of Rolling Stock, VNR

() is a predecessor.

Table 4-2 List of TWG members on the Vietnamese side

No.	Name	Position	Remarks
	Secretariat Committee		
1	Eng. Do Van Hat	General Director of TRICC-JSC	Chairperson
2	Eng. Nguyen Thanh Tinh	Deputy General Director of TRICC-JSC	Authorized chairperson
3	Eng. Pham Quoc Cuong	VNRA, Science and Technology Division Manager	Vice-chairperson
4	Eng. Hoang Trung Kien	VNRA, Science and Technology Division Authority	Member
5	Eng. Nguyen Manh Tien	TRICC-JSC, Quality Control Department Assistant Manager	Member
A	Track Group		
6	Eng. Nguyen Ngoc Truy	TRICC-JSC, Ex-President	Leader
7	Dr. Pham Van Ky	Hanoi University of Transport and Communications	
8	Eng. Tran Van Su	TRICC-JSC, Ex-Vice President	
B	Bridge and Tunnel Group		
9	Eng. Nguyen Trong Bach	VNR, Ex-Vice President	Leader
10	Eng. Nguyen Van Thanh	VNRA, Infrastructure Department	
C	Power Electric Group		
11	Dr. Ho Anh Sang	MOT, Science and Technology Agency Authority	
12	Dr. Trieu Viet Linh		
D	Information and Telecommunication Group		
13	Eng. Pham Quoc Cuong	VNRA, Science and Technology Division, Manager	Leader of Telecom. Group
14	Dr. Ngo Quang Minh	Urban Railway Administration Commission, Member	
15	Eng. Tran Cong Thuyet	VNR, Ex-Information and Telecommunication Department	Leader of Signaling Group
16	Eng. Nguyen Tien Thinh	VNRA, Design and Investment Division Authority	
E	Rolling Stock Group		
17	Eng. Pham Dinh Thuy	TRICC, Affiliate Company, Vice President	Leader of Rolling Stock Group
18	Eng. Tran Xuan Sinh	Inspection of Rolling Stock Agency, Railway Division, Assistant General Manager	
F	Operation Group		
19	Eng. Nguyen Van Ha	VNR, Legislative Transfer Division, Assistant General Manager	Leader of Operation Group

Table 4-3 Record of the Study (AC Meetings and Seminars)

Work item		Year of 2008												Year of 2009				
		Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	
Establishment of the organization for implementation	Discussion of the basic policy for the Study Establishment of the organization for implementation of the Study	■																
	Analysis of collected data Review of laws and technical regulations in Vietnam Translation and analysis of laws and technical regulations in Vietnam Collection of technical regulations in foreign countries and laws and technical regulations in Japan Translation of materials into Vietnamese Collection and analysis of information on the projects	■	■															
Building the national technical regulations and standards set for Vietnam Railway	Technical regulation and Commentaries	Discussion on the applicability of the technical regulations in Japan to Vietnam Preparation of systematic contents of technical regulations and standards Discussion on marketing, service and operation over plural lines Analysis of the administrative system in Vietnam Discussion of the system of technical regulations and standards Discussion of the items and prescription policy of the technical regulation Preparation of the schedule to prepare the technical regulation Preparation of the first draft of the technical regulation Discussion of the basic direction as a railway system Discussion of the compatibility of technical regulation in different technical fields Preparation of the second draft of the technical regulation Summarization of the draft of the technical regulation Translation of the draft of the technical regulation			■	■	■											
		Standard preparation item and prescription policy Preparation of the guideline to prepare the standards Discussion of the railway system applicable to urban railways Preparation of the first draft of the standards Preparation of the second draft of the standards Discussion on the compatibility of the standards between different technical fields Translation of the draft standard and ITR Proposal to facilitate approval procedures Proposal of the organization for operation, examination and supervision Translation of draft DFR Response and reflection of different opinions for registration							■									
	Standards for urban railways	Proposal to facilitate approval procedures Proposal of the organization for operation, examination and supervision Translation of draft DFR Response and reflection of different opinions for registration								■	■	■						
		Preparation of the inception report Explanation and consultation on the inception report Preparation of a draft progress report Consultation on the progress report in Japan Consultation and modification of the progress report Preparation of an interim report Consultation on the progress report in Japan Consultation and modification of the inception report Preparation of a draft final report Consultation on the draft final report in Japan Consultation and modification of the draft final report Preparation of the final report		■	■	■					■							
Consultation and preparation of reports	Support committee meeting in Japan															■		
	Advisory committee meeting																	
	Seminar																	

Seminar

CHAPTER-5. OUTLINE OF THE TECHNICAL REGULATION AND STANDARD IN THE STUDY

5-1 Scope of the National Technical Regulation and Standard Set for Railway in Vietnam

5-1-1 Performance-based Approach to Technical Regulation

Based on the experience in Japan and the Scope of Work concluded between Vietnamese side (VNRA and Department of Science and Technology (DOST) in MOT) and JICA Preparatory Study Team on 31 October 1997, the Study Team considered that the technical regulation formulated in the Study (hereinafter referred to as “the Regulation”) should be legally binding and therefore be stipulated in performance-based approach, while the commentaries would include concrete and detailed numerical specification for voluntary application. In terms of the standard set formulated in the Study (hereinafter referred to as “the Standard”), the Study Team thought they would be drafted by selecting normal/typical numerical values/figures from the commentaries. (Figure 5-1)

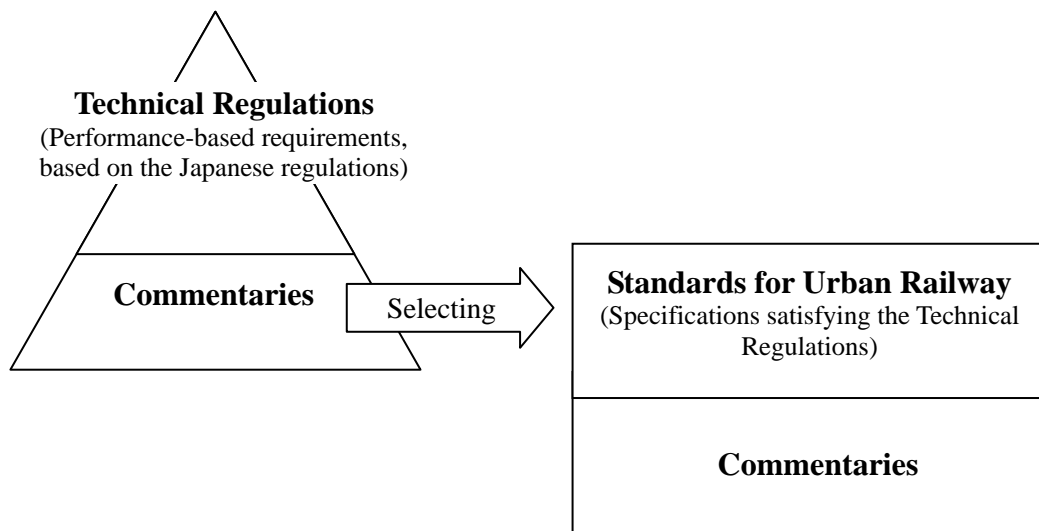


Figure 5-1 Concept of Technical Regulation and Standard in the Preparatory Study (October 2007)

In the past in Japan, the government of Japan had stipulated detailed numerical specifications in the railway regulations with legal force by a Ministerial Ordinance. Under these regulations, however, railway operators might refrain from introducing new technologies of railway systems. Thus, as mentioned in 3-1, the government revised the regulations in 2001 to make them performance-based requirements without detailed numerical specifications. Accordingly, these specifications were set forth in the commentaries for reference and/or voluntary application by a notification of the Director of the Railway Bureau.

The Study Team considered the same style as in Japan was deemed to be applicable to the regulations in Vietnam because there would be some problems/disadvantages as follows if describing concrete and detailed numerical specification prematurely in the regulations:

- a. The regulations shall cover not only the existing Vietnam railways but also electrical urban railways, high-speed railways and other advanced railway systems in the future such as linear metro, monorail and AGT. On the other hand, as the optimal systems for these new railways are not clear and not be able to be determined for the time being, it is difficult to prescribe relevant specifications in the regulations.
- b. Diversified railway technologies in various countries might be excluded.
- c. Advanced railway technologies not stipulated in the regulations might be excluded.

In view of the above, the performance-based technical regulations enable such high-speed railways and urban railway systems as well as new technologies to be smoothly introduced in the future.

5-1-2 Law on Standards and Technical Regulations (Law No.68/2006/QH11)

Vietnamese side stated that the study work should be implemented taking into account the Law on Standards and Technical Regulations (Law No. 68/2006/QH11 dated June 29, 2006). According to Article 1 of the law, the definition of “technical regulation” and “standards” are stipulated as follows:

- a. “Technical Regulation” means regulation on the limits of technical characteristics and management requirements which products, goods, services, processes, the environment and other objects in socio-economic activities must comply with in order to ensure safety, hygiene and human health; to protect animal, plants and the environment; to safeguard national interests and security; and ensure consumers’ right and meet other essential demands. Technical regulations shall be promulgated in a written form by competent state agencies for mandatory application
- b. “Standard” means regulation on technical characteristics and management requirements used as standard for classifying and appraising products, goods, services, processes, the environment and other objects in socio-economic activities with a view to improving the quality and effectiveness of these objects. A standard shall be published in a written form by organizations for voluntary application

5-1-3 Scope of the Regulation

Based on the Law on Standards and Technical Regulations as well as the concept of performance-based regulations, the scopes of the Regulation and the Standard were agreed by the Vietnamese and Japanese side as follows:

Basically, the Regulation stipulates performance-based requirements and detailed description of the Regulation with concrete numerical specifications and figures are set forth in the commentaries on the Regulation (hereinafter referred to as “the Commentaries”). However, some important and basic numerical values in the Commentaries are selected and set forth in the supplementary provision of the Regulation, which accordingly have a legal binding power.

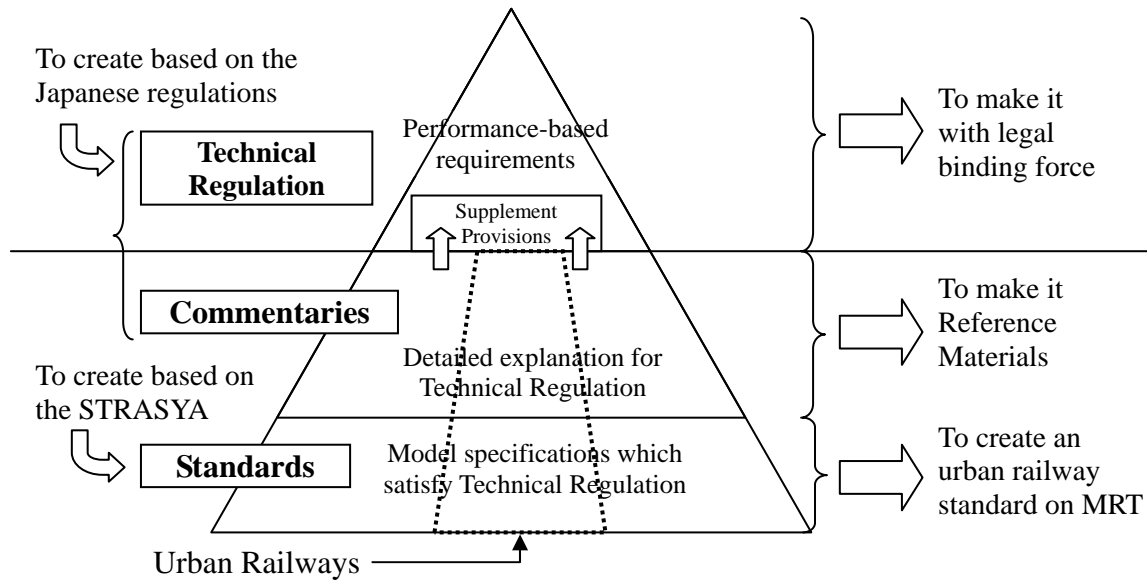


Figure 5-2 Concept of the Regulation and the Standard in the Study

The Regulation and the Commentaries (hereinafter referred to as “the Regulations”) are formulated in a comprehensive manner covering the whole of railways including national railways, urban railways, and high-speed railways. This is because that there are no differences in the systems for signals and safety/security among national railways, urban railways, mono-rail, subway, high-speed railways even Shin-kansen in Japan. However, among urban railways, only tramcars are excluded in the Regulations and the Standard because it is significantly affected by the road traffic and accordingly should be controlled not only from the railway safety viewpoint but from the road traffic safety viewpoint. According to the railway classification as well as track classification, applicability of the Regulations is shown like as below.

Table 5-1 Applicability of the Regulations

		Railway Classification (Railway Law)		
		National Railway	Urban Railway	Specialized Railway
Classification in the Regulation	Ordinary Railway	to be applied	to be applied	not applied
	Semi-high-speed Railway	to be applied	-	-
	High-speed Railway	to be applied	-	-
	Non-conventional Railway	-	to be applied (excluding tramcars and cable railways)	not applied

On the other hand, considering future possibilities to introduce various train operation systems such as one-driver or driver-less automatic train operation (ATO) and other train operation control system as well as through-operation between VNR and a urban railway, the Regulations has been drafted to be able to deal with such issues in the future.

5-1-4 Scope of the Standard

The Standard for urban railways is a set of normal/typical numerical values/figures selecting from the Commentaries, which accordingly satisfied the Regulation. It aims to develop integrated urban railway system with unified standards to realize merits in such respects as inter-operability between different lines, joint use of rolling stock as well as their depots/workshops among different lines.

Basically, the Standard has been drafted based on the STRASYA (Standard Urban Railway System for Asia) prepared by Japanese government and JARTS in 2004, and has designed for urban railways with heavy demand of 30,000 p/h/d (passenger/ hour/direction) or over. As for other railways system with medium or small demand such as LRT, AGT, and monorails, the Study Team introduced several model cases to the Vietnamese side.

Furthermore, in the process of preparing the Standard, the Study Team pointed out to the Vietnamese side that the following two issues, which are not clearly specified in the Standard at this time, would be more important and should be taken into account when revising the Standard in the future.

a. Inter-operability

Regarding the connection between railway lines, Clause 1, Article 19 of the Railway Law prescribes that “Positions for connection of domestic railway lines must be located at railway stations. The Minister of Transport shall prescribe the order and procedures of licensing the connection of urban railways and specialized railways to national railways”. And also, Clause 2, Article 58 stipulates that “To ensure the connection to other urban public transport modes and the national railway for easy transit of the passengers”. VNRA has not asserted the necessity of through-operation at present, however, necessary provisions shall be added in the Standard to realize inter-operability between different lines in the future.

To implement through operation with inter-operability, it is required to unify the basic standards for the gauge, electrification system, construction gauge and rolling stock clearance. Therefore, through operation between the existing VNR lines with 1,000 mm-gauge and urban railways with 1,435 mm-gauge requires remodeling of VNR lines into three-rail gauge railways.

There are also critical issues to be coordinated and adjusted between different railway operators, such as rules for joint use of stations, train operation diagrams, expenditure allocation rules and joint use of rolling stock and so forth.

Furthermore, the standards for the ticket barrier system, magnetic tickets and IC cards should be unified for the convenience of passengers.

b. Promotion of barrier-free facilities

Clause 3, Article 43 of the Railway Law prescribes that “On passenger cars there shall be lights, ventilation, cooling equipment, and equipment supporting the disable, sanitary facilities except of urban train”. Paragraph d, Clause 2, Article 97 also prescribes that “To provide services to passengers in a civilized, urbane and thoughtful manner, and make convenient for the disable

when going into station, getting in and off the train”. Furthermore, Clause 3, Article 59 prescribes that “Urban railway stations shall have signs and instructions about routes, stations on the route; ensure convenient and safe movement of passengers; have facilities providing information, selling tickets and controlling the passengers getting on and off the train and in and out the station; have emergency telephone, medicine, first-aid facilities and reserved electric sources for metro stations”.

In accordance with these prescriptions, it is important for the government to develop a barrier-free design guideline for realizing integrated amenity, and to promote the introduction of barrier-free facilities in railway stations and rolling stock based on the Railway Law. Thus, it is desired for railway operators and business entities to integrate the standards for such barrier-free facilities as elevators, escalators, Braille point blocks, vocal/acoustic guidance and guidance panels.

5-2 Outlines of Technical Working Groups

As described in Chapter 5, technical issues were discussed at Technical Working Groups (TWG) consisting of four sub-groups.

As the work progressed, the scope of items or ways to incorporate concrete methods and/or numerical values/figures in the draft might have varied among the sub-groups. In other words, inconsistencies might have occurred with regard to the interrelated issues among the sub-groups: for example, in some sub-group, concrete methods and/or numerical values/figures would be stipulated in clauses, whereas not in other sub-groups. So, the sub-groups concerned in such interrelated issues as in table below have closely coordinated each other and made necessary adjustment on the clauses from time to time.

Table 5-2 Interrelated Issues in the Technical Regulation

Cross-related Issues		Sub-Groups				
		Civil Eng. Structure	Track	Electricity	Signaling and Telecom.	Rolling stock
Classification	Item					
General provision	Prevention of strong noise					
	Measures to facilitate movement					
Permanent way	Construction gauge					
Rolling stock	Rolling stock gauge					
Maintenance of facilities and rolling stock	Maintenance					
Train operation	Relation between railway signals and train operation					
	Stop indicating signal aspect					
	Sign and sign marker					

Note) : master (strongly related issues) : subordinate (related issues)

Outlines of the works at each sub-group as follows:

5-2-1 Working Groups for Tracks and Civil Engineering Structures

The two working groups (for tracks and for civil engineering structures) worked together on common issues except on special items in each field.

As for tracks and civil engineering structures, there are some design standards and norms in the Norms of Railway Operation issued in 2005 by MOT decision as well as in the standards by the National Fundamental Construction Committee. Thus, the Regulations have been drafted referring to these standards.

The Regulation in the field of civil engineering structures consists of the following chapter:

1. Construction gauge and width of formation level
2. Prevention of disaster and other injury
3. Track layout at stations
4. Rolling stock sheds, workshops and depots
5. Structures
6. Architectures
7. Facilities of underground station
8. Station equipment
9. Platforms
10. Pedestrian way for passengers and the similar systems
11. Maintenance of facilities and rolling stock

The Regulation in the field of tracks consists of the following chapter:

1. Gauge
2. Track profile, radius of curve, cants, slacks and transient curves
3. Gradients and vertical curves
4. Distance of track centers
5. Track structure
6. Measures to reduce high-level noise and vibration
7. Protection of the space under bridges and prevention of overrunning of rolling stock
8. Prevention of entry into tracks
9. Evacuation equipment
10. Track markers and indicator
11. Track crossings and intersection with roads
12. Level crossings

5-2-2 Working Groups for Electricity and Signaling/Telecommunications

The two working groups (for electricity and signaling/telecommunications) worked together on common issues except on special items in each field.

As there are no electrified railways in Vietnam, no provisions for railway electrification equipment are

shown in the Railway Law. In preparing the technical regulation, therefore, the working group for electricity examined the Electricity Law in Vietnam as a first step.

In the chapter “Electricity equipment, power facilities and measures for safety of electricity” of the Electricity Law, it is prescribed that electrification shall be in conformity to electricity standards which are separately set forth.

In Japan, the prescriptions on transmission and distribution lines in the Technical Standards and the Commentaries are exactly the same as those in the electricity equipment technical standards and commentaries which issued by the Ministerial Ordinance, Ministry of Economy, Trade and Industry (METI).

Therefore, the Study Team has excluded the provisions for railway transmission and distribution lines from the Regulation, on the ground that these lines are supposed to be in conformity to the Vietnamese Electricity Law and Standards.

The Regulation in the field of electricity consists of the following chapter:

1. Contact line system
2. Equipment at Substation
3. Other of power supply
4. Facilities and Rolling Stock Maintenance

In the field of signaling, there are existing rules/norms on railway signal procedures, railway operation procedures and crossing handling in addition to the Railway Law. Therefore, the working group set important prescriptions in the Regulations considering their compatibility with the existing rules/norms.

In the field of telecommunications, railway telecommunication facilities are supposed to be generally in conformity with the technical standards instituted by the Ministry of Information and Communications (MIC). Therefore, the working group examined telecommunication facilities especially for railway safety/security referring to the railway technical standards in Japan.

The Regulation in the field of telecommunication consists of the following chapter:

1. Block equipment
2. Railway signal indication devices
3. Interlocking devices
4. Devices that automatically stop trains and decelerate their speed
5. Automatic train operation system
6. Train detection device
7. Safety ensuring telecommunications
8. Installation of overhead telecommunication lines
9. Level crossing safety equipment
10. Ensuring safety at the time of trouble occurrence

11. Maintenance of signaling and telecommunications
12. Inspection and use of train operation guaranteeing equipment
13. Regular inspection of signaling and telecommunications

5-2-3 Working Group for Rolling Stock

The working group for rolling stock drafted the Regulations especially focusing on electrical rolling stock which does not exist in Vietnam, while making efforts to incorporate the existing rules/norms on non-electrical rolling stock for the national railways.

The Regulation in the field of rolling stock consists of the following chapter:

1. Regulation scope, application subjects, and railway environment requirement of rolling stock
2. Rolling stock gauge
3. Mass of rolling stock
4. Rolling stock running gear
5. Body structure and other devices
6. Fire prevention of rolling stock
7. Other equipment
8. Device and rolling stock maintenance

5-2-4 Working Group for Train Operation

Regarding train operation field, unlike the other fields, detailed provisions are provided in the Railway Law itself. After comparing and discussing the railway technical regulations in Japan and relevant laws in Vietnam, the working group for train operation has prepared minimum items for the Regulation that will become necessary in the future in Vietnam.

The Regulation in the field of train operation consists of the following chapter:

Matters related to railway staff:

1. Guaranteeing operation safety
2. Theoretical and practical training for railway staff
3. Having a motor-driving crew on board

Matters related to train operation:

1. Loading limits for rolling stock
2. Train brakes
3. Station boundaries
4. Train operation time
5. Methods to ensure safety between trains
6. Train steering position
7. Train operation speed

8. Simultaneous train entry and exit
9. Train protection and track closure
10. Shunting
11. Relation between train operation and railway signals, signs and marks

5-3 Consultation with Related the Authorities

5-3-1 Consultation with the Ministry of Science and Technology

According to the Law on Standards and Technical Regulations (Law No.68/2006/QH11), the drafts of technical regulation and/or standard shall be evaluated by the Ministry of Science and Technology before their enactment. The Study Team exchanged opinions with the Ministry and obtained the following information.

- a. The two Decisions instituted by the Ministry of Science and Technology in September 2007 stipulate the procedures to prepare, review and institute technical regulations and standards. According to the Decisions, Ministry of Transport, the organization in charge for the Regulation and the Standard, shall establish a Standard Preparation Committee, which develops the drafts of the Regulation and the Standard jointly with VNRA. It is also required to submit the drafts to relevant organizations (Ministries and Agencies) to seek opinions thereon.
- b. The technical regulation is generally composed of following parts which should include clauses for management. Some detailed numerical values/figures could be added as the supplementary provision.
 1. General
 2. Clauses for technology (with drawings for explanation attached at the end)
 3. Clauses for management
 4. Responsibilities related individuals and organizations
 5. Procedures for implementation

5-3-2 Consultation with the Ministry of Construction and Ministry of Natural Resources and Environment

The Regulations contain the following provisions related to the Ministry of Construction and the Ministry of Natural Resources and Environment.

- a. Measures against underground fire (related to the Ministry of Construction)
- b. Prevention of high-level noise and vibration along railway lines (related to the Ministry of Natural Resources and Environment)

In the preliminary consultation with the Ministry of Construction, no special problems were found in the aforementioned provision because it does not have overlapped specifications with the existing or forthcoming regulations under the Ministry of Construction.

In the preliminary consultation with the Ministry of Natural Resources and Environment, the Ministry did not clearly state the necessity of detail criteria for noise and vibration. Therefore, the Study Team does not stipulate concrete targets for noise and vibration reduction in the supplementary provision of the Regulation, but in the Commentaries.

5-3-3 Consultation with Hanoi and Ho Chi Minh Cities

As the Regulations and the Standard should be applicable to the metro projects which are now under way in Ho Chi Minh and Hanoi cities, the Study Team held several meetings with the Hanoi Metropolitan Rail Transport Project Board (HRB) and the Management Authority for Urban Railway (MAUR) in Ho Chi Minh to discuss the situation and contents of the Regulations and the Standard in the course of the Study.

Both cities requested that the Regulation are to be open to the international standards. On the other hand, HRB requested the Study Team to adopt the third-rail system in the Standard in place of the proposed contact wire system. In this connection, the Study Team explained as follows: The Regulation drafted as a performance-based regulation is open to various specifications and/or standards as far as they satisfy the Regulation. As for the Standard, it is a kind of model specifications which satisfy the Regulation, and not limited to, allowing voluntary application

When the Study began, the Ho Chi Minh metro line No. 1 had already decided to develop as an urban railway based on the STRASYA with the Japanese finance. In drafting the Regulations and the Standard, the Study Team has carefully examined not to contradict each other.

CHAPTER-6. ENACTMENT OF TECHNICAL REGULATIONS AND STANDARDS IN VIETNAM

The Law on Standards and Technical Regulations prescribes the procedures of enactment of the technical regulations and standards as summarized below.

According to Articles 17 and 33 of the Law, the organizations that issue national technical regulations and standards shall hold seminars on the draft of these regulations and standards, allow at least 60 days to collect public comments before finalizing the draft, adjust the contents of the draft with related organizations, and submit it to the Ministry of Science and Technology (MOST) for evaluation.

After receiving the draft, MOST shall review it within 60 days based on Articles 18 and 33 of the Law. After approval of MOST, the concerned organizations shall finalize and release the regulations and standards within 30 days.

Figure 6-1 and Figure 6-2 show the original schedule for the Regulation and the Standard.

The Study Team officially submitted the draft of the Regulation and the Standard to MOT in November 2008, and VNRA and JICA held the joint seminar on January 14, 2009 in order to disseminate them to the related organizations. As of April 2009, a little bit behind the original schedule, MOT has been collecting public comments to finalize the drafts which are to be submitted to MOST.

In this legalizing process, the Study Team has provided necessary technical support in answering technical questions and preparing additional materials.

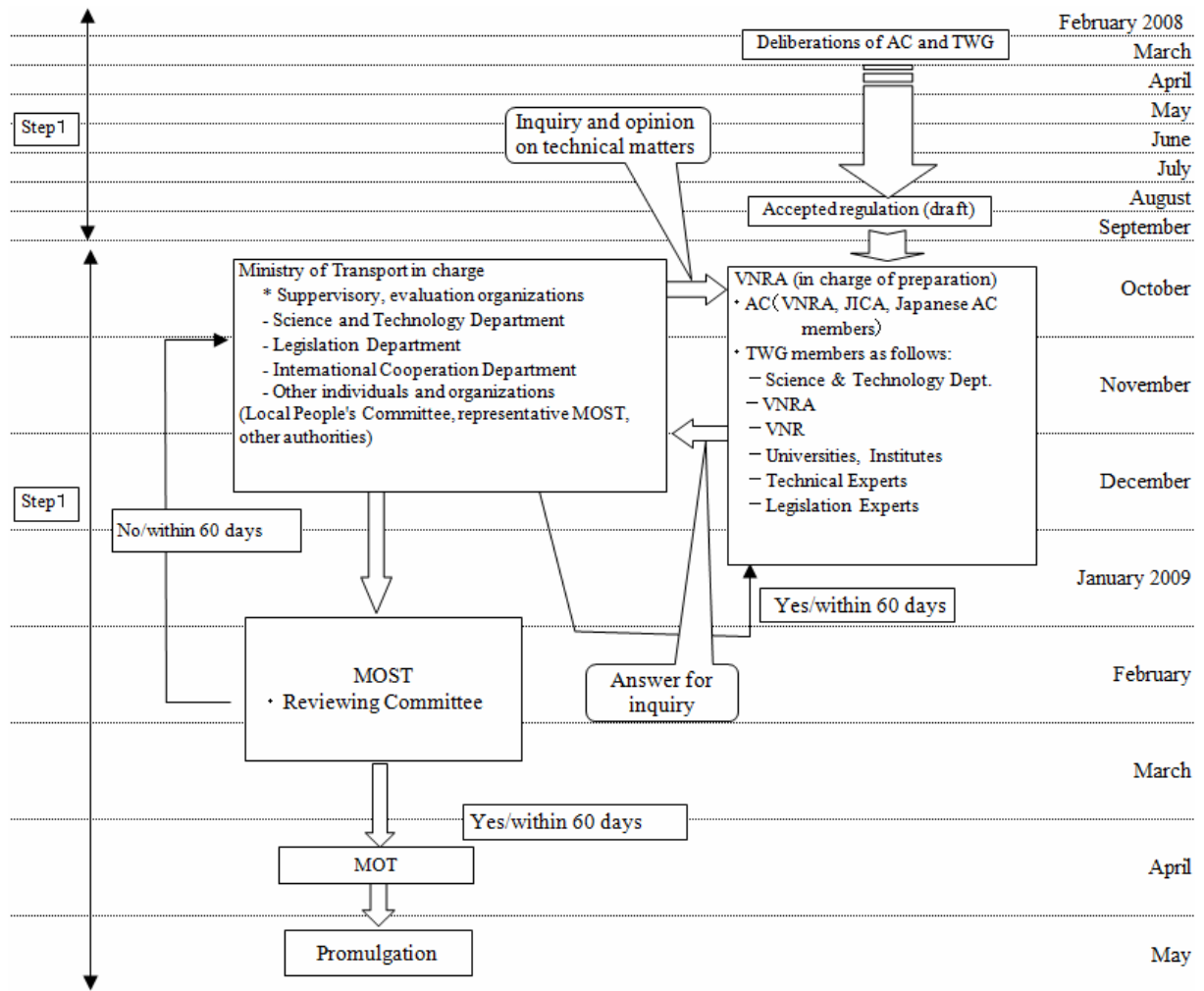


Figure 6-1 Procedures for Preparation, Evaluation and Issuance of the Technical Regulation

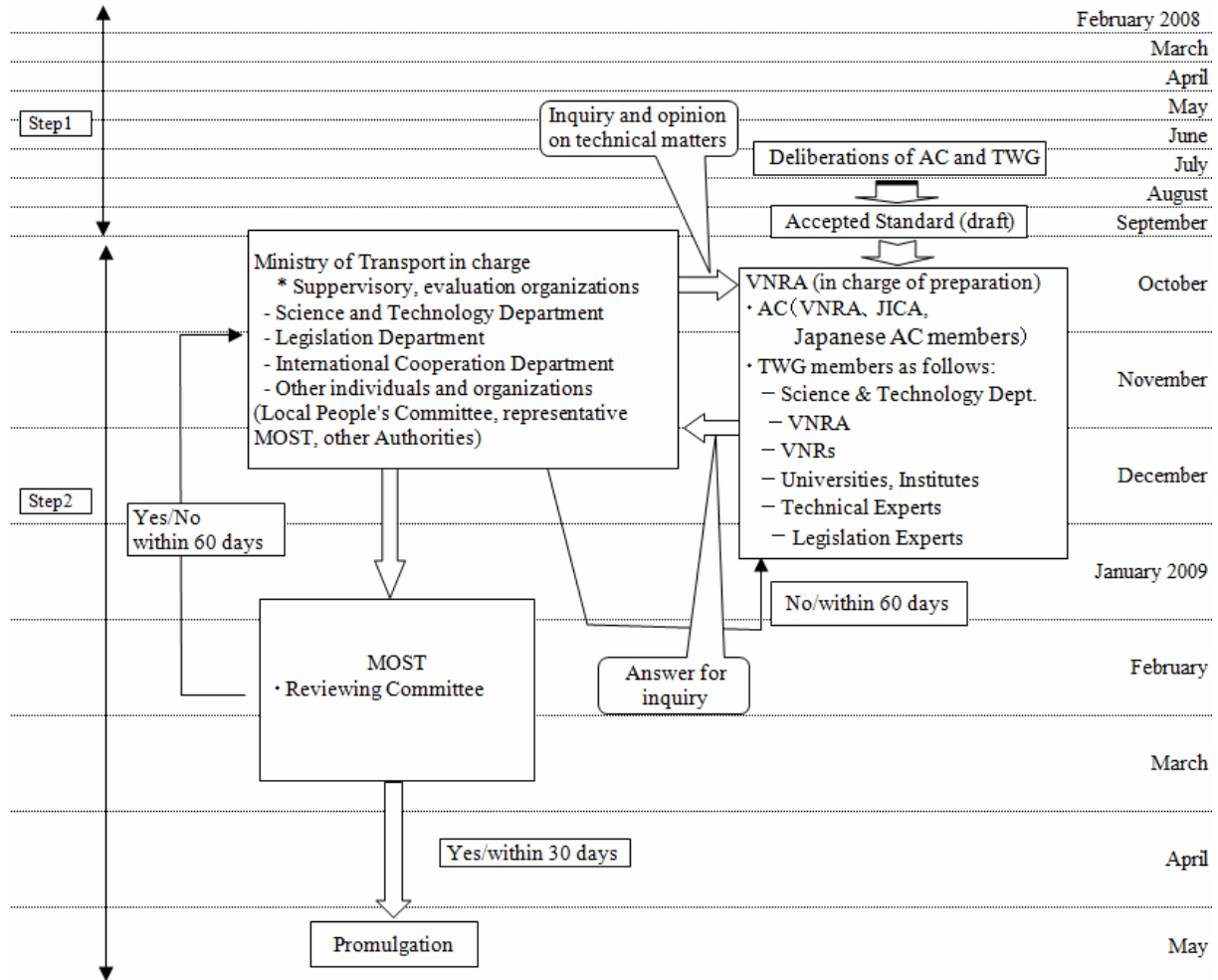


Figure 6-2 Procedures for Preparation, Evaluation and Issuance of the Standards

Based on the document of VNRA dated April 21, 2008, the procedure for preparation, evaluation and issuance of technical regulations and standard is as follows:

Stage 1:

- 1) Regarding the drafts of the Technical Regulation and Standard, the study team will discuss and make adjustments with experts in TWG and Hanoi University of Transport and Communications.
- 2) The study team will hold seminars with JICA and AC members concerning the comments of TWG experts consulted.
- 3) The adjusted, reviewed drafts will be submitted to VNRA.

Stage 2:

- 1) Legislation procedures will be promoted by MOST and MOT to give instructions for use in Vietnam.
- 2) The materials will be evaluated by the Reviewing Committee, then the study team will deal with matters that arose, hold a public hearing, and issue the materials.

CHAPTER-7. ENFORCEMENT OF THE TECHNICAL REGULATIONS

7-1 Ensuring Safety of Railways by Application of the Technical Regulation

To develop and operate railways smoothly and safely, it is important not only to prepare technical regulations but also to enforce them appropriately. To achieve this, it is necessary to establish legal procedures to confirm whether railway facilities and/or rolling stock conform to the technical regulations at construction or remodeling stage. It is also essential for supervisors (administration side) to examine from time to time whether these facilities sufficiently conform to the technical standards or not.

In the side of railway operators and/or business entities (hereinafter referred to as “railway operators”), they must determine their own implementation criteria (including train operation rules) to be observed by themselves based on the technical standards. Administration side must supervise the railway operators in accordance with the legal procedures and inspect whether the technical standards are observed by railway operators.

7-1-1 Enforcement Procedure of the Technical Standards in Japan

In Japan, railway technical standards^{*)} based on the Railway Business Law are instituted as a Ministerial Ordinance of the Ministry of Land, Infrastructure, Transport and Tourism (hereinafter referred to as “MLIT”). This stipulates that railway operators shall determine and observe their own implementation criteria based on the Ministerial Ordinance. When the railway operators determine or change the implementation criteria, they shall report the change to the Regional Transport Bureau of MLIT in advance (Article 3 of the Ministerial Ordinance on the Technical standards for Railways). (* “Standard” is often used instead of “regulation” in Japan, while its meaning is almost equal to “regulation”.)

How to enforce the technical standards when railway facilities and/or rolling stock are constructed, improved and remodeled in Japan, is prescribed in the Railway Business Law and the Implementation Guideline on Railway Business Law as outlined below.

a. Approval of construction work

After obtaining approval for railway business, railway operators or business entities shall draw up a construction work plan for railway facilities and submit it to the Minister of Land, Infrastructure, Transport and Tourism (hereinafter referred to as “the Minister”) for approval of the construction work. The Minister shall approve the construction work plan after confirming that it conforms to the rules stipulated in the Ministerial Ordinance of MLIT (Article 8 of the Railway Business Law, and Articles 9, 10, 12 of the Implementation Guideline on Railway Business Law).

b. Change in the construction work plan

The railway operators or business entities shall obtain approval from the Minister when changing the construction work plan. The Minister will approve the change in the construction work plan after confirming that it conforms to the technical standards. In the case of a minor change in the construction work plan stipulated in the said Ministerial Ordinance, however, railway operators or business entities shall only report it to the Minister (Article 9 of the Railway Business Law, and Articles 14, 15 of the Implementation Guideline on Railway Business Law).

c. Inspection of construction work

Railway operators or business entities shall complete the construction work by the time specified in the said approval of the Minister and apply for inspection thereof to the Minister. The Minister shall inspect the completed construction work and authorize it as having passed the inspection when it conforms to the approved construction work plan as well as the technical standards (Article 10 of the Railway Business Law, Articles 3, 4 and 5 of the Implementation Guideline on Railway Business Law).

d. Change in railway facilities

When railway operators or business entities wish to change railway facilities that have passed the inspection for completion, they shall draw up a construction work plan for changing the facilities and obtain approval from the Minister. The Minister shall approve the plan after confirming that it conforms to the technical standards. In the case of a minor change in railway facilities stipulated in the said Ministerial Ordinance, however, railway operators shall only report it to the Minister. Railway operators or business entities shall apply for inspection to the Minister after completing the construction work when the inspection is required for the construction work in accordance with the said Ministerial Ordinance (Article 12 of the Railway Business Law, Articles 16 and 17 of the Implementation Guideline on Railway Business Law, Article 7 of the Railway Facilities Inspection Rules).

e. Check of rolling stock

Railway operators shall obtain confirmation from the Minister that the rolling stock they wish to use for the railway business conforms to the technical standards. Railway operators shall also obtain confirmation from the Minister when they wish to use it for the railway business after changing the structure or components of the rolling stock which has obtained the above confirmation. In the case of a minor change in the rolling stock stipulated in the said Ministerial Ordinance, however, railway operators shall only report it to the Minister (Article 13 of the Railway Business Law, Articles 19 to 22 of the Implementation Guideline on Railway Business Law).

For reference, the Minister only checks whether the fundamental design conforms to the technical standards in the above confirmation, whereas the completion inspection shall be undertaken on the responsibility of railway operators.

f. Security inspection and others

The Railway Business Law stipulates that the officials of MLIT can enter offices or other business places of railway operators to inspect the management, accounting, facilities, books, documents or articles and ask questions to related personnel. In the security inspection based on this stipulation, the said officials can investigate the status of observance of the related laws on facilities, rolling stock and train operation, and implementing situation of matters permitted, approved and confirmed based on the related laws; and the status of observance of detailed rules on installment of facilities, rolling stock and train operation (Article 56 of the Railway Business Law, Article 4 of the Railway Business Inspection Rules).

Figure 7-1 shows the basic flow of the above procedures from a. to e. with application of the technical standards.

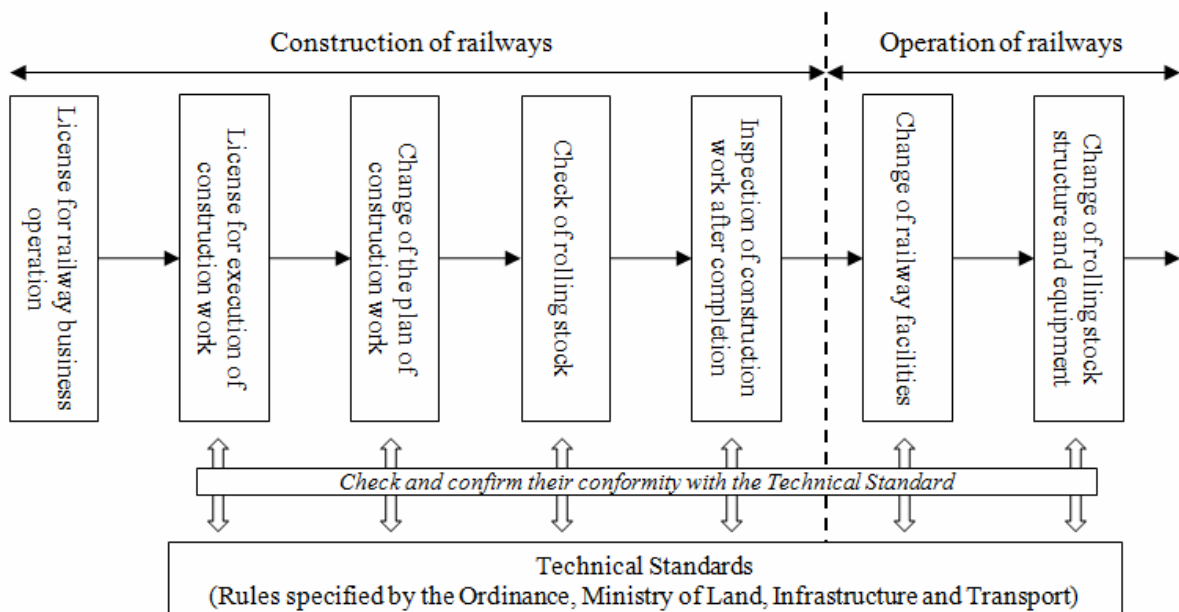


Figure 7-1 Procedures for Construction and Remodeling of Railways in Japan

7-1-2 Appropriate Scheme for Application of the Technical Regulation in Vietnam

a. General method to evaluate conformity with the technical regulations

A method to evaluate conformity with the technical regulations is stipulated in Clause 3, Article 41 of the Law on Standards and Technical Regulations. According to this stipulation, conformity with the technical regulations shall be compulsorily evaluated through such processes as tests, inspection, authentication and publication thereof as required by the government.

According to the related organizations in Vietnam, the method of “authentication” and/or “publication” of the conformity with the technical regulations seem to be applicable for factory products, and is not suitable for railway technologies. Although this issue has not yet been formally discussed by the related organizations, there is a dominant opinion that a method of

"inspection" would be more suitable for railways.

b. Actual procedure to evaluate conformity with the technical regulation

As the evaluation method has not been determined yet, the actual procedures should be discussed in the future. In a survey, the related organizations explained that technologies or specifications are determined and authenticated through a flow of procedures under the Construction Law, such as a master plan (MP), a feasibility study (FS), and engineering design, bidding and execution of construction work. At present, the Transport Construction Quality Control and Management Bureau belonging to Ministry of Transport (MOT), carries out quality control of railway facilities in the same way for facilities related to roads, vehicles and motorbikes, while the Vietnam Register of MOT is in charge of the quality control of rolling stock. It seems that the related organizations in Vietnam consider that it is most practical to follow such inspection and control procedures of the related agencies.

Therefore, in parallel with the enactment of the technical regulation, it is necessary to determine a method and procedures of evaluating their conformity based on the existing cases in Vietnam and in consideration of the systems and precedent cases in Japan or other countries.

c. Necessity of a security inspection system

In order to ensure the safety of railways, it is essential to check the conformity with the technical regulation at the time of construction, improvement and remodeling of railway facilities and rolling stock. It is also important for the administration side to check regularly whether railway operators are observing the technical regulation (or their own implementation criteria) in routine management and control.

For this purpose, it would be effective for the administration side to adopt and introduce a security inspection system by following such cases as in Japan.

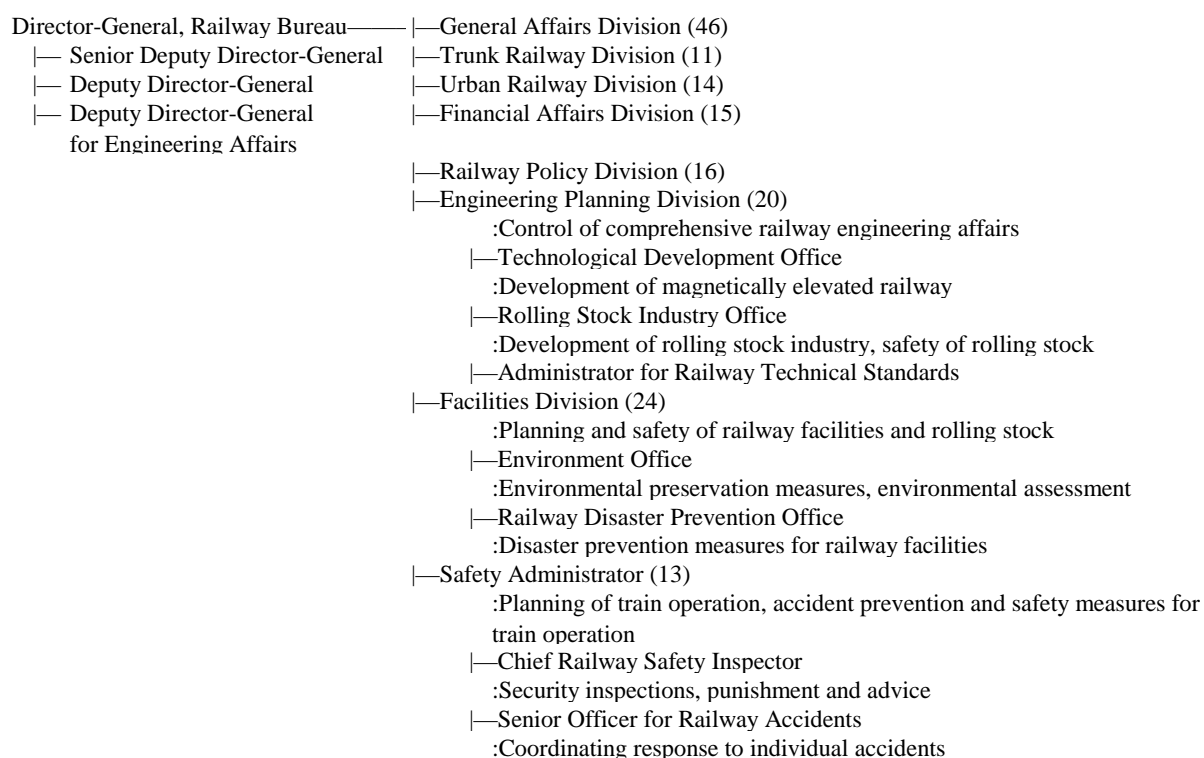
7-1-3 Organization/Institution to Enforce the Technical Regulations

To enforce the technical regulation, it is also important to create and develop appropriate organization/institution in charge. The organization managing and supervising technical regulations in Vietnam would be different from that in Japan. Actually, the Vietnam Railway Administration (VNRA) belonging to MOT is not always in charge of all kinds of inspection, supervision and other matters relevant to railways. Although VNRA is in charge of preparation of the technical regulation at the moment, it is still being discussed who enforce the technical regulation and how.

Irrespective of which organization administer an evaluation of the technical regulation conformity, it is necessary to appoint and train engineers in different fields to facilitate examinations and inspections with enough knowledge and skill. It is particularly important to prepare trained expert engineers in such specific field as tracks, signals, contact wires and rolling stock. It would be possible to outsource these works where necessary, but it is still necessary to establish the organization/institution who can evaluate the outsourcing results appropriately.

The organization in Japan for railway affairs including enforcement of railway technical standards is described below, as a reference for the Vietnamese side when discussing and establishing their own organization.

In Japan, MLIT is a sole supervising organization to ensure the safety of railways dividing the responsibility between the Head Office and Regional Transport Bureaus. The Regional Transport Bureaus are located in nine regions, Hokkaido, Tohoku, Hokuriku/Shin-etsu, Kanto, Chubu, Kinki, Chugoku, Shikoku and Kyushu, in which the Railway Department takes charge of supervising railway operators in each region. The following organization chart shows the staff related to engineering affairs.



Total number of staff of Railway Bureau: 161 (including 57 of the organizations for engineering affairs)

Figure 7-2 Organization Chart, Railway Bureau - Head Office, MLIT (FY 2008)

- (Kanto, Chubu, and Kinki region)
- Director, Railway Department———|—Administration Division
 - |—Coordinate Administrator |—Planning Division
 - |—Engineering Division
 - :Civil engineering, track facilities, electricity, signal facilities, safety of rolling stock
 - * Engineering Divisions No. 1 and No. 2 at the Kanto Regional Transport Bureau
 - |—Safety Advisory Division
 - :Report, investigation, cause analysis, prevention of recurrence of railway accidents
 - |—Chief Railway Safety Supervisor
 - :Planning of security supervision, safety of train operation
 - ... Kanto Regional Transport Bureau (42):
 - Including 7 (Engineering Division No.1), 8 (Engineering Division No.2), 6 (Safety Advisory Division), 5 (Chief Railway Safety Supervisor and others)
 - ... Chubu Regional Transport Bureau (26):
 - Including 5 (Engineering Division), 5 (Safety Advisory Division), 3 (Chief Railway Safety Supervisor and others)
 - ... Kinki Regional Transport Bureau (31):
 - Including 8 (Engineering Division), 5 (Safety Advisory Division), 4 (Chief Railway Safety Supervisor and others)
- (Hokkaido, Tohoku, Hokuriku/Shin-etsu, Chugoku, Shikoku, and Kyushu region)
- Director, Railway Department———|—Planning Division
 - |—Coordinate Administrator |—Engineering Division
 - :Civil engineering, track facilities, electricity, signal facilities, safety of rolling stock
 - |—Safety Advisory Division
 - :Report, investigation, cause analysis, prevention of recurrence of railway accidents
 - * Safety Advisory Officer at the Shikoku Regional Transport Bureau
 - |—Cable Railway Division
 - :Safety of cable railways
 - * Only at the Hokuriku/Shin-etsu Regional Transport Bureau
 - |—Chief Railway Safety Supervisor
 - :Planning of security supervision, safety of train operation
 - ... Hokkaido Regional Transport Bureau (19):
 - Including 6 (Engineering Division), 4 Safety Advisory Division, 3 (Chief Railway Safety Supervisor and others)
 - ... Tohoku Regional Transport Bureau (19):
 - Including 6 (Engineering Division), 4 Safety Advisory Division, 2 (Chief Railway Safety Supervisor and others)
 - ... Hokuriku/Shin-etsu Regional Transport Bureau (22):
 - Including 5 (Engineering Division), 4(Safety Advisory Division), 4 (Cable Railway Division), 3 (Chief Railway Safety Supervisor and others)
 - ... Chugoku Regional Transport Bureau (16):
 - Including 4 (Engineering Division), 4 (Safety Advisory Division), 2 (Chief Railway Safety Supervisor and others)
 - ... Shikoku Regional Transport Bureau (14):
 - Including 5 (Engineering Division), 1 (Safety Advisory Division), 2 (Chief Railway Safety Supervisor and others)
 - ... Kyushu Regional Transport Bureau (20):
 - Including 7 (Director, Engineering Division), 4 (Director, Safety Advisory Division), 2 (Chief Railway Safety Supervisor and others)

Total number of staff at Regional Transport Bureau: 209 (including 126 of organizations related to engineering)

Figure 7-3 Organization Chart of Railway Division - Regional Transport Bureau, MLIT (fiscal 2008)

The above organizations are for the staff to supervise railway operators in Japan. It should be noted that the number of railway operators, size and experience of railway business, experience of engineering staff on the supervisor side in Vietnam are quite different from those in Japan.

7-2 Appropriate Review of the Technical Regulation

It is often the case that the technical regulations should be reviewed or revised to cope with unforeseen issues/problems especially when discussing ways to prevent accidents and when developing/introducing new technologies.

In the case of Japan, even after transforming the technical standards into performance-based ones in 2001, the technical standards and their commentaries have been revised from time to time being triggered by such events as a serious derailment accident of JR West, a subway fire disaster in Korea and introduction of new railway systems. These revisions have been made to improve the safety of railways and not to obstruct the introduction of new technologies which safety has been confirmed.

In this connection, a permanent steering committee on the technical standards, together with working groups in different fields of specialty, is organized in Japan. The committee and working groups regularly collect and examine all kinds of requests from railway operators regarding the technical standards and the commentaries, and which are occasionally revised in cases where deemed necessary and the safety of technologies concerned has been confirmed.

In Vietnam as well, Article 35 of the Law on Standards and Technical Regulations prescribes that the technical regulations shall be revised at least every five years or when necessary. As the drafted technical regulation for railways this time prescribe not only performance-based requirements but also important numerical values/figures in the supplement provisions, it is necessary to monitor its status regularly and to review and/or revise them quickly when necessary. And in order to maintain the technical regulation, it is also desirable to establish mechanisms to collect and examine the requests from railway operators referring to such precedent cases as in Japan.

7-3 Flexible Application of the Technical Regulation

The drafted technical regulation for railways prescribes not only performance-based requirements but also important numerical values/figures in the supplement provisions. Although these values/figures are intended to guarantee the safety under any condition, special cases are remained where the safety may be secured even without relying on those provisions. Furthermore, it may take too long to review or revise these values/figures when introducing new technologies, or they need to be introduced on a trial basis even though it may be premature or inappropriate to generalize them.

To cope with such problems in Japan, there used be special provisions in the former standards before the introduction of performance-based requirements, which allowed the introduction of different structures/technologies from those stipulated in the technical standards as long as the Minister of MLIT exceptionally approves the introduction of new technologies as a result of flexible application of technical standards. The procedures were as outlined below.

- a. Railway operators apply for the approval of the special structure/technology to the Minister of MLIT.
- b. The Railway Bureau of MLIT, investigates the following aspects of the case:

- Reasonable and sufficient grounds to adopt a special structure/technology
 - Test data to evaluate the safety of the structure/technology
 - Special measures to guarantee the safety of the structure/technology where necessary
- c. Approval of the special structure/technology for the applicant railway operators (attached with conditions or a term of validity where necessary)

Of course, such special treatment should not be abused and the technical standards would be revised after careful consideration on safety. However, as unforeseen cases may emerge since enactment of the technical standards, it is required to apply the standards flexibly with sufficient guarantee of safety.

In Article 138 “Enforcement Provisions” of the draft of the technical regulation prescribes that “In case problems or difficulties arise in applying the provisions/criteria, those who apply them shall report the matter to the leader of railway operators and the Minister of Transport in order to solve those problems or difficulties”. It is desirable, therefore, to flexibly apply this prescription with careful examination of safety in order to implement construction and remodeling of railways smoothly as well as in a reasonable manner.

7-4 Recommendation for Enforcement of the Technical Regulation

The sections above describe the issues to be discussed in Vietnam in the future when examining how to enforce the technical regulation.

In Vietnam, the enforcement of the technical regulation has not yet adequately been discussed. In order to ensure safe and smooth railway transport, only establishment of the technical regulation would be nonsense without its enforcement mechanism. Therefore, discussions on how to enforce the technical regulation should be made in parallel with those on their legalization, and it is desirable to establish an appropriate mechanism/system for effective enforcement by reflecting such precedent cases as in Japan. Summarizing this chapter, the Study Team recommends below to realize the effective enforcement of the technical regulation.

- a. Vietnam is urgently requested to establish methods and procedures to apply the technical regulations appropriately based on the laws and practices in the country, while referring to the precedent cases in other countries such as Japan.
- b. The organizations to evaluate the conformity with the technical regulations should employ and train a sufficient number of engineers who have necessary knowledge and skills in relevant fields, and establish a system to enable them to work efficiently.
- c. To ensure the safety of railway transport, the administration side shall establish a security inspection system to regularly confirm that railway operators conform to the technical regulations.
- d. An appropriate mechanism to grasp and examine the requests from railway operators as well as to review and revise the technical regulation in a timely manner should be established in accordance with the related laws.

- e. Regarding the case where exceptional treatment is required in applying the technical regulations, it is advisable to establish a mechanism which enables flexible actions to introduce new technologies on the condition that railway safety is guaranteed.

DRAFT TECHNICAL REGULATION

TABLE OF CONTENTS

Chapter 1 GENERAL RULES	TR6
Article 1. Objective	6
Article 2. Definitions	6
Article 3. Regulation scope	7
Article 4. Implementation rules	7
Article 5. Submission of documents	7
Article 6. Prevention of harm	8
Article 7. Prevention of heavy noise	8
Article 8. Measures to be taken to facilitate the smooth movement of passengers	8
Chapter 2 OFFICIALS IN CHARGE	9
Article 9. To guarantee operating safety	9
Article 10. To ban work in intoxicated conditions	9
Article 11. To keep knowledge and skill	9
Article 12. To have theoretical and practical training for an official in charge	9
Article 13. To have a crewman who drives a power car on board, and so on	9
Chapter 3 TRACKS	10
Section 1 GAUGE	10
Article 14. Gauge	10
Section 2 LINE SHAPE OF THE TRACK	10
Article 15. Line shape of the track	10
Article 16. Curve radius	10
Article 17. Cant (Superelevation)	10
Article 18. Slack (Increasing of the distance between two rails)	11
Article 19. Transition curve	11
Article 20. Gradient	11
Article 21. Vertical curve	11
Section 3 CONSTRUCTION GAUGE	12
Article 22. Construction gauge	12
Section 4 WIDTH OF FORMATION LEVEL AND DISTANCE BETWEEN TRACK CENTERS	12
Article 23. Width of formation level	12
Article 24. Distance between centers of tracks	13
Section 5 RAILWAY STRUCTURE	13
Article 25. Track	13
Article 26. Road bed and earth structure	13
Article 27. Structure	14
Article 28. Buildings	14
Article 29. Facilities for reducing significant noise and vibration	14
Section 6 SAFETY FACILITIES	14
Article 30. Facilities for the prevention of a disaster	14

Article 31.	Protection of the area under bridge	15
Article 32.	Prevention of rolling stock overrun, etc.	15
Article 33.	Prevention of entry into roadway	15
Article 34.	Evacuation equipment, etc.	15
Section 7	TRACK SIGN POSTS	16
Article 35.	Track sign post	16
Chapter 4	STATIONS.....	16
Article 36.	Station layout.....	16
Article 37.	Station facilities	16
Article 38.	Platforms	16
Article 39.	Passenger ways.....	17
Article 40.	Facilities of underground station, etc.	17
Article 41.	Sheds, depots and workshops, etc.	17
Chapter 5	THE INTERSECTION WITH A DIFFERENT RAILWAY AND WITH ROADS	18
Article 42.	The intersection with a different railway and with roads	18
Article 43.	Level crossings.....	18
Chapter 6	POWER SUPPLY EQUIPMENT	19
Section 1	CONTACT LINE FACILITIES	19
Article 44.	Installation, etc. of contact lines, etc.	19
Article 45.	Approach or crossing of overhead contact lines, etc.	19
Article 46.	Insulation division of contact lines	19
Article 47.	Prevention of troubles under overbridges, etc.	20
Article 48.	Installation of return current rails	20
Article 49.	Lightning protection	20
Article 50.	Prevention of induction damage.....	20
Section 2	EQUIPMENT AT SUBSTATION	20
Article 51.	Facilities at substations.....	20
Article 52.	Installation of electrical equipment and switchboards	21
Section 3	OTHERS POWER SUPPLY DIRECTIVES	21
Article 53.	Protection of electrical equipment.....	21
Article 54.	Insulation of electric lines	21
Article 55.	Grounding of electrical equipment.....	21
Chapter 7	SIGNALING AND TELECOMMUNICATIONS ENSURING TRAIN OPERATION SAFETY.....	22
Article 56.	Block equipment	22
Article 57.	Railway signal indication devices	22
Article 58.	Interlocking devices	22
Article 59.	Devices that automatically stop trains or decelerate their speed	22
Article 60.	Automatic train operation devices.....	23
Article 61.	Train detection device	23
Article 62.	Safety ensuring telecommunications.....	23
Article 63.	Installation of overhead communication lines.....	23
Article 64.	Level crossing safety equipment	24
Article 65.	Ensuring safety at the time of trouble occurrence	24

Chapter 8 ROLLING STOCK	25
Section 1 GENERAL	25
Article 66. Scope and objects of application	25
Article 67. Railway environment requirement	25
Section 2 ROLLING STOCK GAUGE	25
Article 68. Rolling stock gauge	25
Section 3 WEIGHT OF ROLLING STOCK	26
Article 69. Weight of rolling stock	26
Article 70. Stability	26
Section 4 ROLLING STOCK RUNNING GEAR	26
Article 71. Running gear	26
Article 72. Propulsion system	27
Article 73. Brake system	27
Section 5 CAR BODY STRUCTURE AND DEVICES	28
Article 74. Carbody structure	28
Article 75. Structure for lightening remarkable noise	28
Article 76. Structure of the crew's room	28
Article 77. Structure of passenger room	28
Article 78. Doorway structure for passenger	29
Article 79. Structure of gangways and door	29
Article 80. Structure of emergency exit	29
Article 81. Coupling system	29
Article 82. Rolling stock structure for transporting special cargo	29
Article 83. Facilities of driver room	29
Article 84. Internal pressure vessels and others and other pressure supply sources and accessory devices	30
Article 85. Auxiliary equipment of rolling stock	30
Article 86. Rolling stock markings	30
Section 6 FIRE PREVENTION OF ROLLING STOCK	31
Article 87. Fire prevention of rolling stock	31
Article 88. Fire alarm system	31
Article 89. Auxiliary power source facility	31
Section 7 OTHER EQUIPMENT	31
Article 90. Car facility of a train by one-man driving	31
Article 91. Device for recording the operational state of a train	32
Chapter 9 FACILITIES AND ROLLING STOCK MAINTENANCE	33
Section 1 STRUCTURE, TRACK	33
Article 92. Preservation of facilities	33
Article 93. Inspection and trial operation of facilities	33
Article 94. Inspection patrol and monitoring of facilities	33
Article 95. Periodical inspection of facilities	33
Article 96. Record	33
Section 2 POWER SUPPLY EQUIPMENT	34
Article 97. Maintenance of power supply equipment	34
Article 98. Inspection and test run of new power supply equipment	34

Article 99.	Inspection and monitoring of the contact lines on the main line.....	34
Article 100.	Regular inspections of power supply equipment.....	34
Article 101.	Records.....	34
Section 3	SIGNALING AND TELECOMMUNICATIONS.....	35
Article 102.	Maintenance of signaling and telecommunications	35
Article 103.	Inspection and use of train operation guaranteeing equipment	35
Article 104.	Regular inspection of signaling and telecommunications	35
Article 105.	Records.....	35
Section 4	ROLLING STOCK	35
Article 106.	Rolling stock maintenance	35
Article 107.	Inspection and running test of new rolling stock and the like	35
Article 108.	Train inspection	36
Article 109.	Periodic inspection of rolling stock.....	36
Article 110.	Records	36
Chapter 10	OPERATION.....	37
Section 1	LOADING LIMITS	37
Article 111.	Vehicle loading limits	37
Article 112.	Indication when hazardous materials are loaded.....	37
Article 113.	Hazard control for vehicles loaded with hazardous materials	37
Section 2	TRAIN OPERATION.....	37
Article 114.	Maximum number of vehicles to be coupled	37
Article 115.	Train brakes	37
Article 116.	Train braking force	38
Article 117.	Operation of the main line outside station.....	38
Article 118.	Train working time	38
Article 119.	Prevention of accidents at train departure	38
Article 120.	Safety assurance between trains	38
Article 121.	Train driving position	38
Article 122.	Train running speeds	38
Article 123.	Train backward operation.....	39
Article 124.	Simultaneous entry or departure of trains	39
Article 125.	Train protection	39
Article 126.	Track possession.....	39
Article 127.	Prevention of train disaster.....	39
Section 3	VEHICLE OPERATION.....	39
Article 128.	Shunting	39
Article 129.	Parking of vehicles	39
Section 4	RAILWAY SIGNALS	40
Article 130.	Relationship between railway signals and operation.....	40
Article 131.	Indication of stop signal	40
Article 132.	Inaccurate signal indication.....	40
Article 133.	Prohibition of dual-purpose use of signals	40
Article 134.	Conditions for clear aspect signals	40
Article 135.	Other matters concerning signal aspect.....	40

Article 136.	Priority of take on proceed signal.....	40
Article 137.	Signs and indicators.....	40
Chapter 11	ENFORCEMENT PROVISIONS.....	41
Article 138.	Enforcement provisions.....	41
SUPPLEMENTARY PROVISIONS		42
Article 16.	Curve radius	42
Article 17.	Cant (Superelevation).....	43
Article 18.	Slack (Increasing of the distance between two rails)	44
Article 19.	Transition curve.....	44
Article 20.	Gradient.....	46
Article 21.	Vertical curve.....	47
Article 22.	Construction gauge.....	48
Article 23.	Width of formation level	59
Article 24.	Distance between centers of tracks.....	59
Article 25.	Track.....	61
Article 38.	Platforms	62
Article 44.	Installation, etc. of contact lines, etc.	64
Article 68.	Rolling stock gauge.....	65
Article 70.	Stability	65
Article 71.	Running gear	65
Article 73.	Brake system	66
Article 78.	Structure of doorways for passengers.....	66

CHAPTER 1

GENERAL RULES

Article 1. Objective

The objective of this technical regulation (hereinafter referred to as “this regulation”) is to ensure safe and stable transportation by defining technical threshold and requirements, which conform to the Railways Law, concerning structures of such railway facilities as civil engineering, electric power, signal communications and others which are used in railway transportation (hereinafter referred to as “facilities”), , and structure and operation of rolling stock.

Article 2. Definitions

In this regulation, the meanings of the principal terms are defined as below. The meanings of other terms shall comply with the Railways Law and related laws.

- (1) “National railway” refers to railways which are used for domestic transportation, transportation in economic regions, and transportation for international communications.
- (2) “Urban railway” refers to railways which are used for passenger transport in urban and surrounding areas.
- (3) “Specialized railways” refers to railways which are used for dedicated transportation for organizations and individuals.
- (4) “Ordinary railway” refers to railways other than non-conventional railways as stated in the item below seven (7), wherein the design speed is not greater than 150 km/h.
- (5) “Semi-high-speed railway” refers to railways which are used for passenger transportation, wherein the design speed is greater than 150 km/h and not greater than 200 km/h and the gauge is 1435 mm.
- (6) “High-speed railway” refers to railways which are used for passenger transport, wherein the design speed is greater than 200 km/h and not greater than 350 km/h and the gauge is 1435 mm.
- (7) “Non-conventional railway” refers to railways which are guided by guide-ways including monorails (straddle type and suspended type), guide-rail type railways, and levitation railways, etc.
- (8) “Main track/line” refers to a track/line which connects and passes through station boundaries and which is constantly used for operations of trains.
- (9) “Side track/line” refers to a track/line other than the main track.
- (10) “Rolling stock” refers to transportation equipment such as locomotives, rolling stock (passenger cars and freight cars), self-propelled rolling stock (motor cars, trailers and internal combustion railcars), and special rolling stock (track testing cars, electric testing cars, accident relief cars and other cars having special structures)
- (11) “Train” refers to railway transportation equipment constituted by locomotives and rolling stock (passenger cars and freight cars), or self-propelled rolling stock (motor cars, trailers and internal combustion railcars), or special rolling stock

- (12) “Station” refers to a place where railway transportation equipment is stopped for shunting and outpacing the train, loading and unloading the baggage, allowing passengers to take the train for transportation, carrying out professional tasks, and providing other services. The station comprises tracks, a station building, a square, a baggage depository, a freight marshalling yard, a platform, a fence, a service area and other necessary facilities
- (13) “Interchange point” refers to a place which is used exclusively for interchange or waiting arrangement of trains
- (14) “Yard” refers to a place which is used exclusively for shunting rolling stock or making up trains
- (15) “Dangerous object” refers to dangerous freight specified in the Railways Law, Article 102, paragraph 1
- (16) “Baggage” refers to baggage of organizations and individuals which is transported by railway operators
- (17) “Blocking” refers to dedicating a section to the operation of one train so as not to allow two or more trains to run at the same time in the same section
- (18) “Railway signaling” refers to signals, signs and indicators
- (19) “Signals” refer to the means which indicate conditions/instructions for drivers of a train or rolling stock in a certain section, by means of shapes, colors, sounds, etc.
- (20) “Signs” refer to the means which are used by driving-related officials to communicate each other by means of shapes, colors, sounds, etc.
- (21) “Indicators” refer to the means which provide necessary information indicating positions of objects, directions, conditions, etc. by means of shapes, colors, etc.

Article 3. Regulation scope

This regulation shall be applied to ordinary railways, high-speed railways, semi-high-speed railways and non-conventional railways, while not be applied to specialized railways, and cable railways and streetcars (trams) under the category of non-conventional railways

This regulation may not be applied to railways which were installed, rebuilt, reformed or modified before this regulation come into effect.

Article 4. Implementation rules

1. Railway operators shall institute their own implementation rules/criteria (hereinafter referred to as “implementation rules”) based on this regulation, and comply therewith.
2. When the Minister of Transport specifies additional rules on this regulation by the notification, the implementation rules shall be instituted in accordance therewith.
3. The Director of Vietnam Railway Administration (hereinafter referred to as “VNRA”) in the Ministry of Transport (or provincial-level Chairs of the People’s Committee entrusted by the Minister of Transport) may give instructions to change the implementation rules when determining that they may not conform to the provisions of this regulation.

Article 5. Submission of documents

When railway operators wish to establish or modify their own implementation rules, they

are required to report it to the Director of VNRA (or provincial-level Chairs of the People's Committee entrusted by the Minister of Ministry of transport).

Article 6. Prevention of harm

The construction entrepreneur shall construct railway facilities without causing danger or injury to people and other facilities in such works as slope cutting, cutting, excavation, embankment, piling, on the basis of the railway operator's suitable instruction, and supervisor.

Article 7. Prevention of heavy noise

Railway operators shall strive to take necessary measures to prevent heavy noise associated with train operations.

Article 8. Measures to be taken in order to facilitate the smooth movement of passengers

Railway operators shall take necessary measures to improve convenience and safety of stations and rolling stock especially for such passengers as the aged and the disabled.

CHAPTER 2

OFFICIALS IN CHARGE

Article 9. To guarantee operating safety

When operating a train, officials in charge shall be qualified, and shall strive to guarantee safety utilizing full of their knowledge/skills and train operating facilities.

Article 10. To ban work in intoxicated conditions

Officials in charge shall not be on duty when they are unable to do their job normally under influence of alcohol or drugs.

Article 11. To keep knowledge and skill

Officials engaged in works directly related to the train operations, and officials who carry out maintenance and other related work on facilities and rolling stock shall have sufficient knowledge and skills to operate trains or vehicles safely.

Article 12. To have theoretical and practical training for an official in charge

1. Railway operators shall provide the officials mentioned in Article 11 with necessary education and training so that they get knowledge and skill on their work.
2. The railway operators shall confirm the aptitude, knowledge and skills of the officials before putting them on duty.
3. The railway operators shall not allow the officials to do their jobs when he is not appeared in a condition to fully utilize his knowledge and skills in their jobs.
4. The railway operators shall not let the staff on probation operate any driving facilities unless they are under instruction or supervision of trainers in charge.

Article 13. To have a crewman who drives a power car on board, and so on

1. A crewman who drives a power car shall be on board a train, provided, however, this shall not apply in the case when the safety is assured without the crewman concerned owing to the structure of the facilities and rolling stock. The contents of this proviso shall be separately provided in the public notice.
2. A crewman who drives a power car shall possess a driver's license specified in Railways Law and other ministerial ordinance, provided, however, that this shall not apply in the case when an apprentice crewman drives a power car under the instruction of another licensed crewman on board. In this case, the crewman with the license shall be responsible for the action of his trainee.

CHAPTER 3 TRACKS

Section 1 GAUGE

Article 14. Gauge

The track gauge shall be set to ensure the safe and stable operation of the vehicles concerned, in consideration of the structure and the design speed of the vehicles, etc.

The ordinary railway gauge shall be as follows.

- (1) The gauge of the national railway shall be either 1000mm or 1435 mm.
- (2) The gauge of the urban railway (except for special railway) shall be 1435 mm.

Section 2 LINE SHAPE OF THE TRACK

Article 15. Line shape of the track

The curve radius and gradient of the main track shall be set to ensure mass and rapid transport of railway transportation, giving due consideration to the design speed, the design traction mass, etc. However, where it is impossible to meet the aforesaid requirements due to unavoidable circumstances such as topological conditions, the curve radius and gradient capable of ensuring the train's operating safety may be used under the given speed limit.

Article 16. Curve radius

1. The curve radius shall be free from the risk of hindering the safe operation of the vehicles, in consideration of the curvilinear passage performance and operating speed of the vehicles, etc.
2. The curve radius shall have a magnitude that allows the train to operate safely at the design speed. However, where it is impossible to meet the aforesaid requirement due to unavoidable circumstances such as topological conditions, the curve radius may be used along which the vehicles run safely under the given speed limit.
3. The curve radius of the main track along the platform shall be as large as possible.
(Refer to supplementary provisions)

Article 17. Cant (Super elevation)

1. Circular curves shall be provided with a cant appropriate to the gauge, curve radius, operating speed, etc. so as not to cause the risk of vehicles overturning, in consideration of the centrifugal force and the influence of wind acting on the vehicles, etc. However, this requirement shall not apply to turnout curves, curves connected to the turnout (hereinafter referred to as “curves incidental to turnout”), side tracks, and other locations being difficult to provide a cant where the operating speed is limited and other measures are taken to eliminate the risk of vehicles overturning.

2. The cant in the transition section shall be diminished over a considerable length along the transition curve or straight line, so as not to hinder the safe operation of the vehicles and the ride comfort of the passenger, in consideration of the cant value on the circular curve, the operating speed and the vehicle's structure, etc.
(Refer to supplementary provisions)

Article 18. Slack (Increasing of the distance between two rails)

1. The circular curve is provided with a slack that is able to prevent an excessive lateral force on the track, giving due consideration to the curve radius, the vehicle's wheel base, etc. However, this requirement shall not apply if the curve radius is large, or the vehicle's wheel base is short, or in other cases there is no risk of generating an excessive lateral force on the track.
2. The slack shall be reduced in considerable length so as not to hinder the safe operation of the vehicles, in consideration of the vehicle's wheel base.
(Refer to supplementary provisions)

Article 19. Transition curve

The transition curve shall be inserted between the straight line and the circular curve and between two circular curves so as not to hinder the safe operation of the vehicles and the ride comfort of passengers, in consideration of the vehicle structure, the cant quantity, the operating speed, etc.

However, this shall not apply to curves incidental to turnout, circular curves with small cant quantity, and other locations being difficult to insert the transition curve where the operating speed is limited and equipment for the prevention of derailment or other measures are taken to eliminate the risk of hindering the safe operation of the vehicles.

(Refer to supplementary provisions)

Article 20. Gradient

1. The gradient shall enable the vehicles to be started, operate continuously at a predetermined speed and stop within a predetermined distance, in consideration of the performance of the power generating unit, the performance of the brake equipment and the operating speed of the vehicles, etc.
2. The gradient of the stop section for the train shall be free from the risk of hindering the departure and arrival of the train, in consideration of the performance of the power generating unit and brake equipment of the vehicles as well as rolling of the train under the influence of wind.
3. The gradient of a section where the vehicles are parked or coupled/decoupled shall be free from the risk of the vehicle rolling. This requirement shall not apply where measures are taken to prevent the vehicle rolling. (Refer to supplementary provisions)

Article 21. Vertical curve

A vertical curve shall be inserted at a location where there is a gradient change so as not to hinder the safe operation of the vehicles and the ride comfort of passengers, in consideration of the operating speed of the train, the vehicle structure, etc. However, this

requirement shall not apply where the change in gradient is small, or the operating speed is low, or in other cases there is no risk of hindering the safe operation of the vehicles.
(Refer to supplementary provisions)

Section 3 CONSTRUCTION GAUGE

Article 22. Construction gauge

1. The construction gauge in a straight line shall be determined so that the distance from the rolling stock gauge is free from the risk of hindering the safe operation of the vehicles as well as the safety of passengers and officials in charge, in consideration of vibrations of the vehicles associated with traveling of the vehicles, etc. (Refer to supplementary provisions)
2. In a straight line where electric locomotives and electric cars travel, the construction gauge shall be determined so that the gap from the rolling stock gauge is free from the risk of electric shock and fire, in consideration of vibrations of the vehicles associated with traveling of the vehicle, etc.
3. The construction gauge in the curve shall be derived by extending the construction gauge in paragraphs 1 and 2 in this article in accordance with the displacement of the vehicle, and tilting the said construction gauge in accordance with the cant. (Refer to supplementary provisions)
4. Any buildings or other structures shall not be provided within the construction gauge.
5. Any objects other than the train shall not be placed within the construction gauge, provided, however, that this shall not apply to the objects necessary for railway construction and other works and when the operating speed is limited or other measures are taken for ensuring the safe operation of the train.
6. Any objects which are likely to collapse toward the inside of the construction gauge shall not be placed even outside the construction gauge.

Section 4 WIDTH OF FORMATION LEVEL AND DISTANCE BETWEEN TRACK CENTERS

Article 23. Width of formation level

1. The width of formation level in a straight line shall ensure that structures serving as tracks can be installed and that the officials in charge who carry out track maintenance and maintenance equipment can step aside safely and easily when the trains travel. (Refer to supplementary provisions)
2. The width of formation level in the curve shall be derived by extending the width of

formation level in paragraph 1 in this article in accordance with the displacement of the vehicle and the cant quantity.

Article 24. Distance between centers of tracks

1. The distance between centers of tracks in a straight line shall be free from the risk of hindering the safe operation of the vehicles, including such case as contact between vehicles, contact between a passenger body hanging out of windows and any opposite vehicles and so on, due to vibrations of the vehicles associated with the operation of the vehicle.
2. The distance between centers of tracks on a curve shall be derived by extending the distance between the centers of tracks in the preceding clause, in accordance with the deflection of the vehicle associated with the curve as well as the deflection of the vehicle associated with the difference in the cant values between two tracks.
(Refer to supplementary provisions)

**Section 5
RAILWAY STRUCTURE**

Article 25. Track

1. The track shall comply with the following criteria:
 - (1) The track shall match the structure of the vehicle, so that the vehicle can be guided in a predetermined direction.
 - (2) The track shall bear a design speed and design loads.
 - (3) The track shall be free from the risk of deformation hindering the safe operation of the trains, and thus be capable of ensuring the safe operation of the trains.
 - (4) The track shall be free from the risk of hindering integrity.
2. Equipment for prevention of derailment or equipment for reducing damage in the event of derailment shall be provided on curves with small radius and other locations where derailment might occur on the main track, or where derailment is likely to result in serious damage, according to the situation of available facilities and the structure of the vehicle, etc.
3. As for the power generating unit on the railway of the linear motor driving system, the ground device, accessories and fasteners thereof shall have the capacity necessary for the operation of trains, etc., and shall be installed in a position where the safe operation of the vehicles is secured, and shall have a structure that is secure against attractive forces associated with the generation of motive power.

(Refer to supplementary provisions)

Article 26. Road bed and earth structure

1. The roadbed on an embankment or cutting section shall have enough thickness of the

upper roadbed to ensure the stability of the formation level, and roadbed materials with sufficient strength shall be used.

2. The structure of earthen structures such as roadbeds, cuttings and embankments shall have sufficient strength to prevent excessive deformation of the track and to enable ordinary track maintenance to be carried out, in consideration of the design speed, train loads and the design passing tonnage along the line section.

Article 27. Structure

Earthworks, bridges, tunnels and other structures shall endure the design loads and be free from the risk of hindering the safe operation of the vehicles due to the displacement of the structure by the train load, an impact, etc.

Article 28. Buildings

Buildings and rail-over-bridges within the roadway (the roadway means the passway to run the trains, including track, roadbed, etc., hereinafter referred to as “the roadway”) premises, sheds on the platform and other similar buildings shall endure all potential loads and be free from the risk of hindering the operation of the vehicles and their availability for passengers, in particular.

Article 29. Facilities for reducing significant noise and vibration

1. The railway for a high-speed railway shall be provided with facilities/equipment to reduce significant noise and vibration associated with the operation of a train, according to the situation of population density adjacent to the railway.
2. The railway for an ordinary railway, on which a new line is constructed or a large-scale modification is carried out, shall be provided with facilities/equipment to reduce significant noise and vibration associated with the operation of a train, according to the situation of population density adjacent to the railway.

Section 6
SAFETY FACILITIES

Article 30. Facilities for the prevention of disasters

1. Measuring instruments such as rain gauges, water-level gauges, anemometers and seismometers shall be installed properly in order to prevent disasters by rainfall, a rain-swollen river, wind, earthquakes, etc.
2. Facilities/equipment to prevent hindrance on the railway or equipment for detecting falling objects, etc. shall be provided at a cutting, a tunnel entrance or the like where falling of objects may cause a hazard to the railway.
3. Railway facilities such as stations and tunnels shall be provided with facilities/equipment for the prevention of flooding according to the situation, and drainage equipment appropriate for the necessary drainage discharge.

Article 31. Protection of the area under bridges

1. Protection equipment to prevent objects from falling shall be installed in bridges which are constructed over busy roads, railways or rivers and when there may be risks to cause damage or injury to people and/or vehicles traveling under the bridge.
2. Relevant protection equipment shall be installed for bridges which are constructed over busy roads or rivers and when there is a possibility of receiving an impact from automobile or boat/vessel. However, for railways other than high-speed railways, danger warning signs may be provided where the traffic density is low and the installation of protective measures is difficult from a topographical viewpoint.
3. The road traffic space under a bridge over road shall have such clearance of prescribed in the design standard for roads. However, danger warning signs may be enough where it is difficult to secure the said clearance from a topographical viewpoint and the installation of the protective measures is difficult.

Article 32. Prevention of rolling stock overrun, and etc.

1. Relevant security equipment shall be installed at locations where vehicles or trains may possibly overrun or runaway the tracks and may possibly cause injuries or damages, in consideration of the operating speed of the train, the gradient, etc.
2. Safety side tracks or protection equipment shall be installed at locations where the main track or side track diverges, where two or more trains may enter or depart at the same time and may mutually hinder their respective routes.
3. In a case that there is a possibility that trains or vehicles may overrun in the continuous downward gradient line section, preventive measures against overrun shall be provided, and refuge side line may be installed where necessary.

Article 33. Prevention of entry into roadway

1. Where people may enter into the roadway, relevant protection equipment or danger warning signs shall be provided as required.
2. Despite the rule in paragraph 1 of this article, protection equipment must be provided for high-speed railways except for bridges, tunnels and other places where people cannot easily access.

Article 34. Evacuation equipment, and etc.

The roadway shall ensure that passengers in evacuation can walk safely along with it in the event of an accident or other emergency, provided, however, that this shall not apply where relevant evacuation equipment is provided according to the situation of the facility.

Section 7
TRACK SIGN POSTS

Article 35. Track Sign Post

1. The main line shall be provided with track sign posts, which are necessary for ensuring the integrity of the roadway and the safe operation of trains.
2. The track sign posts in the side line may be installed based on the manner of the main line.

Chapter 4
STATIONS

Article 36. Station layout

1. The station layout shall be based on the train operations.
2. The effective length of the main track used for arrival, departure, refuge in a station shall be long enough for the longest train that operates in the main track concerned.
3. For station layout, the convenience of passenger transfer, interoperability between different routes, and connectivity to planned routes in the future shall be considered.
4. For station layout, the transport plan, the track capacity, and the function of track equipment shall be considered.
5. For depot layout, the type of depot, the function of inspection/repair, and the track capacity shall be considered.

Article 37. Station facilities

1. The station shall be provided with platforms, freight loading and unloading areas, and other relevant equipment necessary for handling passengers and/or freight, according to the volume of passengers and/or freight to be handled.
2. The station shall be provided with equipment that provides useful information for passengers who utilize the station.

Article 38. Platforms

Platforms shall comply with the following criteria.

- (1) The effective length of the platform shall be equal to or greater than the length of the longest train that arrives at and departs from the platform, which length ranges from the front passenger car (if the conductor is stationed in a car other than passenger cars, that car is included; the same will apply in this article) to the rearmost passenger car, and shall be free from the risk of hindering the safe and easy boarding of passengers; provided, however, that this shall not apply in the case where it is impossible to meet the aforesaid requirement due to topological conditions or the like, and where passenger entrances of the vehicle are closed off or other necessary measures are taken.

- (2) The width of the platform and the distances between the edge of the platform and the wall of such structure on the platform as posts, entrances of bridge over railway and/or underground passage, waiting rooms, shall be free from the risk of hindering the safe and easy movement of passengers. (Refer to supplementary provisions.)
- (3) Measures shall be taken for ensuring the safety of passengers on the platform, according to the speed, the number of train operations, the operation type of the train, etc.

Article 39. Passenger ways

1. The widths of passenger ways and passenger stairs shall be free from the risk of hindering the movement of passengers.
2. Passenger stairs shall be provided with necessary measures to prevent passengers from falling off the stairs.

Article 40. Facilities of underground station etc.

1. Ventilation equipment shall be installed in the railway stations that principally have underground structures and are situated underground, tunnels connected thereto, and long tunnels (hereinafter referred to as “underground stations, etc.”), provided, however, that this shall not apply when sufficient natural ventilation for their space can be secured.
2. The underground station, etc. shall be provided with the necessary fire extinguishing equipment, evacuation equipment and other fire detection and alarm systems, according to the situation.

Article 41. Sheds, depots and workshops; etc.

1. Sheds, depots and workshops, etc. shall have sufficient ability of accommodations, inspection before the departure of the train, minor repair and repair for each grade, according to the rolling stock to be dealt with.
2. Rolling stock inspection/repair facilities shall have adequate inspection /repair equipment, according to the type of rolling stock to be inspected and/or repaired.

CHAPTER 5 INTERSECTION WITH A DIFFERENT RAILWAY AND WITH ROADS

Article 42. The intersection with a different railway and with roads

1. Newly constructed railways shall intersect with a different railway at different ground levels, excluding where dedicated railways intersect with another dedicated railway.
2. The construction of railway intersection with roads shall be organized at different ground levels in the following cases where:
 - (1) Railways which have the design speed of 160km/h and over intersect with roads.
 - (2) Railways intersect with roads of grade III or higher grades and urban roads excluding roads in suburban area.
 - (3) Urban railways except trams intersect with roads.

Article 43. Level crossings

Level crossings shall be installed giving due attention to the safety and smooth passing of the means of transportation (such as motor vehicles, trains, etc.) and people walking through them. Level crossings shall also be provided with safety equipment for level crossing.

CHAPTER 6 POWER SUPPLY EQUIPMENT

Section 1

CONTACT LINE FACILITIES

Article 44. Installation, etc. of contact lines, etc.

1. Contact lines and feeder lines, apparatus and wires belonging to them, and protection facilities shall be installed to be free from the risk of electric shock and fire, according to the location where they are to be installed, installation methods, and standard voltages.
2. Overhead contact lines and overhead feeder lines shall be installed at a height to be free from the risk of suffering electric shock or posing obstacles to other traffic, according to the location where they are to be installed, installation methods, and standard voltages. (Refer to supplementary provisions)
3. Contact lines shall be able to withstand the predictable maximum wind pressure load, tension arising from the wiring, etc.; and besides, shall be installed to be able to collect power without troubles/problems, according to the operating speed of the trains and the current collection method of the rolling stock.
4. Contact lines and feeders shall be installed so as to prevent troubles of electric confusion with other contact lines and feeders of different standard voltages, and other similar conditions.
5. Contact line voltages shall be maintained at sufficient levels to ensure the appropriate operation of the trains. (Refer to supplementary provisions.)

Article 45. Approach or crossing of overhead contact lines, etc.

When the power-applied portions of overhead contact lines or overhead feeder lines approach or cross other electric lines, structures, or vegetation, they shall be installed to be free from the risk of damaging other electric lines or structures, and suffering electric confusion, shock or fire.

Article 46. Insulation division of contact lines

To avoid wire breakage or electric shock, contact lines shall not be divided in the sections where electric locomotives or electric cars stop regularly; provided, however, that this rule does not apply when necessary measures are taken to prevent electric locomotives and electric cars from stopping at the divided part or to prevent troubles from occurring in case that an electric locomotives or electric cars stop at the divided part.

Article 47. Prevention of troubles under rail-over-bridges etc

In the cases where contact lines and feeders are installed under rail-over-bridges, platform shelters, bridges, or similar facilities, and they are likely to cause danger or damages to people and facilities etc., preventive equipment/facilities shall be provided.

Article 48. Installation of return current rails

1. Return current rails shall be installed in such a manner that they will form a sufficient electric circuit for return current, and that leakage current flowing from the rails to the ground will be minimized.
2. The return current rails laid on level crossings and personal passages, etc., shall be installed in such a manner that the potential difference to ground will not cause any harms to passersby, etc.

Article 49. Lightning protection

1. Measures to protect against lightning damage shall be installed on contact lines and feeder lines, as well as on associated equipment where necessary for safety purposes, provided, however, that this shall not apply where there is little danger of damage associated with lightning.
2. Where electric lines of different voltages are connected via a transformer, the lines and associated equipment shall be provided with protection so as to be free from the risk of electric shocks or fire.

Article 50. Prevention of induction damage

Contact lines and feeders shall be separated from other weak-current lines at an increased distance in order to prevent damage associated with induction, or shall be provided with appropriate protections.

**Section 2
EQUIPMENT AT SUBSTATION**

Article 51. Facilities at substations

1. Substations and switching stations shall be designed and constructed so as to prevent the entry of unauthorized persons.
2. Substations and switching stations shall be fitted with protective equipment for electrical equipment and lines in the substation as well as with fire-fighting equipment in case of emergencies. However, fire-fighting equipment is not required at substations and switching stations where deemed to have a negligible risk of fire.
3. Transformation equipment used for train operations shall have enough capacity for the anticipated load associated with train operations.
4. Monitored substations (including automated substations, remote-control monitored

substations and portable substations with non-permanent operators) and switching stations shall be provided with control rooms equipped with monitoring and control facilities, as well as appropriate facilities for dealing with incidents such as accidents, equipment failure and disasters.

Article 52. Installation of electrical equipment and switchboards

Electrical equipment, switch boards and associated equipment shall be equipped to prevent the risk of fire and electric shock.

Section 3

OTHER POWER SUPPLY DIRECTIVES

Article 53. Protection of electrical equipment

Electric lines and associated electrical equipment shall be fitted with appropriate protection, where necessary for safety reasons in order to prevent grounding and short-circuit faults.

Article 54. Insulation of electric lines

The insulation characteristics used on electric lines and electrical equipment shall be capable of withstanding the level of abnormal voltage anticipated in the event of a fault, without failing and causing danger.

Article 55. Grounding of electrical equipment

Electrical equipment shall be properly grounded for protection purposes, where required to prevent electric shock or fire caused by excessive voltage levels or abnormal increase in electrical potential, and to protect the electrical equipment.

CHAPTER 7

SIGNALING AND TELECOMMUNICATIONS

ENSURING TRAIN OPERATION SAFETY

Article 56. Block equipment

1. Block equipment shall indicate signals and guarantee blocks according to the conditions of block section on the route.
2. System guaranteeing the interval between trains shall be able automatically to decelerate or stop the train in question by continuous control in accordance with the distance to other trains on its route and the conditions of its route.
3. When that the equipment set forth in paragraph 1 and 2 are used for the single-track section, they shall be able to prevent opposite train from entering its section at the same time.

Article 57. Railway signal indication devices

1. Structure of railway signal indication devices and display, methods of indication and display, and their installation methods shall ensure not to cause any signal misreading.
2. Signal indication devices shall be installed so as to decelerate the train to the speed indicated by signals or stop the train before it reaches the beginning of the section protected by those signals.
3. Signal indication devices shall be installed at the intersection, junction of tracks and other locations where trains may collide or get derailed so as to prevent collisions and ensure the safety of train operations.

Article 58. Interlocking devices

1. Interlocking devices between signals, between signal and switches, and between signal and other on the route of trains, shall be installed at intersection, junction of tracks and other locations where the train may collide or get derailed so as to prevent collisions and ensure the safety of train operations.
2. Devices that operate the devices set forth in the preceding paragraph through remote control shall display the location of trains, the condition of the opening of routes for trains, and other necessary information to ensure the safety of train operations at the place where remote control is operated.

Article 59. Devices that automatically stop trains or decelerate their speed

When trains are operated using the automatic block measure or block with non-fixed block section, equipment capable of automatically stopping train or decelerating their speed according to train conditions as well as signal indication shall be installed, provided, however, that this shall not apply in the case where the safety of train operations are secured depending on the status of train operations as well as the condition of tracks.

Article 60. Automatic train operation devices

Automatic train operation devices installed for railways without driver shall meet the following requirements:

- (1) They shall not allow trains to depart before the safety of passengers getting in/off the trains is confirmed.
- (2) They shall have necessary functions to ensure the safety of train operations with controlling the speed of trains smoothly and setting the target speed at lower than the operating speed indicated by control data from devices which secure the interval between trains.
- (3) They shall stop trains smoothly at a point where passengers easily get on/off the train.

Article 61. Train detection device

1. Train detection devices (limited to necessary devices to ensure safety) shall be able to exactly detect the train without failure caused by induction and other phenomena.
2. When the boundary is set up between the detective sections of the device as set forth in the preceding paragraph, it shall be at the position where there is no danger that trains collide with each other.

Article 62. Safety ensuring telecommunications

1. Telecommunications shall support the effective railway management and operation, and shall provide efficient services for railway users.
2. Telecommunications shall guarantee transmission line and terminal unit in good condition in order to control the train operation.
3. In principle, telecommunications shall be carried out through dedicated telecommunication lines. In case the dedicated telecommunication lines are not able to be used due to the compelling reasons, telecommunication line of other telecommunications companies may be used.
4. For the types of telecommunications used for railway which Ministry of Informatics and Communication (hereinafter referred to as “MIC”) authorize to use on the national telecommunication line shall comply with the technical rules promulgated by MIC.

Article 63. Installation of overhead communication lines

1. Overhead telecommunication lines shall be installed at a height to be free from the risk of posing obstacles to other traffic.
2. Overhead telecommunication lines shall be installed so as to be free from the risk of causing danger or damages to people and facilities, and also to be free from the risk of troubles/problems caused by contact with other lines and lightning damage.

Article 64. Level crossing safety equipment

Level crossing safety equipment shall be able to inform passers-by and vehicles of the approach of trains, and block the traffic over the crossing, in order to ensure their safety as well as the train operations. However, if the volume of railway and road traffic at the crossing is small or it is technically extremely difficult to install equipment for blocking traffic over the crossing, the level crossing safety equipment may be the ones only to inform them of the approach of trains. In addition, if the volume of railway and road traffic at the crossing is extremely small, only the markers showing the existence of the crossing may be installed in order for people and vehicles to recognize the crossing.

Article 65. Ensuring safety at the time of trouble occurrence

Signaling and telecommunications shall function as a whole system to ensure the safety of train operations even if each equipment fails to function or some of them fail at the same time.

CHAPTER 8 ROLLING STOCK

Section 1 GENERAL

Article 66. Scope and objects of application

1. Scope of application
 - (1) These technical criteria apply to the rolling stock in Vietnam, which are manufactured, purchased, remodeled or repaired, with respect to functions, structures and materials.
 - (2) The rolling stock shall comply with the criteria prescribed in the Railway Law or other laws in addition to those stipulated in Chapter 8.
 - (3) When the rolling stock is used for through-operation with other railway operators, which is difficult to comply with this Chapter, it is allowed to have structures different from that prescribed in this Chapter, provided that it conforms to the Vietnam Railway Law and other law and it can safely be operated on the railways in Vietnam.
2. Objects of application
The operators of ordinary railways, high-speed railways, semi-high-speed railways and special railways shall strictly observe this regulation with respect to the design, import, manufacture, assembling, maintenance and improvement of rolling stock as well as recovery from accidents and marketing in railway businesses.
3. Regarding the structure and operation of rolling stock of special railways, application of the prescriptions in this regulation can be waived in part, with special rules specified separately as required in the Ordinance, Ministry of Transport.

Article 67. Railway environment requirement

The rolling stock shall guarantee the safe and stable operation under the operational and environmental conditions in Vietnam and exert the performance required at its design level.

Section 2 ROLLING STOCK GAUGE

Article 68. Rolling stock gauge

The rolling stock shall not exceed the rolling stock gauge in the following states:
Where the car is at a stop on a flat and a straight track with the center lines of carbody and bogie right on that of the track. Where the car is loaded with cargoes to the maximum capacity.

Where the carbody or bogie is not inclined due to the unbalanced loading of passengers or cargoes.

However, snow blowers, skirts, cranes and other devices that are used in part or wholly outside the rolling stock gauge for structural reasons are allowed to exceed the rolling stock gauge to the extent that the safe operation of rolling stock is guaranteed. (Refer to supplementary provisions.)

Section 3

WEIGHT OF ROLLING STOCK

Article 69. Weight of rolling stock

The rolling stock shall not impose loads heavier than the rated capacity of tracks or structures.

Article 70. Stability

1. The rolling stock shall guarantee the safe and stable train operations under the maintenance conditions of bridges and tracks, and other operating conditions.
2. The rolling stock shall be constructed not to overturn even when stopping on curved tracks.

(Refer to supplementary provisions.)

Section 4

ROLLING STOCK RUNNING GEAR

Article 71. Running gear

The running gears shall conform to the following criteria.

- (1) Wheels shall not damage tracks when the car is running thereon.
- (2) Axles/running gears shall be arranged/constructed to make the rolling stock safely pass curves of the minimum radius of the line where it is operated.
- (3) The suspension system shall have a capacity to withstand the shock transmitted from the tracks and guarantee sufficiently high ride comfort according to car types when they are running.
- (4) The front of the head car of trains shall be equipped with rail guards to remove obstructive articles on the rail while in operation.
- (5) Running gears shall comply with the conditions in the above paragraphs and have a robust structure and sufficiently high strength to guarantee the safe and stable operation of rolling stock.

(Refer to supplementary provisions)

Article 72. Propulsion system

1. The rolling stock shall be equipped with power generating equipment appropriate for facilities and train operations.
2. The equipment in electrical circuits of rolling stock shall conform to the following criteria.
 - (1) There shall be no risk of electric shock or fires due to dielectric breakdown or crossed wires.
 - (2) There shall be no risk to cause inductive interference on the equipment in other electric circuits used for the railway operation.
 - (3) Current collectors shall have compliance characteristics to follow contact wires.
 - (4) Pantographs except those on double headers shall be capable of retracting simultaneously by manipulation from the driving cab, unless there are inevitable reasons not to comply therewith.
 - (5) Pantographs shall not cause fires due to arcs when retracting.
 - (6) Pantographs shall not burn or fail due to the heat of over-current.
 - (7) The safety of electric circuits shall be guaranteed against the incursion of abnormally high voltage.
 - (8) The rolling stock to be operated under high-voltage contact wires shall be capable of interrupting power supply in emergency.
3. The internal combustion and steam engines of rolling stock shall comply with the following criteria.
 - (1) Necessary measures shall be taken to protect the engines against abnormal overheat.
 - (2) Necessary measures shall be taken for steam engines to prevent fires caused by cinders or burning chips emitted therefrom.
 - (3) Floors and walls shall be constructed to prevent fires due to engine heat.
 - (4) Fuel devices shall be capable of preventing fuel leaks or ignition.
 - (5) Exhaust pipes shall be constructed to prevent passengers from danger or other equipment from failure due to heat or exhaust gases.

Article 73. Brake system

1. The rolling stock shall be equipped with brakes that conform to the following criteria.
 - (1) Brakes shall be capable of steadily decelerating or stopping the rolling stock.
 - (2) Brakes except those of special cars and cars coupled exclusively for shunting operation (with this exception holding in the paragraph 5 as well) shall be activated in unison on all cars in the train set by manipulation from the driving cab.
 - (3) The function of brakes shall not be affected by vibration or shock etc.
 - (4) Brakes shall maintain an uninterrupted braking force when activated.
 - (5) Brakes shall automatically be activated when cars in the train have separated.
 - (6) Brakes except those of cars used for inspection, maintenance or special purposes shall be capable of quickly stopping cars when activated.
 - (7) Brakes except those of steam locomotives equipped with an alarm device shall be capable of detaining cars in case their normal function is not guaranteed due to the unavailability of the source of brake force.

2. In addition to the brakes that satisfy the above criteria, the rolling stock shall be equipped with brakes that comply with the following criteria.
 - (1) A device that conforms to the criterion in the above paragraph (3) and prevents the rolling stock in storage from moving, except when the rolling stock in storage is coupled with a car equipped with a device to prevent moving.
 - (2) Brakes that function independently when the brakes in the above paragraph have failed and that comply with the paragraphs 1, 3 and 4 in the above clause 1. This prescription applies only to passenger cars excluding passenger wagons.
- (Refer to supplementary provisions)

Section 5

CARBODY STRUCTURE AND DEVICES

Article 74. Carbody structure

The carbody shall be robust and has sufficient strength to withstand loads while the rolling stock is in operation.

Article 75. Structure for reducing remarkable noise

The rolling stock used for high-speed operation shall be constructed to reduce violent noise that is generated during train operation.

Article 76. Structure of the train crew's room

1. The train crew's rooms except those of special cars shall be constructed to protect the equipment in the room and the operation by the train crews from unauthorized deeds of passengers in the passenger room and be equipped with entrance/exit openings not to disturb train operation.
2. The windows of train crew rooms except those of special cars shall be glazed with safety glass panes or equivalent to ensure visibility required for operation. The windshield glass panes shall have strength to withstand wind pressure and impact imposed by flying stones.

Article 77. Structure of passenger room

Passenger rooms shall conform to the following criteria.

- (1) Windows shall have sufficient strength and be constructed to prevent contact with outside facilities or falling of passengers when opened.
- (2) The inside of passenger room shall be ventilated as required.
- (3) Passenger rooms shall be equipped with lighting apparatus to ensure sufficient brightness in running at night, in tunnels and in emergency.
- (4) Isles shall ensure safe and smooth passage.
- (5) Seats, beds and standing spaces shall ensure the safety of passengers in consideration of the conditions of train operation.
- (6) Passenger trains shall be equipped with toilets as required.

- (7) In additions to the above paragraphs, passenger rooms shall ensure the safety of users.

Article 78. Doorway structure for passenger

1. The entrance/exit doorways for passengers shall guarantee safe and smooth boarding/alighting of passengers, keeping the difference in level of the floor or steps and the platform height as a minimum.
2. The automatic door operating system shall comply with the following criteria.
 - (1) All doors shall be opened/closed simultaneously.
 - (2) The train crew shall be capable of checking the door open/close status.
 - (3) The door operating equipment except that of passenger cars for which the train crew is capable of directly checking the door open/close status shall be designed not to start trains until doors are closed.
 - (4) Doors except those of third rail cars shall manually be opened in emergency .

(Refer to supplementary provisions)

Article 79. Structure of gangways and gangway doors

1. Passenger cars except those exclusively operated as a single car shall be equipped with gangways and gangway doors shall be equipped to ensure safe and smooth passage of passengers.
2. For trains that are to be operated in sections where passengers cannot evacuate from their sides in emergency by structural reasons, it shall be ensured that passengers evacuate safely from the rear of the tail car and the front of the head car (from the rear of the tail car only, in case of trains coupled with a locomotive at the head).

Article 80. Structure of emergency exit

Rolling stock from which it is difficult to escape in emergency shall be equipped with emergency exits to ensure safe evacuation without fail for passengers; the system of which shall enable the train crew to easily check the door open/close status of the emergency exits.

Article 81. Coupling system

Couplers (except those of articulated trucks and similar structures) shall be robust, have sufficient strength, withstand vibration and shock and be capable of coupling cars without fail.

Article 82. Rolling stock structure for transporting special cargo

Freight cars to transport flammable liquids, road vehicles and other special cargoes shall be constructed and have equipment to prevent fires caused by these cargoes.

Article 83. Facilities of train crew's room

1. The train crew's room used for train operation shall be equipped with instrument meters, indicators, alarms and other devices required for train operation control, which shall allow the train crew to easily manipulate and check.
2. The train crew's room used for train operation shall be equipped with a device to automatically stop the train, in case the driver has become unable to continue operation,

except when safe train operation is guaranteed by facilities and structure of rolling stock.

3. The switch to release the block systems (ATS, ATC and ATO systems) shall not easily be manipulated by the train crew.
4. The train master room shall be equipped with operating device for a brake system, a brake pipe pressure gauge and signing devices. The cars installed with a communication system shall be equipped with transmitting and receiving devices therefor.

Article 84. Internal pressure vessels, other pressure supply sources and ancillary devices

Internal pressure vessels, other pressure sources and devices ancillary thereto shall conform to the following criteria.

- (1) The vessels and devices shall be capable of preventing abnormal pressure rises.
- (2) The vessels and devices shall be capable of preventing malfunction due to moisture or other reasons.
- (3) The vessels and devices shall not fail due to vibration or shock.

Article 85. Ancillary devices of rolling stock

1. Rolling stock except those guaranteeing safe and smooth running and boarding/alighting of passengers shall be equipped with ancillary devices complying with the following criteria.
 - (1) Signing devices to exchange signs correctly between train crew members.
 - (2) Communication devices for smooth communication between train crew members.
 - (3) A whistle to issue alarms against danger with a sufficiently large volume.
 - (4) A public address system to cover all passenger rooms.
 - (5) Emergency notification devices for passengers to easily notify the train crews of emergency.
 - (6) An emergency train stop device to easily stop the train in emergency.
 - (7) Marker lamps to enable confirming the running direction of trains from ahead and behind thereof.
 - (8) Rescue hammers to enable passengers to evacuate from the train by breaking windows therewith, which shall be kept at places where the passengers easily find and pick them out.
2. The ancillary devices in the above paragraphs (6) and (8), however, shall not be installed where passengers out of the train are subjected to electric shock or where the safety of passengers is not guaranteed.

Article 86. Rolling stock markings

The rolling stock shall be marked to be identified easily.

Section 6
FIRE PREVENTION OF ROLLING STOCK

Article 87. Fire prevention of rolling stock

1. Wiring on the rolling stock shall be designed and equipped with devices to prevent fires due to the heat generated from crossed wires or overheated components.
2. Protective measures shall be taken for components which may generate arcs or heat.
3. The carbodies of passenger cars shall be constructed with fire-resistant materials to prevent anticipated outbreak or spread of fires.
4. Locomotives (except steam locomotives), passenger cars, and freight cars having rooms where train crew takes duties, shall be equipped with fire extinguishers which are available at the initial stage of fire outbreak.

Article 88. Fire alarm system

Sleeping cars shall be equipped with alarm devices to notify the outbreak of fire automatically.

Article 89. Auxiliary power source facility

The devices to ensure the safety of train operation and passengers shall maintain their normal functions for a certain period of time after the power supply has been interrupted.

Section 7
OTHER EQUIPMENT

Article 90. Rolling stock facility by one-man driving

1. Trains on which a power car driver is on duty alone shall comply with the following criteria in addition to those prescribed from Articles 66 through 89.
 - (1) Passenger cars to be operated in underground sections or where it is difficult for passengers to quickly evacuate therefrom in emergency shall be equipped with a device to automatically notify stations or the train operation center of the status of the devices stipulated in the paragraph 2, Article 83 when they have been activated, and with other devices to ensure the safety of passengers in emergency.
 - (2) It shall be ensured that the driver can smoothly communicate with stations or the train operation center at specified positions when required for security reasons.
 - (3) For passenger cars, it shall be ensured that the power car driver can operate entrance/exit doors for passengers and use the public address system at specified positions.
2. Trains on which a power car driver is not on duty shall comply with the prescriptions from Articles 66 through 89 and be equipped with devices for passengers to

communicate with the train operation center from the passenger room; and other necessary measures shall be taken to ensure the safety of passengers in emergency, provided, however, this shall not apply in the case where the safety of passengers is guaranteed by the train crew on board the train.

Article 91. Device for recording the operational state of trains

Trains, a train operation center, and related places, shall be installed with a device to record the operational status of trains, except where the maximum train speed is low or it is difficult to install the device for structural reasons.

CHAPTER 9

FACILITIES AND ROLLING STOCK MAINTENANCE

Section 1

STRUCTURE, TRACK

Article 92. Preservation of facilities

1. The tracks shall be maintained so that the train can be operated safely at a predetermined speed.
2. If the main track is temporarily not in the state set forth in preceding paragraph 1, the speed of the train shall be limited or other necessary measures shall be taken for the safe operation of the train; and locations that require particular attention or have possibility of failure shall be monitored. When failure is detected, trains shall be protected while necessary actions such as immediate fixing shall be taken.

Article 93. Inspection and trial operation of facilities

1. Newly-installed, reconstructed, modified or repaired facilities shall not be used before they are inspected, tested, and handed over properly. For simple reconstruction or repair, however, testing may be omitted.
2. When the train is operated on tracks which have experienced disasters or accidents and are suspected of their faulty, or where have been placed out of service, they shall be inspected beforehand and testing shall be conducted as required.

Article 94. Inspection patrol and monitoring of facilities

The main track shall be inspected according to the conditions of the line section and the train operating conditions.

If there is a risk of disaster impeding the safe operation of trains on the main track, the track concerned shall be monitored; and when something dangerous which may cause an accident is detected, trains shall be protected while such next step of maintenance as fixing the failure shall be taken.

Article 95. Periodical inspection of facilities

Periodical inspections of facilities shall be carried out at intervals of the stipulated inspection period. Period, sites/locations and methods of inspection shall be specified according to the type, structure, and working conditions of the facilities.

Article 96. Record

When the facilities is inspected as set forth in Article 93 and Article 95, and when they are reconstructed, modified, repaired or rehabilitated, the records thereof shall be prepared and retained.

Section 2 POWER SUPPLY EQUIPMENT

Article 97. Maintenance of power supply equipment

Electric power supply equipment for train operations (hereinafter referred to as “power supply equipment”) shall keep trains in a condition that enables them to run safely at a designated speed.

If the contact lines installed on the main track are temporarily not in a condition as set forth in the preceding paragraph, the speed of trains shall be restricted, or other necessary measures shall be taken to ensure the safe operation of the trains; and the sections which need particular attention shall be monitored.

Article 98. Inspection and test run of new power supply equipment

1. Newly-installed, remodeled, modified or repaired power supply equipment shall not be used before they are inspected and conducted test runs. For minor remodeling, modification or repair, however, test runs may be omitted; and the same for power supply equipment on the side lines that has no risk of causing problems to the main lines.
2. When the train is operated with power supply equipment which has experienced disasters or other accidents in train operations and are suspected of failure, or which has not been used for some time, they shall be inspected in advance and test runs shall be conducted as required.

Article 99. Inspection and monitoring of the contact lines on the main line

The contact lines installed on the main line shall be inspected according to the condition of the line section and the train operating conditions.

If there is a risk of disasters impeding the safe operation of trains on the main line, the contact lines concerned shall be monitored.

Article 100. Regular inspections of power supply equipment

Regular inspections of power supply equipment shall be carried out at intervals of the stipulated inspection period. Period, objects and methods of inspections shall be specified according to the type, structure, and working conditions of the equipment.

When the Ministry of Transport stipulates detailed matters related to the regular inspections set forth in the preceding paragraph, the regular inspections shall be conducted in accordance with them.

Article 101. Records

When power supply equipment is inspected as set forth in Article 98 and Article 100, and when it is remodeled, modified, fixed or repaired, the records thereof shall be prepared and retained.

Section 3
SIGNALING AND TELECOMMUNICATIONS

Article 102. Maintenance of signaling and telecommunications

Signaling and telecommunications shall be kept in a condition that enables them to operate properly.

Article 103. Inspection and use of train operation guaranteeing equipment

Newly installed, remodeled or repaired signal and telecommunication equipment shall not be used before they are inspected to confirm their functions properly. The same procedures shall be applied to signal and telecommunication equipment which have experienced disasters or other accidents in their operation and are suspected of failures, or which has not been used for some time.

Article 104. Regular inspection of signaling and telecommunications

Regular inspection of signal and telecommunication equipment shall be carried out at intervals of the stipulated inspection period. Period, objects and method of inspections shall be specified according to the type, structure and working conditions of the facilities.

Article 105. Records

When signal and telecommunication equipment are inspected as set forth in Articles 103 & 104, and when they are remodeled, repaired or maintained, the records thereof shall be prepared and retained.

Section 4
ROLLING STOCK

Article 106. Rolling stock maintenance

1. The rolling stock shall be maintained under conditions to perform its normal function.
2. The rolling stock shall not be operated unless the state of the rolling stock for safe operation is confirmed by the authorized organization.

Article 107. Inspection and running test of new rolling stock

1. The rolling stock newly manufactured, purchased, remodeled or repaired shall not be used before its integrity is confirmed by inspections and trial runs. For a minor remodeling or repair, however, trial runs may be omitted under the condition that the fact shall be notified to and approved by the official assigned by the authorized organization.
2. Rolling stock which has experienced derailment or other accidents and is suspected of its failure, or which has been out of service, shall be inspected and subjected to a running test as required before they are put in service.

Article 108. Train inspection

Functional inspection shall be conducted for major components of rolling stock to prevent accidents.

Article 109. Periodical inspection of rolling stock

1. Before the periodical inspection of rolling stock, the "procedures of inspection and repair at different levels" shall be prepared in accordance with its structures and operational conditions of rolling stock.
2. The authorized organization shall prescribe the periodicity, objects and contents of inspection as well as implementation procedures in the said "procedures of inspection and repair at different levels."

Article 110. Records

When rolling stock is inspected as set forth in Articles 107 and 109, and when it is remodeled, modified, fixed or repaired, the records thereof shall be prepared and retained at the relevant business unit.

CHAPTER 10 OPERATION

Section 1 LOADING LIMITS

Article 111. Vehicle loading limits

1. A vehicle shall not be loaded beyond its maximum loading capacity.
2. A vehicle shall be tried to keep the balance of loading to avoid collapse or overturn of cargoes caused by shaking/rolling of the train.
3. A vehicle shall not be loaded beyond the rolling stock gauge. However, this shall not apply to extra-large cargo transportation where it is secured that the loading condition does not cause any troubles/problems to the train operation.

Article 112. Indication when hazardous materials are loaded

A vehicle loaded with hazardous materials shall be labeled as such, as easily seen on both sides of the vehicle.

Article 113. Hazard control for vehicles loaded with hazardous materials

When transporting or parking the vehicles loaded with hazardous materials, and when loading or unloading those materials, necessary measures shall be taken not to endanger the passengers, nearby inhabitants and railway facilities in consideration of the surroundings.

Section 2

TRAIN OPERATION

Article 114. Maximum number of vehicles to be coupled

1. Maximum number of vehicles to be coupled shall be decided to suit the performance, structure, and strength of the vehicles, and conditions at the facility.
2. When vehicles loaded with hazardous materials only (except vehicles with special structures) are coupled, appropriate measures shall be taken so as not to cause injury to the passenger and crew.

Article 115. Train brakes

1. A train made up of two or more vehicles shall use brakes that act on all made-up vehicles in tandem and act automatically when made-up trains are separated, provided, however, that this shall not apply where preventive measures are taken to secure safe

operation of the train.

2. When a train is made up or changed in its formation, brakes shall be tested to ensure its performance.

Article 116. Train braking force

Train braking force shall be sufficient to negotiate the track gradient and running speed.

Article 117. Operation of the main line outside station

Vehicles shall not be operated on the main line outside of a station unless they form a train, provided, however, that this shall not apply at the time of shunting of vehicles.

Article 118. Train working time

1. Train operation shall be made according to the predetermined time of departure, passing, arrival, etc. at a station as required.
2. When train operation is disturbed, every effort shall be made to restore the operation to the normal.

Article 119. Prevention of accidents at train departure

The official in charge shall not allow a train to start when he or she recognizes that passengers or cargoes are in any dangerous condition such as being caught by doors, for instance.

Article 120. Safety assurance between trains

1. The train shall be operated in any of the following methods to ensure safety between trains. However, this shall not apply for the train operation in a station area where the train follows railway signal aspect, or indication, or instructions of the person who controls the operation in the station (including a person who is designated in advance by him or her).
 - (1) Block system
 - (2) Use of a device to secure an interval between trains
 - (3) Method in which a person in charge of driving a power car operates a train paying attention to the forward visibility and other conditions necessary for safe operation of the train.
2. The preceding paragraph may not apply when operating a relief train or operating a service train in a section that already has another service train, and where necessary measures to secure safe operation of the train is separately specified.

Article 121. Train driving position

The person who drives a power car shall operate the train at the front head of the front most vehicles, provided, however, that this shall not apply where there is no possibility of causing hindrance to the safe operation of the train.

Article 122. Train running speeds

1. The train shall be operated at a safe speed that fits into the condition of track and contact line, rolling stock performance, operating method, signal conditions, and train protection method, etc.

2. When driving on the track with the speed limit indicator which shows a speed limit different from what is specified in the speed regulation, the driver shall drive at the shown speed on the indicator or lower speed for safety.

Article 123. Train backward operation

No train shall perform backward operation, provided, however, that this shall not apply where measures to keep a following train outside of the train's backward operation range or other measures against hindrance to the safe operation of other trains are taken.

Article 124. Simultaneous entry or departure of trains

Where two or more trains enter or leave the station and they may cause hindrance to each other's route owing to their overrunning, these trains shall not be operated simultaneously.

Article 125. Train protection

In the event of a hindrance that requires stopping of trains, a stop signal shall be indicated and measures to stop promptly other proceeding trains shall be taken considering emergency braking distances of the trains.

Article 126. Track possession

Where a necessity arise to block tracks for the purpose of construction, maintenance and others, necessary measures shall be taken to prevent trains (except trains used for construction, maintenance) from entering into the section.

Article 127. Prevention of train disaster

When trains may be put in danger due to storms, earthquakes, etc., necessary measures to prevent disasters including temporary suspension of operation shall be taken considering the situation.

Section 3
VEHICLE OPERATION

Article 128. Shunting

1. Shunting of vehicles (including replacement of trains; the same in the next paragraph) shall be conducted by using signs and other safe methods.
2. Shunting of vehicle shall be conducted so as not to cause hindrance to the operation of trains.

Article 129. Parking of vehicles

When parking vehicles, necessary measures shall be taken to prevent them from self-moving or rolling.

Section 4

RAILWAY SIGNALS

Article 130. Relationship between railway signals and operation

When operating a train according to railway signal aspects or indications, the conditions as shown or indicated by railway signals shall be complied to.

Article 131. Indication of stop signal

1. When a stop signal is shown, a train shall stop in the outward of the specified stop position. However, when the stop signal is shown too late for the train to stop at the required stop position or when the required stop position is not indicated, the train shall stop as quickly as possible.
2. The train which stopped following the provisions described in the preceding paragraph shall not proceed until it sees a proceed signal shown or receives a direction to proceed, provided, however, that this shall not apply in case where the operation method is changed to the one as described in Article 120 Paragraph 1 Item 3.

Article 132. Inaccurate signal indication

In case when no signal aspect is given at a position where there should be, or when the signal is not likely distinct, it shall be interpreted as a signal of the maximum restriction on the operation of the train,

Article 133. Prohibition of dual-purpose use of signals

Signals shall not be used for two or more tracks or purposes, provided, however, that this shall not apply where it causes no hindrance to the safe operation of trains.

Article 134. Conditions for clear aspect signals

The aspect of proceed signals may be shown as long as there is no hindrance on the route of the train.

Article 135. Other matters concerning signal aspect

In addition to the provisions described from Article 131 to Article 134, types of signals, patterns and conditions as well as manipulation of signal aspects, shall be specified beforehand so that the train driver can see and understand correctly the conditions to follow in the signal aspects, which secures the safe operation of the train.

Article 136. Priority of take on proceed signal

When a proceed signal to a train is shown, the route of the train shall not be hindered by others.

Article 137. Signs and indicators

Types and patterns of signs and indicators shall be specified beforehand for the safe operation of trains.

CHAPTER 11

ENFORCEMENT PROVISIONS

Article 138. Enforcement Provisions

1. Organizations and individuals involved in operations for national railway and urban railway networks shall strictly comply with this regulation.
2. The leaders of related organizations are responsible for dissemination of this regulation to the agencies under their control and subordinates.
3. In case where problems or difficulties in implementation of this regulation may arise, those who are involved in implementation of this regulation shall make a report to the leader of the railway operator as well as the Minister of Transport for solutions.
4. If the international treaty, which the Socialist Republic of Vietnam has signed or agreed to, includes provisions inconsistent with this regulation, the provisions of the international treaty shall be applied.
5. The Director of Vietnam Railway Administration, Ministry of Transport, shall take charge of managing this regulation in agreement with related agencies.

SUPPLEMENTARY PROVISIONS

[CIVIL, TRACK]

Article 16. Curve Radius

1. The curve radius (except for curves along platforms) in a main line of ordinary railways shall be more than or equal to the values in the following table according to the classification of design speeds.

Table 16-1 The curve radius of curves in a main line of ordinary railway

Line classification	Design speed (V), Others	Minimum curve radius (m)		
		Urban railway G1435 mm	National railway G1000 mm	National railway G1435 mm
1st class line	120 km/h < V ≤ 150 km/h			1200 m
	100 km/h < V ≤ 120 km/h	800 m	800 m	
2nd class line	70 km/h < V ≤ 120 km/h			800 m
	60 km/h < V ≤ 100 km/h	400 m	600 m	
3rd class line	V ≤ 70 km/h			400 m
	V ≤ 60 km/h	300 m	300 m	
All class	unavoidable case due to a topographical condition or another	160 m	150 m	250 m
	A turnout curve and the curve in front or behind turnout (hereinafter referred to as “curve incidental to turnout”)	160 m		

2. The curve radius (except for curves along platforms) in a main track of special railways shall be 100 m or larger.
3. In a particular case, regardless of the requirements of above clause 1 and 2, , the curve radius for ordinary railways and special railways may be reduce to the curve radius commensurate with the performance of curvilinear passage of the targeted rolling stock under the condition of setting a speed limit .
4. The minimum curve radius along platforms (except for high speed railways) shall be greater than or equal to the values specified in below table. However, at the end of a platform where few passengers are expected, the above requirement may not apply. (“End of platform” means the range within about a length of a car from the end edge of the platform, and “few passengers are expected” means a situation where there is no passenger stairway or ticket barrier at the end of platform and users may not queue up.)

Table 16-4 The minimum curve radius along platforms

	Urban railway G1435mm	Special railway	National railway G1000 mm		National railway G1435 mm	
			Classes 1-2	Class 3	Classes 1-2	Class 3
Minimum curve radius at the end of platform (m)	400 m		500 (400)	500 (300)	1000 (600)	800 (500)
Section where only vehicles of the length less than 18m run.	300 m					

Note: The values in parentheses show unavoidable cases due to any reason including a topographical condition.

Article 17. Cant (Super elevation)

1. A cant shall be provided in a curve of a main line, except for a curve incidental to turnout. In a side track, however, a cant may be provided correspond to its necessity.
2. A maximum cant and permissible cant deficiency for ordinary railways shall be smaller than or equal to the values specified in the table below. However, when the height of gravity center of a vehicle is considerably lower than 1900mm, or when the risk of overturning due to a wind is considerably small, an appropriate value corresponding to a track condition may be used after the examination of safety considering the vehicle performance.

Table 17-2 A maximum cant and permissible cant deficiency

	Urban railway G1435 mm	National railway G1000 mm	National railway G1435 mm
Maximum cant	180 mm	95 mm	150 mm
Permissible cant deficiency	90 mm	50 mm (1-2 class-line) 60mm (3 class-line)	90 mm
Permissible cant deficiency when using car-body tilting/ inclination system	The value shall be set in consideration of the property of a car body tilting/ inclination system		

Note:

- (1) The cant values for urban railways are applied to the line sections where only electric passenger trains run.
- (2) The maximum cant and permissible cant deficiency shall be set up as suitable for a line in consideration of the structure of rolling stock.
3. The cant provided for a circular curve shall be an appropriate value in consideration of

the centrifugal force which vehicles receive during running. However, when the gravity center of a vehicle is high enough corresponding to a gauge, or when the vehicle are lightweight, it shall be verified that the safety against overturning of the vehicle due to wind effect under the condition that the vehicle is stopping or traveling at a limited speed in the curve concerned.

4. A cant in ordinary railways shall be gradually diminished according to the following criteria.
 - 4.1 In a case that a transition curve is provided, the cant shall be gradually diminished over its entire length.
 - 4.2 In a case that transition curve is not provided (except for a case of connection with two curves of same direction), the following criteria shall apply.
 - (1) Track length for diminishing the cant when using linear gradual diminishing method:
If a maximum wheel base of a vehicle is 2.5 m or shorter, the length shall be 300 times or longer of the cant.
If a maximum wheel base of car is longer than 2.5 m, the length shall be 400 times or longer of the cant.
 - (2) The steepest gradient of the cant when using curve gradual diminishing method:
If maximum wheel base of a vehicle is 2.5 m or shorter, the gradient shall be 1/300.
If maximum wheel base of a vehicle is longer than 2.5 m, the gradient shall be 1/400.

Article 18. Slack (Increasing of the distance between two rails)

1. The maximum slack for ordinary railways shall be as in table below.

Table 18-1 The maximum slack

Slack (mm)	Urban railway G1435 mm	National railway G1000 mm	National railway G1435 mm
Maximum (main track, side track)	15 mm	20 mm	15 mm
Unavoidable case due to a topographical condition or another	25 mm		

2. The slack shall be gradually diminished according to the following criteria.
 - (1) In a case that a transition curve is provided, the slack shall be gradually diminished over its entire length.
 - (2) In a case that a transition curve is not provided, the slack shall be gradually diminished in the section of the length longer than or equal to the maximum wheel base of a vehicle from the end of the circular curve. However, in a case of a curve in turnout, the above criteria may not apply.

Article 19. Transition curve

1. The length of a transition curve for ordinary railways shall be longer than or equal to

the largest one among the values calculated by the table below corresponded to the classification of design speed.

However, in the section where speed limit is lower than or equal to 70 km/h, L2 and L3 may be apply the value in parenthesis in the lower line.

Table 19-1 The length of transition curve

Maximum train speed Length of transition curve		$150\text{km/h} \geq V_{\text{max}} > 110\text{km/h}$	$110\text{km/h} \geq V_{\text{max}} > 90\text{km/h}$	$90\text{km/h} \geq V_{\text{max}} > 70\text{km/h}$	$70\text{km/h} \geq V_{\text{max}}$
		L1	wheel base is 2.5m or less	300C	
	wheel base is more than 2.5m	400C			
L2		$10 * C * K * V$	$10 * C * K * V$	$8 * C * K * V$	$8 * C * K * V$ ($7 * C * K * V$)
L3		$9 * C_d * K * V$	$9 * C_d * K * V$	$9 * C_d * K * V$	$9 * C_d * K * V$ ($7 * C_d * K * V$)

Note:

- (1) L1, L2, L3 means a transition curve length (mm) -- C shows an actual cant (mm), Cd shows a cant deficiency (mm), and V shows the highest train speed in the curve (km/h).
 - (2) K is 1.07 for 1000mm gauge and 0.75 for 1435 mm gauge.
 - (3) The value in parenthesis shows an unavoidable case due to any reason including a topographical condition.
2. The length of a transition curve in an unavoidable case due to a topographical condition shall comply with the following criteria according to the parameters including wheel base of a vehicle running through the transition curve.
 - 2.1 The length of the transition curve shall be as follows and be determined by taking the operating speed of trains into account. However, in a case of a curve incidental to turnout, a circular curve etc. with small cant, and when it is confirmed that the running safety of the vehicle is secured by limiting the operating speed, this criteria may not apply.
 - 2.1.1 The length of the transition curve in ordinary railways shall be longer than or equal to the value obtained by formulas below.
 - (1) For the section that maximum wheel base of a vehicle running through the curve is longer than 2.5m:
 $L = 400C$
 - (2) For the section that maximum wheel base of a vehicle running through the curve is shorter than or equal to 2.5 m:
 $L = 300C$
 In these formulas, L and C represent the following values.

L: Length of transition curve (unit: mm)

C: Actual cant (When inserting a transition curve between two circular curves, it is the difference between respective actual cants. Unit: mm)

In this case, if the gradual diminishing is provided by a curve gradual diminishing method, the gradual diminishing curve shall be such shape that the steepest gradient of the cant is 1/400 for a section where maximum wheel base of the vehicle running through the curve is longer than 2.5 m, and 1/300 for other section.

Article 20. Gradient

1. The steepest gradient in a train running area for ordinary railways shall be lower than or equal to the value in table below.

Table 20-1 The steepest gradient in a running area of train

Line classification	Design speed (V)	Maximum gradient (‰)		
		Urban railway G 1435mm	National railway G 1000mm	National railway G 1435mm
1st class	120km/h < V ≤ 150 km/h			12 (18)
	100 km/h < V ≤ 120km/h	10 (35)	12 (18)	
2nd class	70km/h < V ≤ 120km/h			18 (25)
	60km/h < V ≤ 100km/h	20 (35)	18 (25)	
3rd class	V ≤ 70km/h			25 (30)
	V ≤ 60km/h	35	25 (30)	

Note: The value in parenthesis shows an unavoidable case due to a topographical condition or others.

2. The steepest gradient for a turnout in ordinary railway shall be 25/1000 or less.
3. The steepest gradient in a running area for freight trains shall be the value enabling freight trains to be operated safely.
4. The steepest gradient in a running section where a train pulled by locomotive is operated shall be the value enabling the train to be operated safely.
5. When the above criteria in clause 1 and 2 is not complied with due to any reasons including a topographical condition, or in a side track (but limited to a track where vehicles are not stored or not coupled/decoupled), the steepest gradient shall be determined considering the following: the running capability of trains in a gradient, the rescue method for failed train, and the running capability of a maintenance vehicle in a gradient.
6. Regardless of the criteria of clause 1, the steepest gradient shall be less than or equal to 60/1000 in a line where only linear induction motor type trains are operated.
7. The steepest gradient for ordinary railways in a train stopping area shall be as in table below.

Table 20-7 The steepest gradient in a train stopping area

Area where train stops.	Steepest gradient (‰)		
	Urban railway G 1435mm	National railway G 1000mm	National railway G 1435mm
Station premises	5	1.5	1.5
Unavoidable case in station premises		2.5	2.5
Area where cars are not stored or not coupled/decoupled.	10	6	6

Note: An area where vehicles are not stored or not coupled/decoupled is limited to the case no trouble is expected for arrivals/departures of trains.

8. The steepest gradient for suspended type monorails, straddled type monorails and guide rail type railways shall be as follows.
 - (1) The steepest gradient in a train running area shall be 60/1000. However, in a case that there are proper reasons including a topographical condition, this criterion may not apply.
 - (2) The steepest gradient in a train stopping area shall be 5/1000. However, in an area where vehicles are not stored or not coupled/decoupled, the steepest gradient may be 10/1000 under the condition that no trouble is expected for arrivals/departures of trains.

Article 21. Vertical curve

1. Vertical curve radius shall be larger than or equal to the values specified in table below. However, where it is confirmed that the running safety of the vehicles is secured examining parameters such as the design speed and the length of car, these criteria may not apply.

Table 21-1 Vertical curve radius

Horizontal curve radius (m)	Vertical curve radius (m)		
	Urban railway G1435 mm	National railway G1000 mm	National railway G1435 mm
Including straight line $R > 800$ m	3000 m (2000 m)	5000 m (3000 m)	Class 1 line: 10000 m
$800 \text{ m} \geq R > 600 \text{ m}$	4000 m (2000 m)		Class 2 line: 10000 m
$R \leq 600 \text{ m}$	4000 m (3000 m)		Class 3 line: 5000 m (3000 m)
Gradient change not requiring to insert a vertical curve (Δi)	Less than 10 ‰	4 ‰ or below	3 ‰ or lower

Note: The value in parentheses shows unavoidable cases due to a topographical condition or other reasons.

- It shall be tried to avoid any conflicts between a vertical curve and a transition curve in ordinary railways.

Article 22. Construction gauge

- Extension width of construction gauge from rolling stock gauge

The construction gauge in a straight line of ordinary railway shall comply with the values in table below.

Table 22-1 The construction gauge in a straight line

Location of construction gauge	Construction gauge (mm)
Main track	The construction gauge · shall be larger than or equal to the width determined by adding 800 mm to the maximum width of the rolling stock gauge. · shall be larger than or equal to the width determined by adding 400 mm to the maximum width of the rolling stock gauge in the section where only vehicles which structures do not allow passengers to let their body out from windows run.
Side track	The construction gauge · shall be larger than or equal to the width determined by adding 400 mm to the maximum width of the rolling stock gauge.
Location above or at side of a platform	The value by adding 50mm to the rolling stock gauge

- The enlargement of the construction gauge in a curve and its inclination based on the cant

The construction gauge in a curve shall be enlarged by adding the values calculated from formulas below. In addition, inclination based on the cant shall be determined by formula in (3).

- (1) Carbody displacement toward curve interior: W_1

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

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

- (2) Carbody displacement toward curve exterior: 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 are defined as follows.

L_0 : Rigid wheel base

L_1 : Distance between bogie centers

L_2 : Overall length of car body

B : Overall width of car body

R : Radius

However, W_1 and W_2 for national railways shall be applied the following simple formulas

$$G=1000\text{mm}$$

$$W_1 = 24,500 / R + 4 * h \text{ (mm)}$$

$$W_2 = 25,500 / R \text{ (mm)}$$

$$G=1435\text{mm (Limited to ordinary railways)}$$

$$W_1 = 40,500 / R + H * h / 1500 \text{ (mm)}$$

$$W_2 = 44,000 / R \text{ (mm)}$$

- (3) Inclination due to cant: A

$$A=C * H / G$$

C : Cant

G : Gauge of track or rail center interval, which is used to determine a cant

H : Height of even angle section in a construction gauge or a rolling stock gauge, or height of considered location

A construction gauge may be used in determining tunnel section determination.

A rolling stock gauge may be used in determining platform position

3. The construction gauge in a section from the end of a circular curve (which, in a case that transition curves are connected directly, is the point connecting both the transition curves, the same shall apply hereinafter) to the point corresponding to a maximum train length operated in the line outside the end of transition curve (if a transition curve is absent, the end of the circular curve) shall be determined by follows: calculating the value to be added at the end of the circular curve according to the above 2, then decreasing the

calculated value gradually in the section, and finally adding the reduced value to each side of the construction gauge in straight section.

4. The construction gauge figure for national railways (limited to non-electrified railways) shall be as displayed below.

4-1 The construction gauge figure of 1000mm gauge

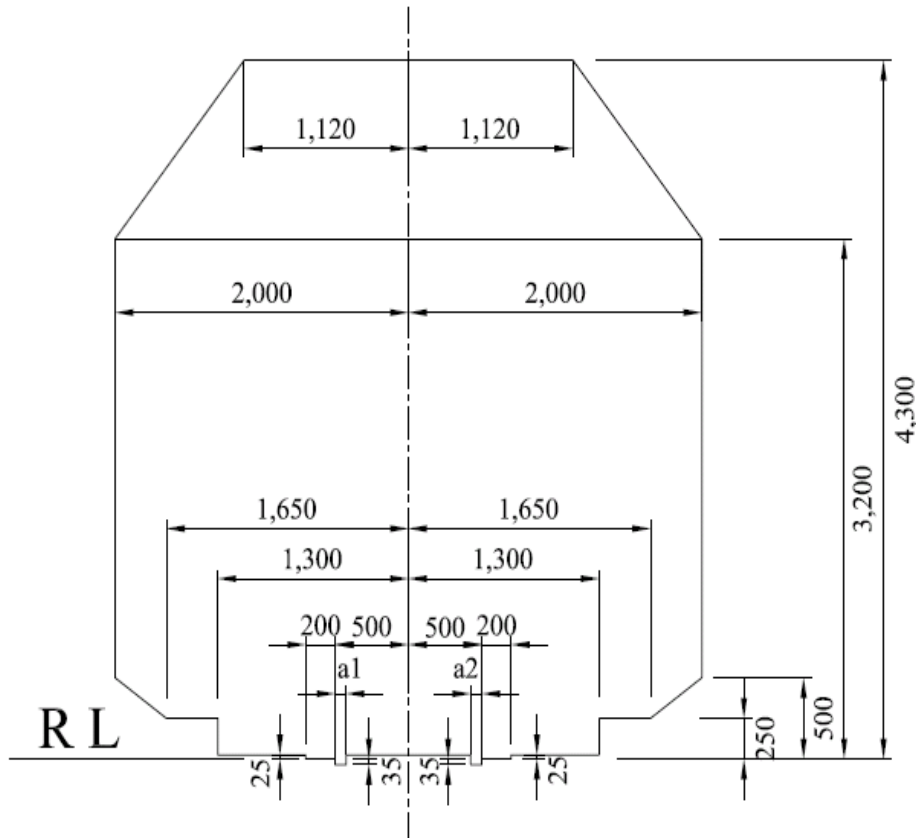
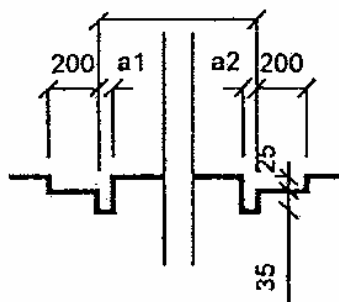


Figure 22-4-1(1A) Construction gauge in a straight section of earthwork or in a main track of a station (1000mm Gauge)

Rail clearance
Inner distance of a rail pair



a1 & a2: Distance between stock rail and anti-derailing rail

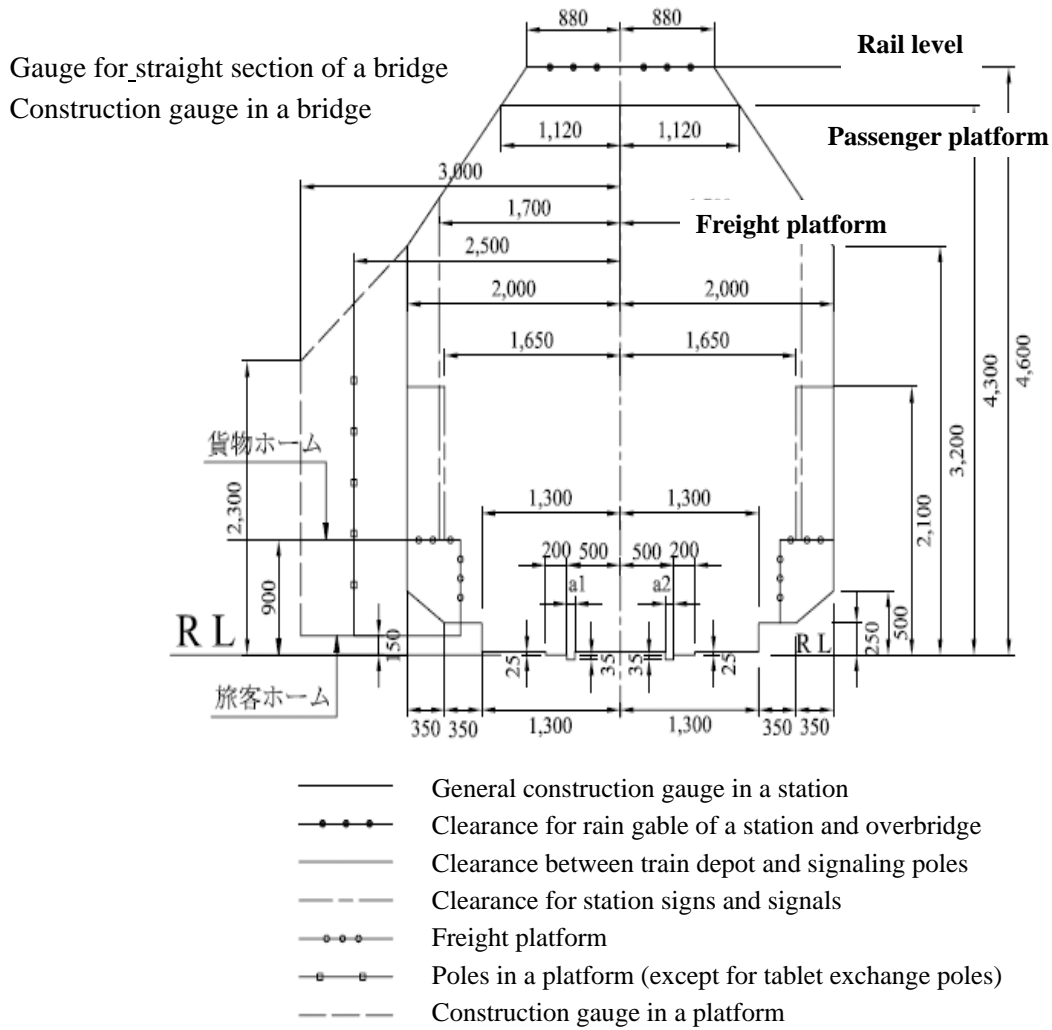
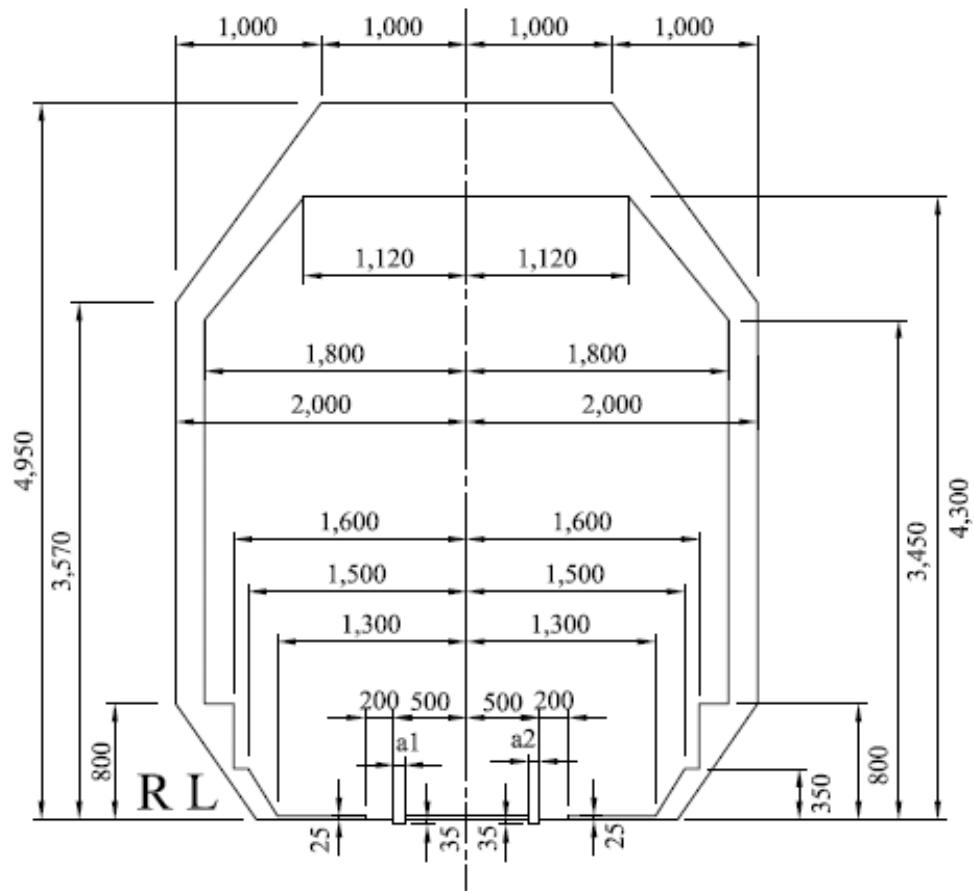


Figure 22-4-1 (2A) Construction gauge in a straight section in a station (1000mm Gauge)



- Construction gauge for straight section of a bridge
- Construction gauge in a bridge
- a1, a2 : Distance between stock rail and anti-derailing rail

Figure 22-4-1(3A) Construction gauge in the straight section of a bridge (1000mm Gauge)

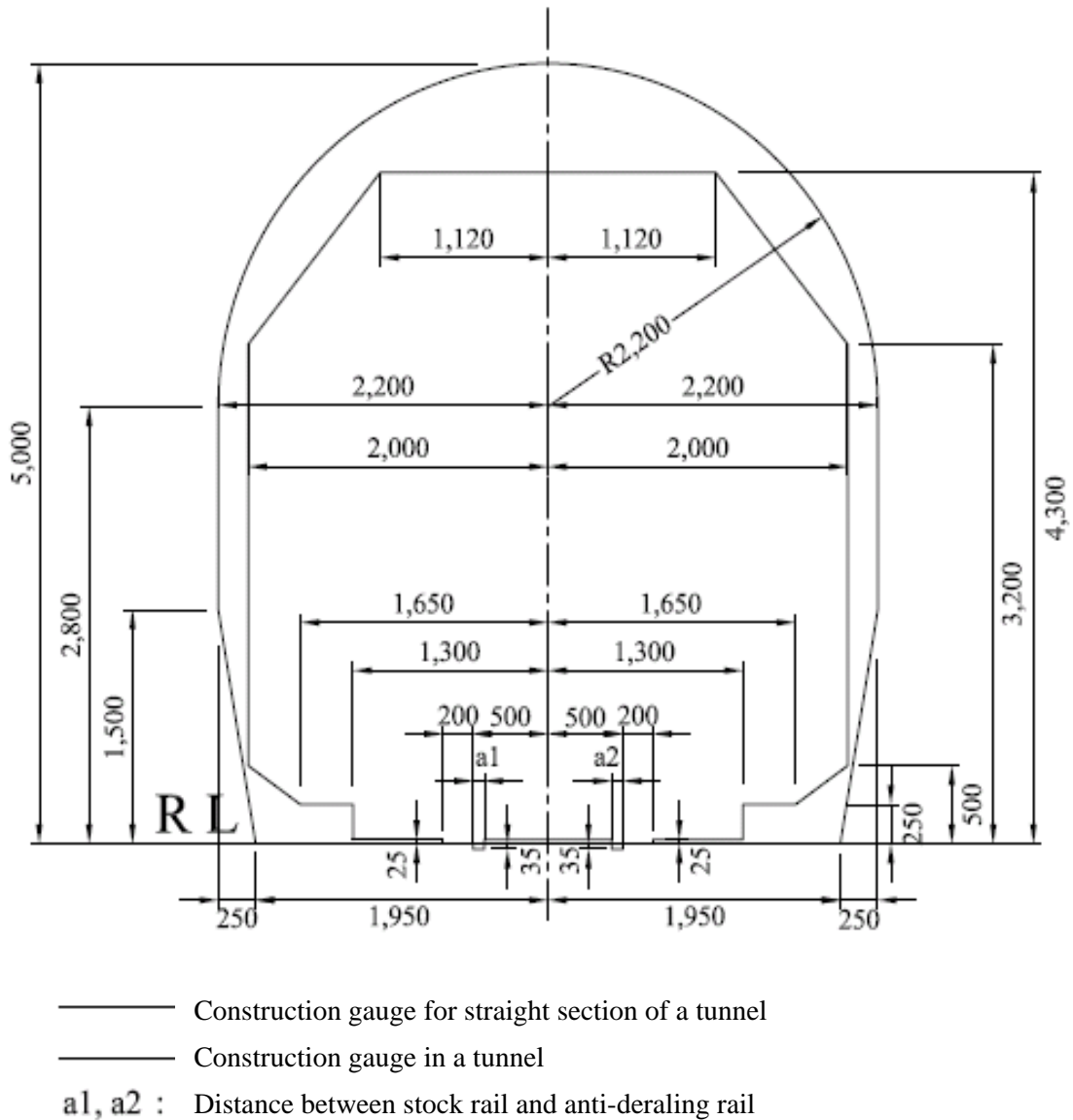


Figure 22-4-1(4A) Construction gauge in a straight section of a tunnel (1000mm Gauge)

Explanation of Figure22-4-1(1A) to Figure22-4-1(4A)

The construction gauge in a curve shall be enlarged by following formulas based on the construction gauge in a straight section.

1. For enlargement toward curve interior: $W_1 = 24,500 / R + 4 \cdot h$ (mm)
2. For enlargement toward curve exterior: $W_2 = 25,500 / R$ (mm)

h: Cant of curve exterior (mm)

R: Radius of curve (m)

4-2 The construction gauge figure of 1435mm gauge

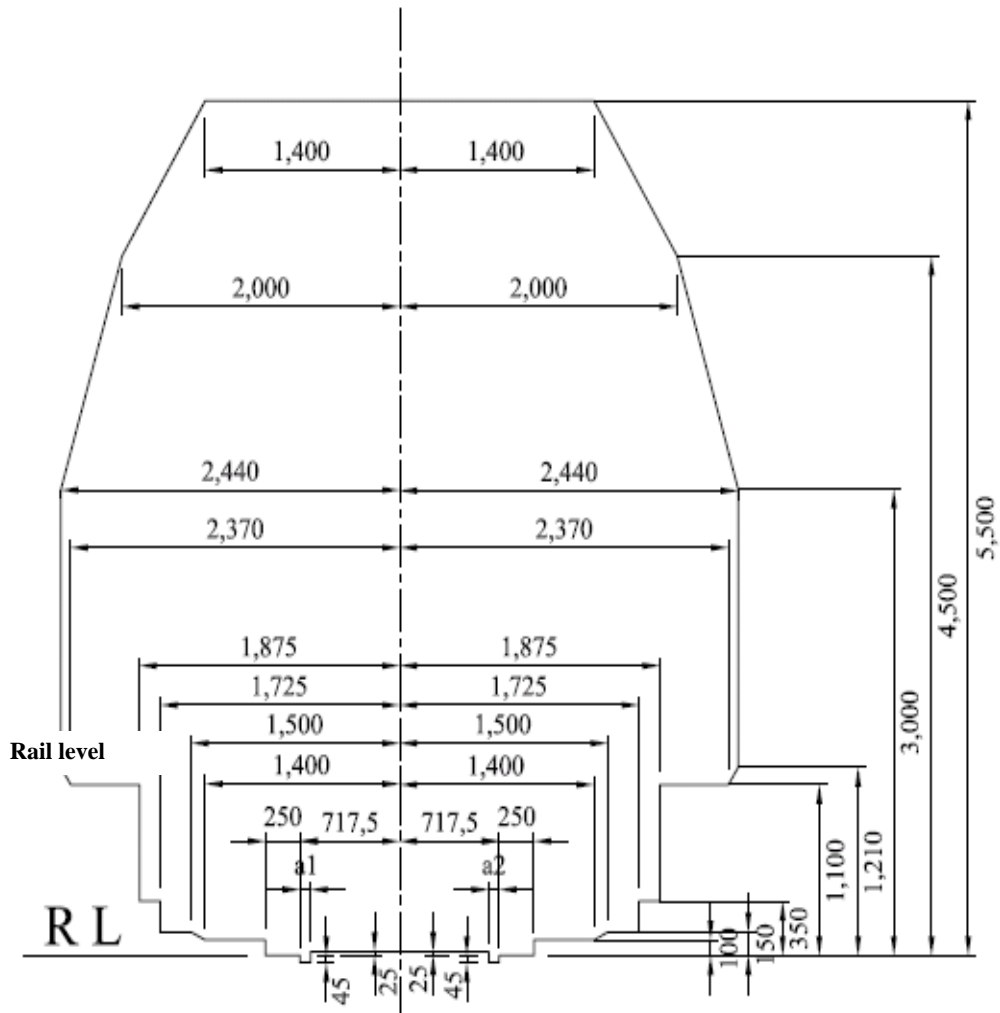


Figure 22-4-2(1B) Construction gauge in a straight section or a main track in a station (1435mm Gauge)

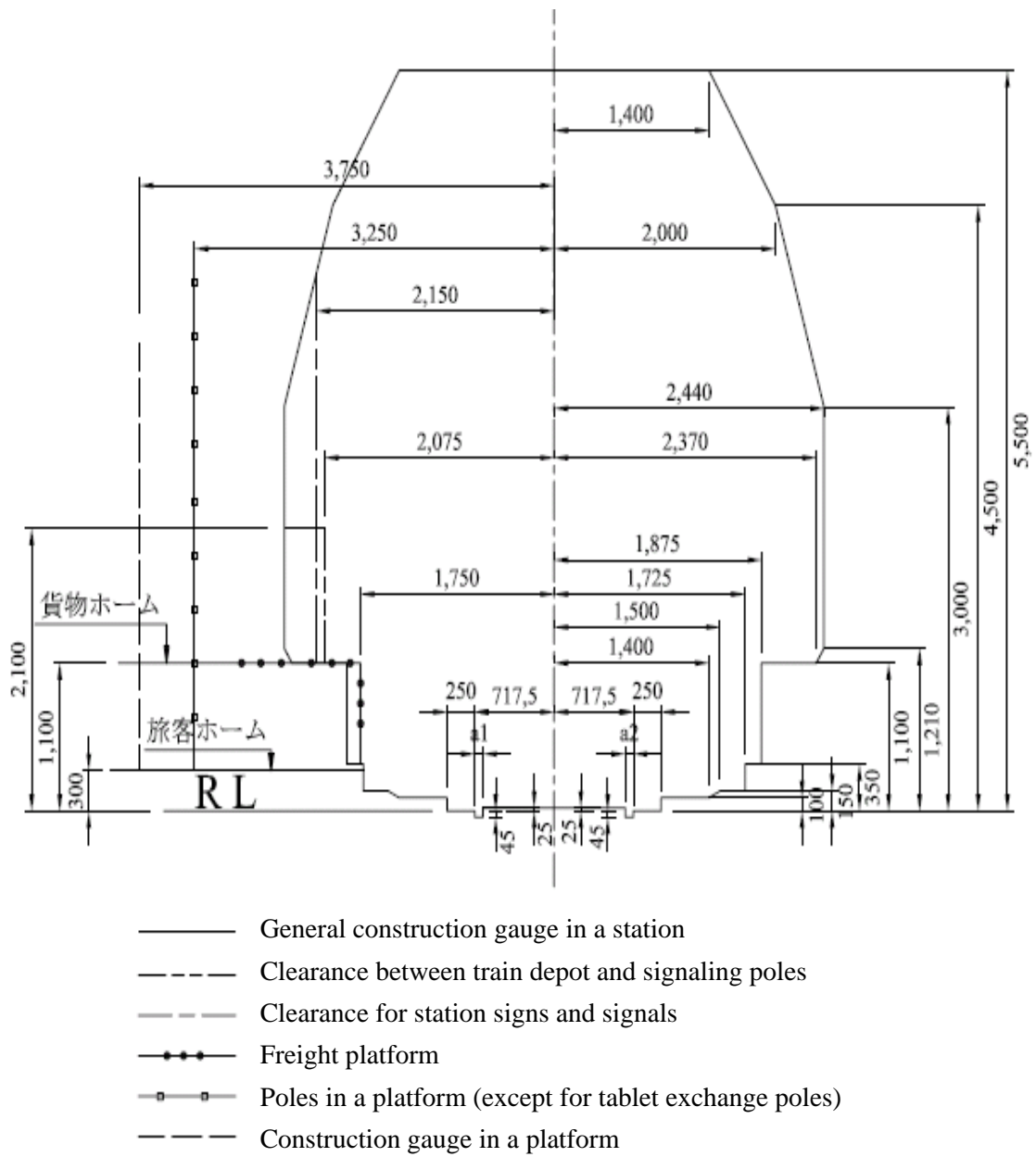
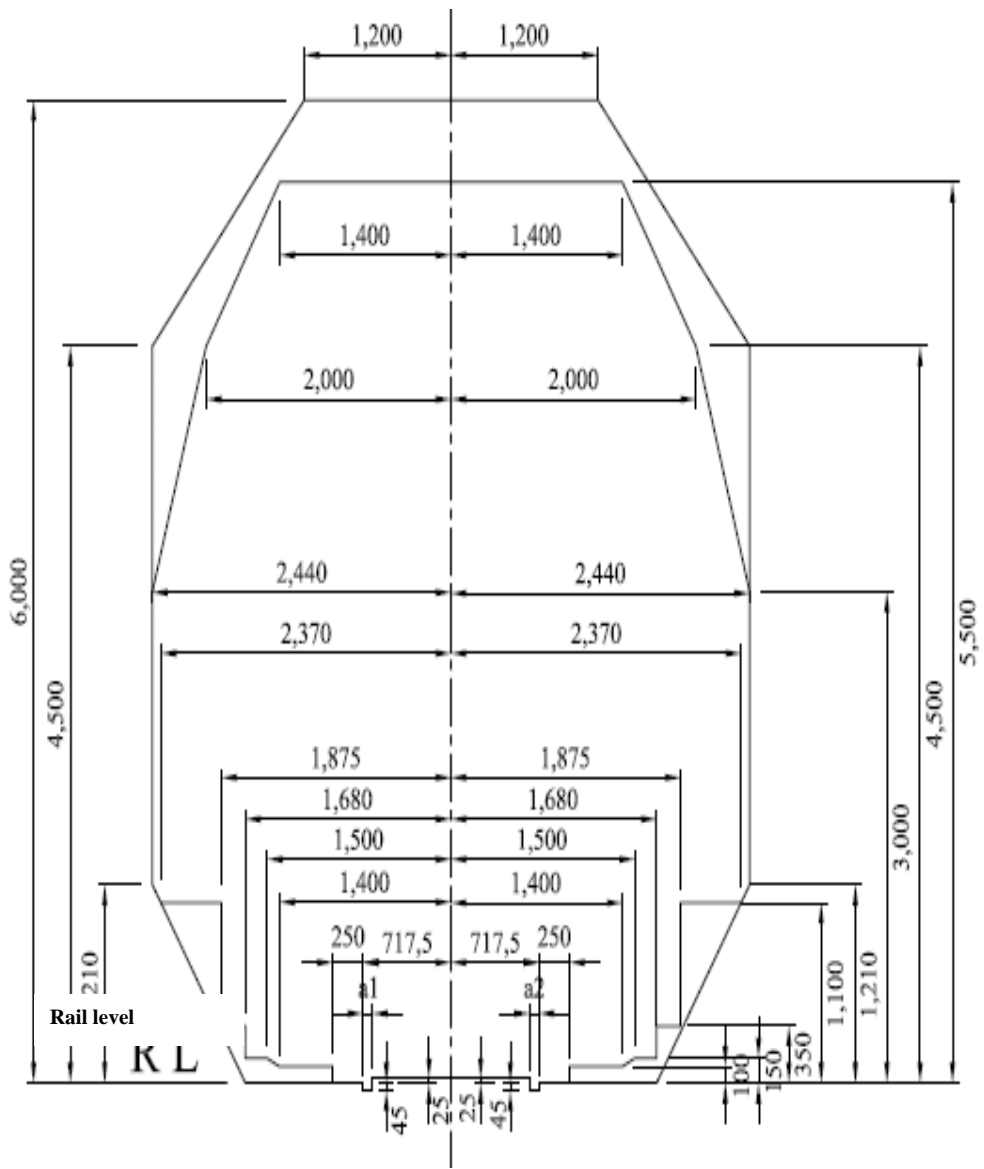


Figure 22-4-2(2B) Construction gauge in a straight section in a station (1435mm Gauge)



- Construction gauge for straight section of a bridge
- Construction gauge in a bridge
- a1, a2 : Distance between stock rail and anti-derailing rail

Figure 22-4-2(3B) Construction gauge in a straight section of a bridge (1435mm Gauge)

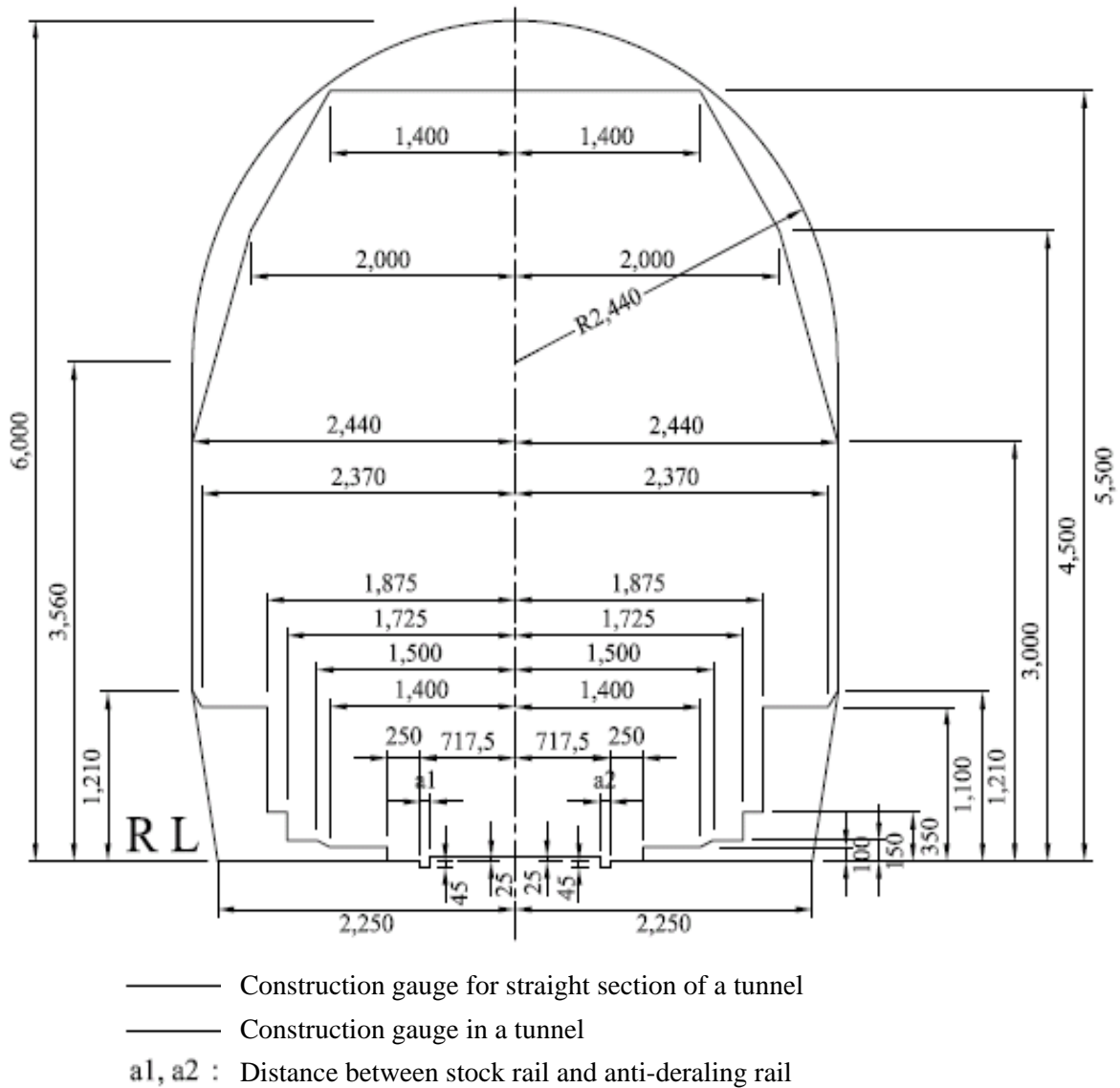


Figure 22-4-2(4B) Construction gauge in the straight section of a tunnel (1435mm Gauge)

Explanation for Figure 22-4-2(1B) to Figure 22-4-2(4B)

The construction gauge in a curve shall be enlarged by following formulas based on the construction gauge in a straight section. (Refer Figure 68-1(1) and 68-1(2) in terms of rolling stock gauges)

1. For enlargement toward curve interior: $W_1 = 40,500 / R + H * h / 1500$ (mm)
2. For enlargement toward curve exterior: $W_2 = 44,000 / R$ (mm)

H: Height from calculation point to rail surface

h: Cant of curve exterior (mm)

R: Radius of curve (mm)

Article 23. Width of formation level

The formation width shall be able to maintain the function of tracks shall comply with the following criteria in considerations of such factors as gauge, track structure, railway utilities and maintenance work.

1. The width of formation level for ordinary railways in banking and/or cutoff section shall be the values specified in table below or larger.

Table 23-1 Width of formation level for ordinary railways

Track class ranking	Design speed (V)	Width of formation level (m)		
		Urban railway G1435mm	National railway G1000mm	National railway G1435mm
First class line	120 km/h < V ≤ 150 km/h			4.0m
	100km/h < V ≤ 120 km/h	3.1m (3.0m)	2.9m (2.6m)	
Second class line	70 km/h < V ≤ 120km/h			3.5m
	60 km/h < V ≤ 100km/h	3.1m (2.8m)	2.7m (2.5m)	
Third class line	not more than 70km/h			3.1m
	not more than 60km/h	2.8m (2.5m)	2.5m	

Note: The value in parentheses shows unavoidable cases due to a topographical condition or other reasons.

Article 24. Distance between centers of tracks

1. Distance between centers of tracks for ordinary railways shall not endanger the safety of train operations, passengers and railway staff, and shall comply with the following criteria.

Table 24-1 Minimum values of the distance between centers of tracks for ordinary railways

	Distance between centers of tracks (m)			
	Urban railway G1435 mm	National railway G1000 mm		National railway G1435 mm
		Class 1 and 2	Class 3	Class 1, 2 and 3
One of spaces where 3 or more tracks are paralleled	B + 1.5 m (B + 1.0 m)			
Main tracks (ordinary section including a station)	B + 0.6 m	4.0 m	3.8 m	4.2 m
Section where only the vehicles of which structures do not allow passenger to let out their body from windows are operated	B + 0.4 m			
Yard-work zone inside a station	B + 1.0 m			
Section without yard-work inside a station	B + 0.8 m	4.4 m		5.0 m
Side tracks or storage tracks	B + 0.4 m			

Note:

- (1) “B” indicates the maximum width of a rolling stock gauge (basic gauge excluding indicators, indicating lamps, and vehicle-side lamps).
When “B” is assumed 3.0m in an urban railway, it is result as B+0.6m=3.6m.
 - (2) The value in parentheses shows unavoidable cases due to a topographical condition or other reasons.
2. The distance between centers of tracks in a curve shall be determined based on the car-body displacement by adding the value obtained from formula below to the distance between centers of tracks specified in the preceding clause 1.

However, if such the value is sufficiently smaller than the space between the construction gauge and the basic gauge of the rolling stock, the enlargement based on car-body displacement may be omitted.

For reference, the calculation formulas for car-body displacement in a curve is the same as the formulas to calculate the enlargement based on the construction gauge and car-body displacement in the curve, which specified in clause 2 of Article 22, in the supplementary provisions.

$$W = A + W_1 + W_2$$

In this formula, W, A, W_1 and W_2 represent the following values.

W: Enlargement dimension

A: Car-body displacement by a cant difference

W₁: Car-body displacement by a curve in the line

W₂: Car-body displacement by a curve in the adjacent line

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

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

L₀: Rigid wheel base (mm)

L₁: Distance between a bogie centers (mm)

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

L: Car-body length (mm)

B: Car-body width (mm)

R: Curve Radius (mm)

Article 25. Track

1. Installation of guard rails in a main track of ordinary railways shall comply with the following criteria.
 - (1) For a section with large lateral rail force and/or with any potential of derailment, derailment preventive guard rails or L shape guards shall be installed. The safety rail shall be installed for a section where the installation of guard rails or L shape guards may be inappropriate due to frequent rock fall events (hereinafter, referred to as “endangered place by rock-fall”).
 - (2) For bridges without ballast floor (bridge sleeper track), derailment preventive guard rails, L shape guards, or inner bridge guardrails shall be installed. For those bridges located in an endangered place by rock fall, inner bridge guardrails shall be installed.
 - (3) For high embankments, derailment preventive guard rails, L shape guards, or safety rails shall be installed. For those embankments located in an endangered place by rock fall, safety rails shall be installed.
 - (4) For all level crossings, crossing guard rails shall be installed.
2. For track structure using crushed stone ballast in ordinary railways, and when the axle load is 16t or less, more than or equivalent to each value in table below shall be applied.

Table 25-2 Track structure using the crushed stone ballast

Design maximum speed (V)	Rail weight, number of sleepers and ballast depth	Design passing tonnage			
		Over 20 million ton/year	Over 10 million ton/year to 20 million ton/year	Over 5 million ton/year to 10 million ton/year	5 million ton/year or less
110 km/h < V ≤ 130 km/h	Rail weight	50	50	50	50
	Number of sleepers	39	37	37	37
	Ballast depth	300	250	250	250
90 km/h < V ≤ 110 km/h	Rail weight	50	50	43	43
	Number of sleepers	39	37	37	37
	Ballast depth	250	250	250	250
70 km/h < V ≤ 90 km/h	Rail weight	50	50	43	43
	Number of sleepers	39	37	37	34
	Ballast depth	250	250	200	200
70 km/h or lower	Rail weight	50	50	43	43
	Number of sleepers	39	37	37	34
	Ballast depth	250	250	200	200

Note:

- (1) Unit: Rail weight: kg; ballast depth: mm; number of sleepers: sleepers per 25 m.
- (2) In a case using a continuous welded rail, the number of sleepers may be reduced by one (1) from each value in the table.
- (3) The thickness of ballast shows the case where a roadbed railway bed is a soil roadbed. The ballast depth in the table may be reduced, when a rail weight or number of sleepers is increased proportionally from the above value, and when the roadbed railway bed has a bearing capacity as the same or more than that of a concrete slab.

Article 38. Platforms

1. Width of a platform in ordinary railways and distance with a home edge shall conform to the specifications in table below.

Table 38-1 Width of a platform and distance with a platform edge

	Classification of a platform	
	The platforms which uses both sides	The platforms which uses one side
Width of a platform (end)	2 m or more	1.5 m or more
Width of a platform (center)	3 m or more	2 m or more
Distance between pillars and a platform edge	1.0 m or more	
Distance between a rail-over-bridge, an underground-passage way, waiting for place and a platform edge	1.5 m or more	
When a platform door is prepared in the above case	1.2 m or more	

[POWER SUPPLY]

Article 44. Installation of contact lines, etc.

1. The height of contact lines above the rail top in overhead single-line system for ordinary railways (excluding high speed railways) shall be 5m as the standard, but not less than 4.4m at D.C., not less than 4.57m at A.C., or not less than 4.8m when the contact lines are installed over a level crossing road. However, in places for exclusive use of railway, where it is not easy for ordinary people to come into, with such structure as underground type or elevated type railways, tunnels, bridges, or section where the fences are prepared, and in a case that the safe distance from the platform edge and the rail top, as well as the safe separation distance from the folded pantograph, are secured, the height of overhead contact lines above the rail top may be lowered.
2. The table below gives the standard voltages of contact lines, according to the types of railways.

Table 44-2 Standard voltages of contact lines

Type of railways	Installation methods	Standard voltage of contact lines
Ordinary railway	Overhead single-line method	1,500VDC 25,000VAC single-phase
	Third rail	750VDC
Suspended type monorail, straddled type monorail, and levitation type railway	Rigid double-line system Monorail	1,500VDC or less
Guide-rail type railway	Rigid double-line system	750VDC or less 600VAC three-phase or less
	Overhead single-line system	1,500VDC or less

[ROLLING STOCK]

Article 68. Rolling stock gauge

The rolling stock gauge for national railways (limited to non-electrified railways) on straight tracks shall be as displayed below.

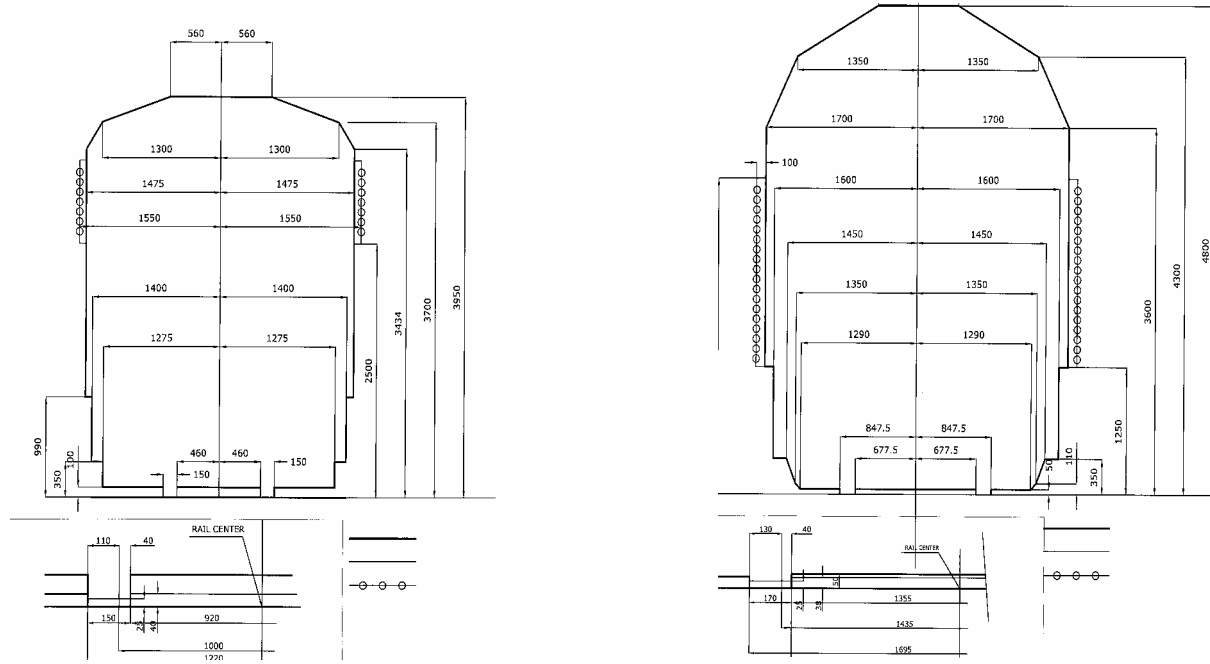


Fig68-1(1)
Rolling stock gauge for non-electrified national railway (1000mm gauge)

Fig68-1(2)
Rolling stock gauge for non-electrified national railway (1435mm gauge)

Article 70. Stability

The ratio of wheel load unbalance of the passenger cars in ordinary railways shall conform to the specifications in table below. (Except when the wheel load unbalance conforms to the other criteria specified separately.).

Table70-1 Ratio of wheel load unbalance

Gauge	Ratio of wheel load unbalance
1000mm	0.9 or more and 1.1 or less
1435mm	0.85 or more and 1.15 or less

Article 71. Running gear

The wheel rim width and other dimensions of rolling stock wheels shall conform to the specifications in table below.

Table71-1 Size of rim width etc.

Category	Ordinary railway rolling stock	
Gauge	1,000mm	1,435mm
Rigid Wheel base	4,300 mm or less	
Rim width of wheel	120 mm or more and 150 mm or less	
Back gauge of a pair of wheel rim	921mm or more and 927mm or less	1,350mm or more and 1,356mm or less
Flange height	25mm or more and 35mm or less	

Article 73. Brake system

The rolling stock for ordinary railways shall be equipped with the brakes specified in the table below.

Table73-1 Type of brake device

Sort of rolling stock	Type of brake device		
	Regular	Parking	Security
Diesel locomotive			
Electric locomotive			
Electric car/ Diesel car			
Passenger car			
Freight car			
Special car			

Note: The mark " " indicates the type of brake which shall be equipped on the rolling stock

Article 78. Structure of doorways for passengers

The boarding/alighting doorways of passenger cars for ordinary railways shall conform to the criteria specified in table below.

Table78-1 Size of the doorway for passengers

Item	Passenger cars	Wheelchair-accessible cars
Effective width	660mm or more	800mm or more
Effective height	1,800mm or more	1,800mm or more

DRAFT URBAN RAILWAY STANDARD

TABLE OF CONTENTS

1. General provisions	US3
1.1 Purpose	3
1.2 Scope of application	3
1.3 Interpretation of terms	3
2. Track and road bed	3
2.1 Gauge	3
2.2 Minimum radius of curve	3
2.3 Minimum lengths of curve and straight section	6
2.4 Gradient	12
2.5 Construction gauge	14
2.6 Width of formation level	16
2.7 Track center distance	16
2.8 Train load	16
2.9 Structures	17
2.10 Track structure of urban railways	17
2.11 Facilities for the prevention of disaster	23
2.12 Facilities for evacuation	23
2.13 Facilities for over-bridge and waterway sections	24
2.14 Intersections between tracks and with roads	24
3. Stations	25
3.1 Station facilities	25
3.2 Platform	25
3.3 Depots and other maintenance facilities	26
3.4 Underground station facilities	27
3.5 Fire fighting measures at underground stations	28
4. Electric equipment	29
4.1 Types of electrification	29
4.2 Height of contact line	29
4.3 Supervisory Control and Data Acquisition (SCADA) system	29
5. Signaling and telecommunications	30
5.1 System guaranteeing the interval between trains	30
5.2 Train operation control system	30
5.3 Interlocking devices	30
5.4 Railway radio telecommunications	30
5.5 Passenger service information equipment	30
5.6 Automatic fare collection equipment	30

6.	Rolling stock	32
6.1	Rolling stock gauge	32
6.2	Main facilities to install in the cab	33
6.3	The main facilities to be installed in a passenger room	33
6.4	Running gears	33
6.5	Propulsion system	34
6.6	Brake system	34
6.7	Coupling system	34
6.8	Load restrictions on track and structures	34
6.9	Car body structure	34
6.10	Feeding voltage	35
7.	Train operation	36
7.1	Aspects of cab signal	36
7.2	Types and indication methods of special signals	36
7.3	Home indicator and starting indicator	36
7.4	Display of contact line terminal indicator	36
8.	Recommendations to improve the convenience of users	37
8.1	Recommendations to improve the convenience of users	37

1. GENERAL PROVISIONS

1.1 Purpose

This document prescribes the fundamental standards on urban railways that will be introduced into Hanoi, Ho Chi Minh City and other large cities in Vietnam, considering the safety, efficiency, convenience and amenity of railway system, in order to realize smooth and efficient transport and improve passenger services, thereby aiming at development of urban railways in the country.

1.2 Scope of application

The standards in this document apply to urban railways for medium- and large-scale transport (those capable of transporting approximately 30,000 passengers or over per hour in each direction) and not to dedicated railways nor to the linear motor propulsion type railways.

1.3 Interpretation of terms

The terms used in the standards are interpreted in the same way as those used in the technical regulation for railway.

2. TRACK AND ROAD BED

2.1 Gauge

The gauge of urban railways (excluding non-conventional railways) shall be 1,435 mm.

2.2 Minimum radius of a curve

2.2.1 The minimum radius of a curve in a main track of urban railways (excluding non-conventional railways) except in the sections along a platform, enables trains to run through at a design speed in principle.

In unavoidable cases due to topographic or other reasons, however, the minimum radius of a curve may be set at 160m or over.

2.2.2 Notwithstanding the foregoing paragraph 1, the minimum radius of a curve in a main line may be set at a suitable dimension corresponding to the curve negotiating performance of the vehicles that run on the curve by setting the restricted speed in special cases.

2.2.3 The minimum radius of a turnout curve in a main track and at stations is set at 100m or over.

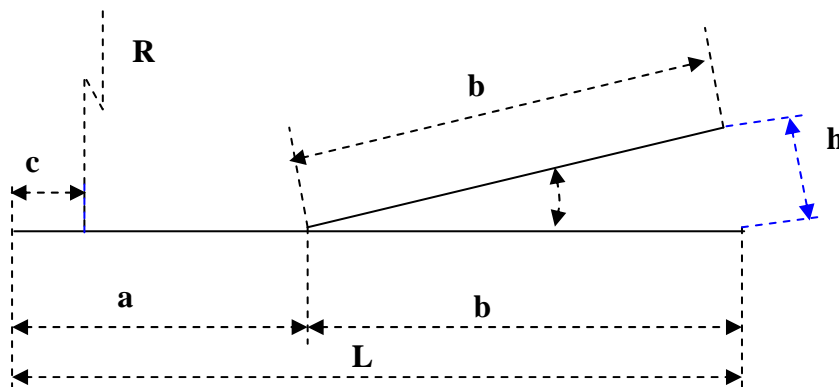
Attached Material:

Table 2.2-1 Turnout skeleton for the 1,435 mm gauge

Turnout No.	Rail Kg/m	Total length L m	Length of turnout toe a m	Length of turnout heel b m	Angle	Radius of curve R m
JP-6#	50	19.589	9.084	10.505	9°32'00"	91.913
JP-7#	50	22.531	10.430	12.101	8°10'00"	126.097
JP-8#	50	25.864	12.130	13.734	7°09'00"	165.328
VN-9#	43	28.848	13.839	15.009	6°20'25"	180.710
JP-9#	50	30.016	13.815	16.201	6°22'00"	202.109
VN-10#	43	24.552	7.976	16.576	5°42'38"	230.000
JP-10#	50	32.760	15.640	17.120	5°43'00"	259.496
JP-12#	50	39.028	18.539	20.489	4°46'00"	374.060
JP-16#	50	52.032	24.791	27.241	3°34'30"	666.927

Remarks,

- (1) The figures in the table are reference values for design.
- (2) The length of turnout toe is the distance between the front end and the turnout intersection.
- (3) The length of turnout heel is the distance between the turnout intersection and the crossing rear end.
- (4) See the drawing below for the meaning of the symbols *a*, *b*, *c*, *h*, *L*, *R* and θ .



Attached Material:

(Item 2.2- Minimum radius of a curve) Curve passing speed

The curve passing speed is calculated by the following equation or less.

- 1) Curve passing speed on an ordinary curve

$$V = \sqrt{127 (C_0 + C_d) R / G} \quad \text{..... Equation 2-1}$$

Where

- V: Train speed (km/h)
- C₀: Actual cant (mm)
- C_d: Cant deficiency (mm)
- R: Radius of curve (m)

Where the gauge is 1,435 mm, the following equation holds.

$$V \leq 0.298 \sqrt{(C_0 + C_d) R} \quad \text{.....Equation 2-2}$$

2) Curve passing speed on a turnout curve

The curve passing speed on a turnout curve (except those having a cant) is determined by setting the value of the cant at 0 in consideration of the safety factor against vehicles turnover outward of the curve.

$$V = \sqrt{127GR / (2aH)} \quad \text{..... Equation 2-3}$$

Where

- V: Train speed (km/h)
- H: Height of car gravity center (mm)
- G: Gauge (1,435 mm)
- R: Radius of curve (m)
- a: Safety factor

Calculate the curve passing speed when the height of car gravity center H is 1,650 mm at the safety factor 3 for high-performance trains, 3.5 for ordinary trains and 5.5 for turnout curves.

Calculate the curve passing speed on a turnout curve by the equation 2-4.

$$V \leq 3.2 \sqrt{R} \quad \text{.....Equation 2-4}$$

Attached Material:

Table 2.2-2 Curve passing speed

Radius of curve (m)	Curve passing speed (km/h)			
	Ordinary curve V ≤ 0.298 ((C ₀ +C _d)R)		Turnout curve V ≤ 3.2 (R)	
	Value of equation	Restricted speed	Value of equation	Restricted speed
1600	195.9	130	128.0	110
1400	183.2	130	119.7	105
1200	169.6	125	110.9	100
1000	154.8	120	101.2	95
800	138.5	115	90.5	85
700	129.6	110	84.7	80
600	119.9	105	78.4	70
550	114.8	100	75.0	65
500	109.5	95	71.6	65
400	97.9	85	64.0	60
350	91.6	80	59.9	55
300	84.8	75	55.4	55
250	77.4	65	50.6	45
200	69.2	60	45.3	40
150	60.0	50	39.2	35
100	49.0	40	32.0	25
80	43.8	30	28.6	20
70	41.0	10 (siding)	26.8	10 (siding)

Remarks,

- (1) This table shows the results of a case study where the curve passing speed is calculated at

the initial values of C_0 and C_d given below based on the vehicle and track structures with a safety margin added to the theoretical value.

The equation for an ordinary curve: $V \leq 0.298 \sqrt{((C_0 + C_d) R)}$

Initial values: $C_0 = 180$ mm and $C_d = 90$ mm

- (2) The following equation is applicable when the height of car gravity center is 1.650 mm or lower

Equation for turnout curves: $V \leq 3.2 \sqrt{(R)}$

Attached Material:

Table 2.2-3 Turnout No. and restricted speed

Turnout No.	Radius of curve R m	$V \leq 3.2 \sqrt{(R)}$ km/h	Restricted speed km/h
JP-6#	91.913	30.7	20
JP-7#	126.097	35.9	30
JP-8#	165.328	41.1	35
VN-9#	180.710	43.0	35
JP-9#	202.109	45.5	40
VN-10#	230.000	48.5	40
JP-10#	259.496	51.5	45
JP-12#	374.060	61.9	55
JP-16#	666.927	82.6	75

Remarks,

- (1) This table shows the calculation results using the following equation for respective radii of turnout curves at a relevant safety factor.

$$V \leq 3.2 \sqrt{(R)}$$

- (2) This table is applicable when the height of car gravity center is 1,650 mm or lower.

2.3 Minimum length of a curve and a straight section

- 2.3.1 A curve of a main line having the same radius of curve (excluding a whole transition curve) other than a turnout curve is larger than the car length. In unavoidable cases for topographical or other reasons, however, adopt a whole transition curve or diminish a transition curve on both sides by half sine-wave length transition curves.
- 2.3.2 A straight section equal to or longer than the vehicle length is inserted between transition curves on the two sides for two curves close to each other on mainlines. In unavoidable cases for topographical or other reasons, however, directly connect transition curves on the two sides or diminished them by half sine-wave length transition curves.
- 2.3.3 In a side line, a cant-less straight section with a length of 5 m or over is inserted in principle between two curves.
- 2.3.4 A straight section equal to or longer than the vehicle length is inserted between a turnout and a curve close thereto from the turnout toe to the heel. In case it is not practical, however, adopt the following measures.

- 2.3.4.1 Insert a straight section with a length of 5 m or over, between the turnout toe or heal and the curve starting point.
- 2.3.4.2 Insert a straight section with a length of 5 m or over, between the crossing front end and the transition curve starting point.
- 2.3.4.3 Where there is transition curve in a curve close to a turnout, start the transition curve from its rear end.
- 2.3.4.4 Where there is no transition curve in a curve close to a turnout, start a transition curve at a point 5 m or over distant from its rear end.
- 2.3.5 In case any of the above prescriptions is not practical, adopt a special line profile and be sure to ensure the safety thereof. Actual designs of the line profile are shown as in the Figs. 2.3-1 and 2.3-14 in the Attached Material.

Attached Material:

(Item 2.3- Minimum length of a curve and a straight section)

A commentary on the minimum length of a curve and a straight section

- a. The minimum length of a circular curve is not specified as the length of a circular curve does not affect much the vehicle running performance according to the result of a train running simulation implemented for the minimum length of a circular curve.

Above is described on the commentary of technical standard in Japan which used to be prescribed in Article 14, Rules on Normal Railway Structure in Japan.

- b. A straight section is inserted between a turnout and a curve close thereto for the following reasons,
 - 1) The said length of the straight section is adopted in consideration of the maximum fixed wheelbase (about 4.5 m).
 - 2) The said length of the straight section is necessary to diminish slacks and cants on a side track where there are no transition curves.
 - 3) The said length of the straight section is required for the maintenance of a turnout rails (having a minimum length of 5 m).
 - 4) To decay the rolling of a vehicle generated when the vehicle passes a turnout before the next turnout, it is desirable to insert a straight section equal to or longer than the car length between turnouts. In case it is not practical, however, insert a straight section with the length of 5 m or over.

Fig. 2.3-1 Minimum length of a circular curve in normal cases

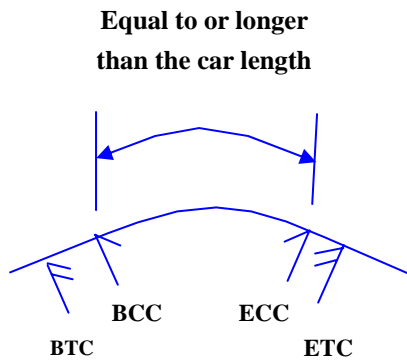


Fig. 2.3-2 Consecutive transition curves where a length of a circular curve equal to or longer than the car length cannot be inserted.

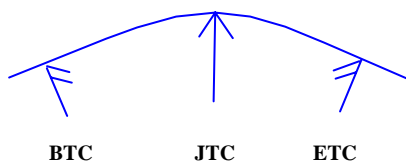


Fig. 2.3-3 Minimum length of a circular curve for curve-diminishing by half sine-wave transition curves

Curve-diminishing transition curves

Can be equal to or less
than the car length

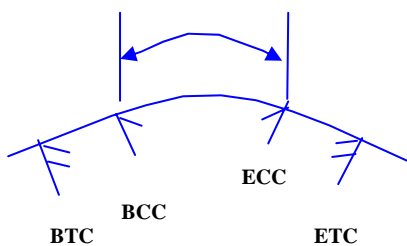


Fig. 2.3-4 Length of the straight section between curves in normal cases

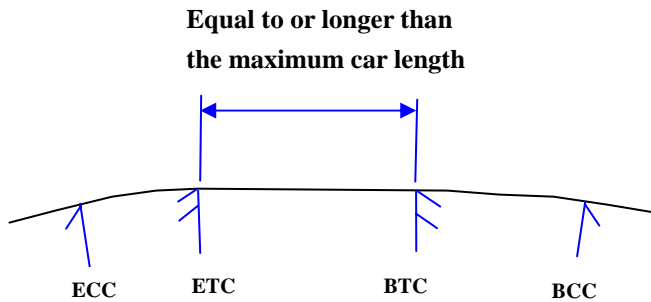


Fig. 2.3-5 Connect the two transition curves in the same direction where a straight section equal to or longer than the maximum car length cannot be inserted.

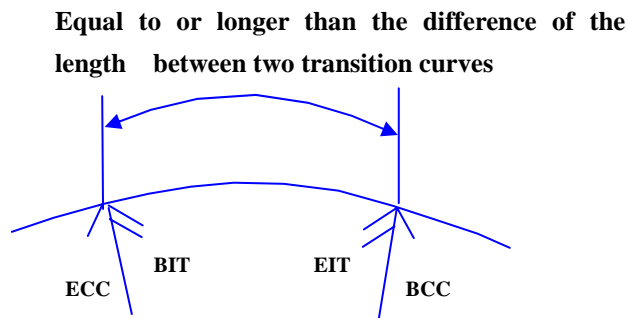


Fig. 2.3-6 Connect the two transition curves in the opposite direction where a straight section equal to or longer than the maximum car length cannot be inserted

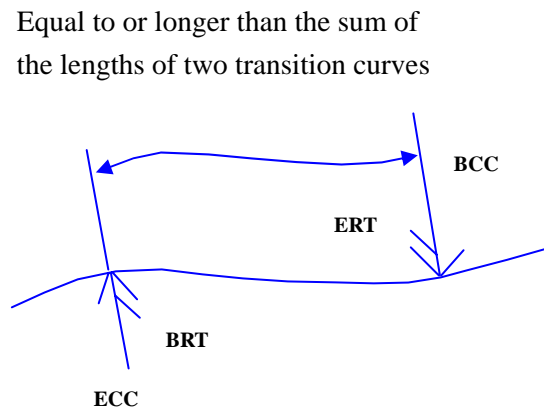


Fig. 2.3-7 Length of the straight section between curves on a main track in the same direction

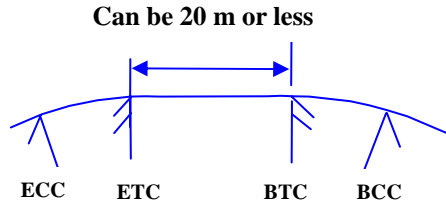


Fig. 2.3-8 Length of the straight section between curves on a main track in the opposite directions

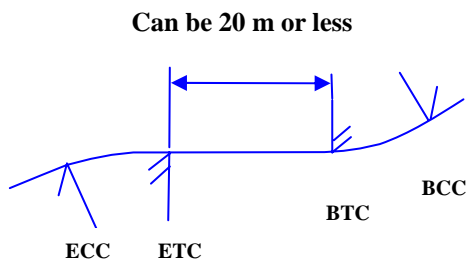


Fig. 2.3-9 Length of the straight section between curves on a side track with no transition curves

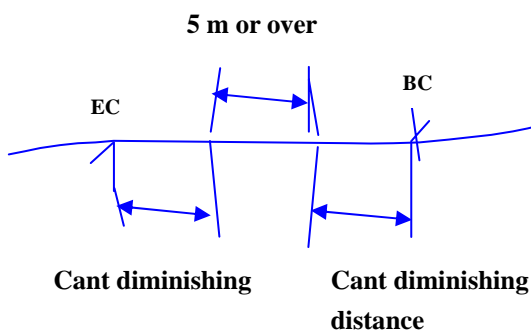


Fig. 2.3-10 Length of the straight section between a turnout and a curve

Normal cases

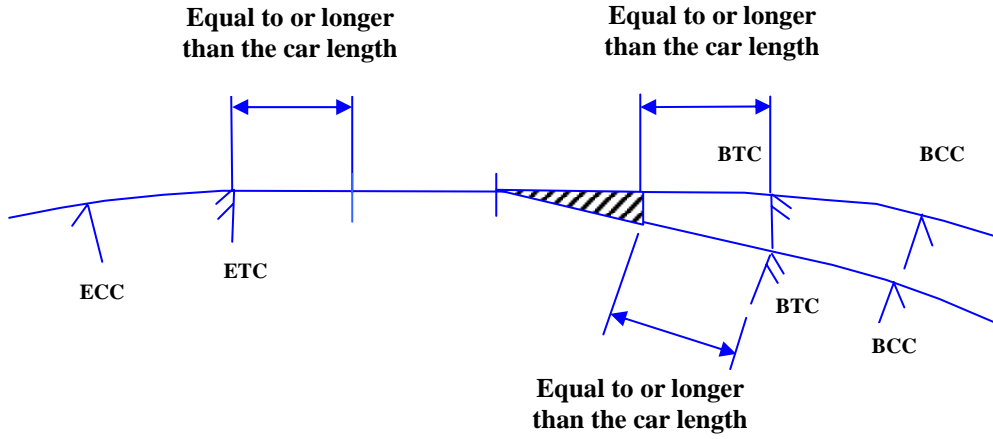


Fig 2.3-11 Length of the straight section between a turnout and a curve

Where transition curves exist

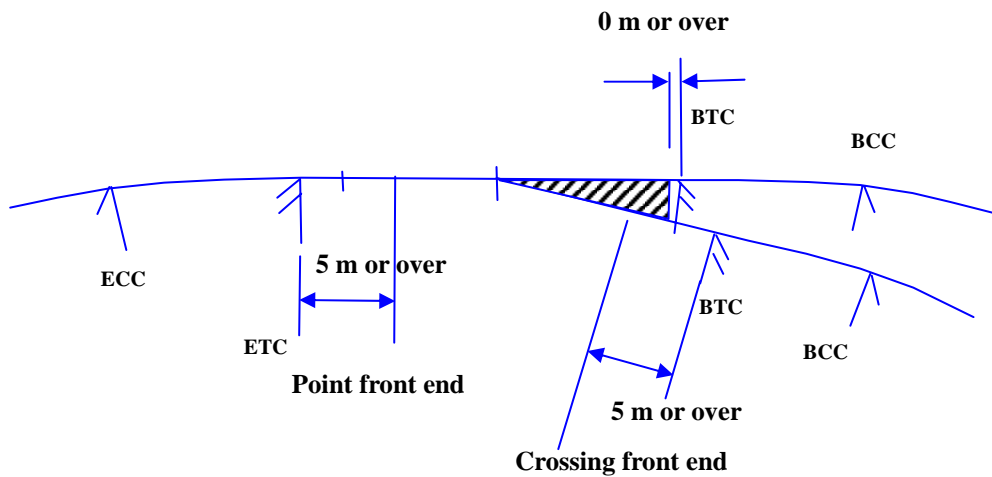


Fig 2.3-12 Length of the straight section between a turnout and a curve

Where transition curves do not exist

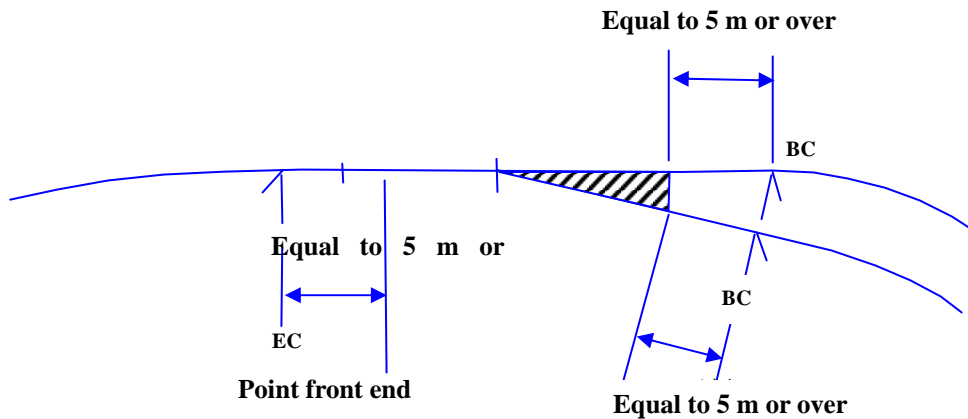


Fig. 2.3-13 Distance between turnouts

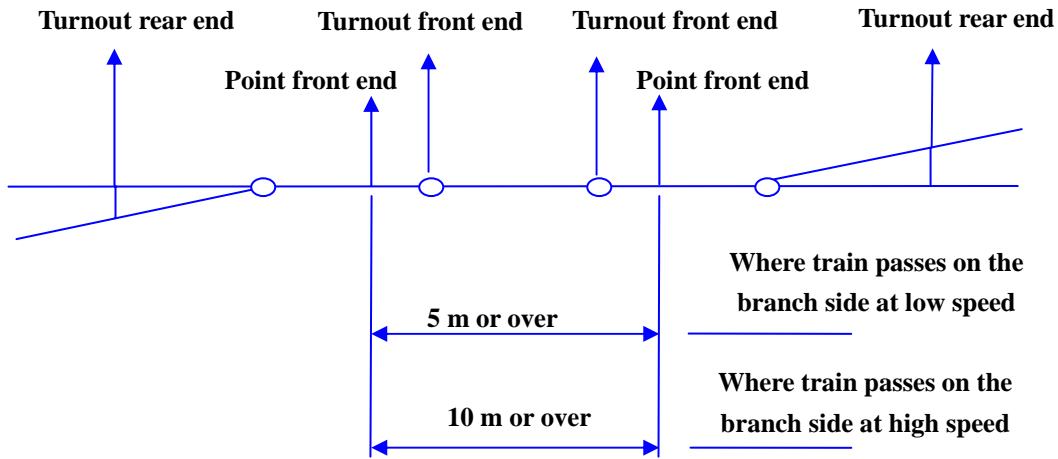
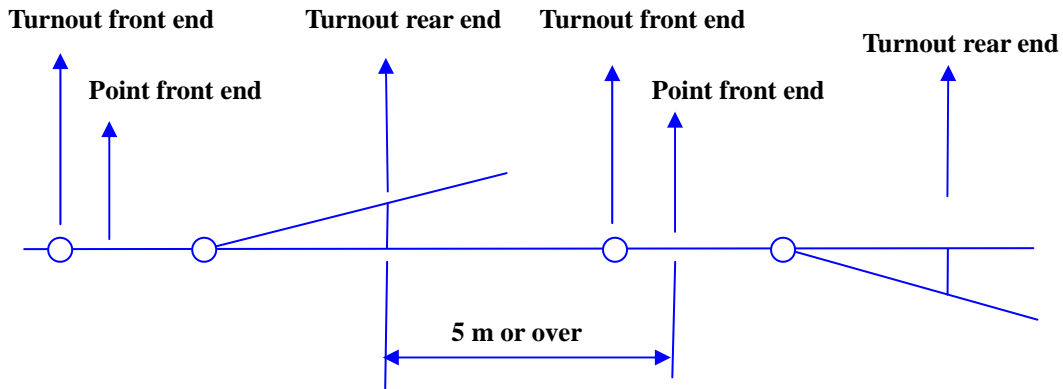


Fig. 2.3-14 Distance between turnouts



2.4 Gradient

2.4.1 The gradient of a main track is set at 35‰ or less.

In unavoidable cases for topographical reasons, however, the gradient on deadheading sections (without passengers on board) where the difference in height is 20 m or less, the gradient may be set at 45‰ or less.

2.4.2 The gradient in the area where trains are kept stopped is set at 5‰ or less. In the areas where cars are not stored or coupled/discoupled, however, the gradient may be set at 10‰ or less provided that departure or arrival of trains is not hindered.

2.4.3 The gradient of a curved section is set equal to or less than the maximum gradient allowed for

the section after compensated for the curve resistance.

Attached Material: (Item 2.4- Gradient) The curve resistance

The curve resistance is calculated by the following equation.

$$r_c = \frac{1000f(G+L)}{2R} \text{ (KN/t)} \text{ -----Equation 2-5}$$

Where:

- r_c : Curve resistance per unit car weight (KN/t)
- G: Gauge (m)
- L: Fixed wheelbase (m)
- f: Coefficient of friction between rail and wheel
- R: Radius of curve (m)

When $G = 1,430$, $L = 3.5$ and $f = 0.2$ (normally 0.1 to 0.27) are substituted into the equation 2-5, the equation 2-6 is obtained.

$$r_c = 494 / R \quad 500 / R \text{ (KN/t)} \text{ -----Equation 2-6}$$

Therefore,

$$\text{Curve resistance (compensated for gradient)} = 500 / R \text{ (‰)} \text{ ----- Equation 2-7}$$

Attached Material: (Item 2.4- Gradient) Tunnel resistance

In a tunnel with a length of 500 m or over, the gradient is compensated for the air pressure that works on trains.

The tunnel resistance r_t (KN/t) is equal to the apparent gradient i (‰) calculated by the equation 2-8

$$r_t = i \text{ (KN/t)}, \quad i = \frac{LV^2}{13W} \text{ (‰)} \text{ -----Equation 2-8}$$

Where:

- r_t : Tunnel resistance (KN/t)
- i : Compensation for air resistance for gradients (‰)
- L: Tunnel length (km)
- V: Train speed (km/h)
- W: Train weight (t)

By applying the above equation, the following tunnel resistance is normally used as a standard for tunnels with the length of 500 m or over.

- $r_t = 2$ KN/t, $i = 2$ ‰ for single-track tunnel
- $r_t = 1$ KN/t, $i = 1$ ‰ for double-track tunnel

The tunnel resistance may be decreased in consideration of a train speed.

2.5 Construction gauge

- 2.5.1 The construction gauge is the rolling stock gauge plus 800 mm as a standard.
- 2.5.2 The construction gauge may be reduced to the rolling stock gauge plus 400 mm or over in the sections where only trains from which passengers cannot hang out of windows are operated.
- 2.5.3 The top boundary of the construction gauge set at the standard height of contact wires (5.00m) plus the height of the contact wire suspension system (500mm) and a margin of 200mm, which is equal to 5.70m, in the DC power supplied sections where having an unlimited space above the track and where fences prohibiting entry into the track are not installed. The top boundary may be lowered, however, in underground sections, elevated sections, tunnels and bridges where unauthorized entry is difficult, or sections guarded with fences where a safe space is ensured between contact wires and folded pantographs and where a safe contact wire suspension system is adopted.
- 2.5.4 The construction gauge of a platform is 1200mm from the rail level in the vertical direction and the rolling stock gauge plus 50 mm in the lateral direction as a standard.
- 2.5.5 Where there are facilities for car rooftop component inspection and car washing/cleaning that infringe the construction gauge, specify the place of installation of these facilities, set the allowable car speed, check the safety of cars and facilities, and mark the facilities in the construction gauge. The construction gauge is reducible to the rolling stock gauge plus 50 mm in this situation.

See Fig. 2.5 for the standard of construction gauge.

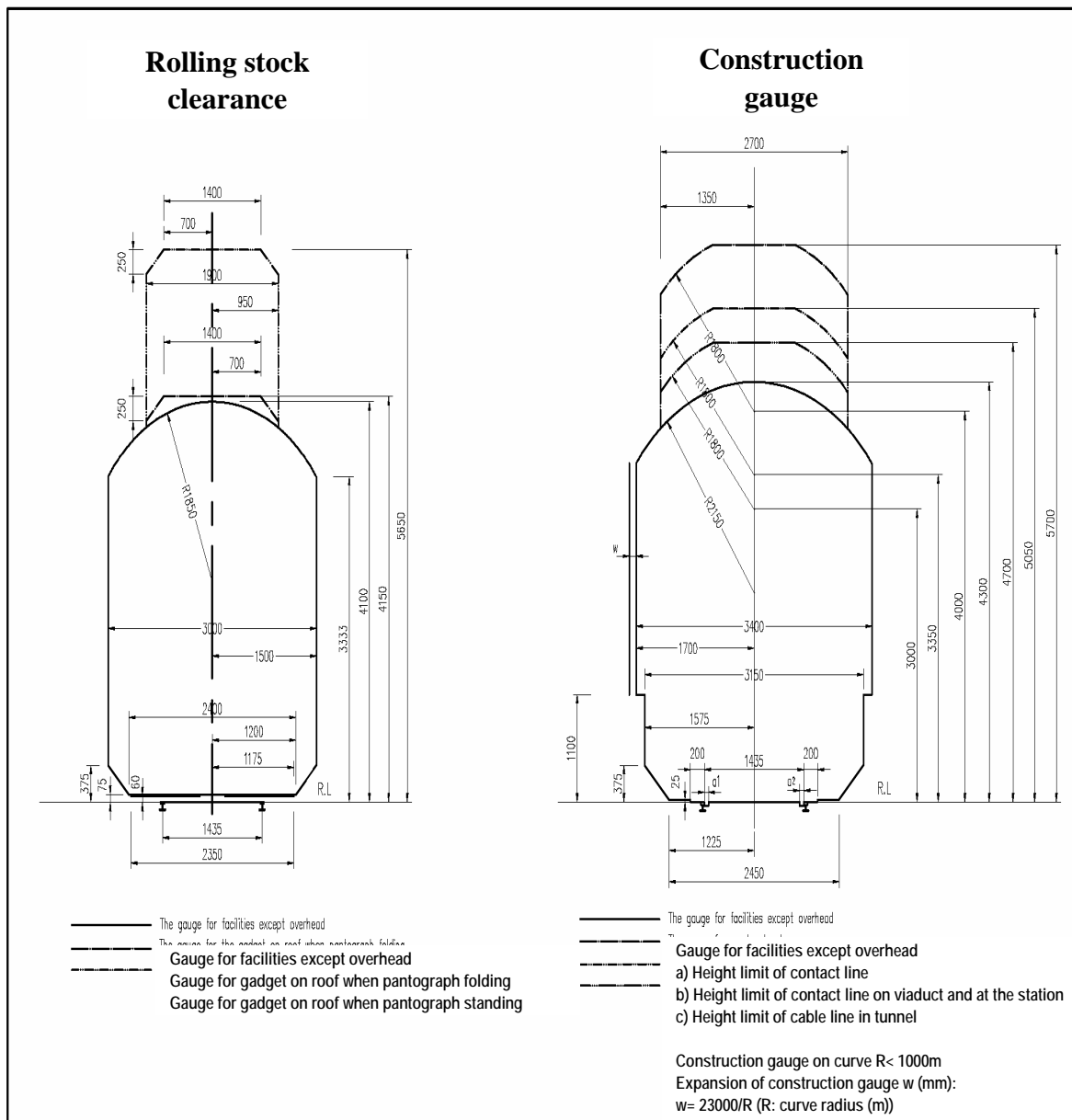


Fig. 2.5 Construction gauge

Legends:

The expansion W of the construction gauge in curve sections is calculated by the following equation.

$$W = \frac{L_0^2 + L_1^2}{8R} \quad (\text{approximation}) \quad \dots\dots\dots(1)$$

Use the equation (1) to calculate the value of W for ordinary cars.

When the fixed wheelbase $L_0 = 2,100mm$ and the distance between fixed axles of trucks $L_1 = 13,400mm$:

$$W = 22,996.25 / R \quad 23,000 / R \quad \dots\dots\dots(2)$$

2.6 Width of formation level

- 2.6.1 The width of formation level for a main track is set at 3.10 m as a standard and 2.80 m or over in cutting and embankment sections.
- 2.6.2 The width of formation level on viaducts and other structures is set at 2.75 m or over, which may be reduced in consideration of the track structure and existence of passing track provided that there are no hindrances.

2.7 Track center distance

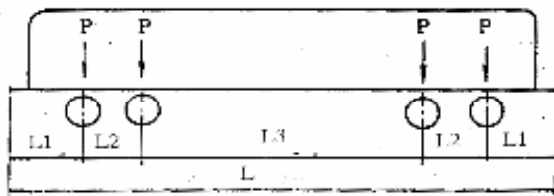
- 2.7.1 The track center distance for a main track is the width of rolling stock gauge plus 600 mm or over.
- 2.7.2 The track center distance in the sections where only trains from which passengers cannot hang out of windows are operated may be reduced to the width of rolling stock gauge plus 400 mm.
- 2.7.3 The track center distance in the sections other than main tracks is the width of rolling stock gauge plus 400 mm or over.

2.8 Train load

- 2.8.1 Bridges, tunnels and earth structures have strength to withstand the design train load and impact loads. The train load is based on the axle arrangement and axle loads shown in the attached material 2.8-1 as a standard.

Attached material: Item 2.8-1 Train load (EMU)

Axle loads and axle arrangement of EMU for passengers



L: Length of car body (automatic coupler center distance)

L2: Fixed wheelbase

The axle load is based on the empty car weight added with the load of the maximum number of onboard passengers.

The maximum number of onboard passengers (persons) = seat capacity (persons) + standing floor area (m²) / 0.1 (m²/person)

$$\text{Axle load (P)} = (\text{empty car weight} + \text{maximum number of onboard passengers} \times 55 \text{ kg}) / 4$$

Legend:

- Calculation unit for standing floor area: m²
- Calculation unit of 0.1: m²/person
- Standing floor area = (Area of car floor) - (area for seats) - (250 mm-area from the seat front edge)

The following Table shows the standard design dimensions for EMU car

Table 2.8-1 Standard design dimensions for EMU car

Item	Standard value
Length of car body (L)	20 m
Fixed wheelbase (L2)	2.1 m
Axle load (P)	16t or less

2.9 Structures

2.9.1 Viaduct

2.9.1.1 The viaduct structures are selected from such types as earth structure, rigid frame structure, bridge structures (concrete girder, PC concrete girder, composite girder and steel girder) in consideration of surrounding conditions, landscape, environment of construction work and economic efficiency.

2.9.1.2 A space is kept under viaduct girders at crossings or intersections with roads in accordance with the road-designing standard.

2.9.2 Underground structures

Underground structures, such as cut and cover tunnels (reinforced concrete box rigid frame), shield tunnels and NATM tunnels, are selected in consideration of topography, geology, number of tracks, environment of construction work and economic efficiency.

2.10 Track structure of urban railways

2.10.1 Track structure in tunnel and viaduct sections

Tracks in tunnel and viaduct sections have the structure with crushed stone ballast track, track of concrete roadbed fixed with PC sleepers or with tie plates, slab track, or other track structures.

2.10.2 In tunnel and viaduct sections, track structures must be checked for the safety of train operation beforehand.

Attached Material:

Table 2.10-1 Threshold values for track maintenance (for reference)

Irregularity	Threshold value for maintenance (unit mm) (applicable at 130 km/h or less)					Transition curve connected to curves with a radius of 400 m or less
	(Ordinary section)					
	Maximum speed allowed for the section or the maintenance point (km/h)					
	≥120 km/h	≥95 km/h	≥85 km/h	≥45 km/h	<45 km/h	
Longitudinal level (mm)	23(15) (7)	25(17) (8)	27(19) (9)	30(22)	32(24)	On the exit side (for running trains) of curves with a radius of 400 m or less and a cant of 80 mm or over, the following specifications apply to the transition curve plus 10 m sections ahead and behind. * Gauge +10 (+6) * Alignment 14 (8)
Alignment (mm)	23(15) (7)	25(17) (8)	27(19) (9)	30(22)	32(24)	
Gauge	* Straight sections and curves with a radius over 600m: +20 (+14) * Curves with a radius, over 200 m to 600 m: +25 (+19) * Curves with a radius less than 200 m: + 20 (+14) Note 1: Expansion of gauge (including slack) is 40 mm or less Note 2: The target gauge expansion in maintenance is 6 mm.					
Cross level	To be maintained based on the cross level change					
Track distortion	23 (18) (including cant run-off)					

Remarks:

Note the following in regard to the threshold values for maintenance.

- (1) The figures are dynamic values measured with a track inspection car. Those in parentheses are static values. The static value is the 10 m versine track irregularity
- (2) The value of track distortion is the change in track level per 5 m.
- (3) The figures in the table do not include slacks, cants or versine values (including those of vertical curves)
- (4) Provide maintenance services to tracks immediately in case irregularities have reached a threshold value or when they are rapidly progressing or apprehended to cause excessive car rolling.
- (5) The figures in parentheses in the bottom line, columns of longitudinal level and alignment, are the values recommended to start maintenance.

When n pieces of such values have arisen in a 500 m section, immediately provide maintenance services.

The value of n may be set for each section classified in a target route in consideration of a

reduction of maintenance, a ride comfort and a maintenance expense.

- (6) Immediately provide maintenance services to sections where gauge expansion has reached the value to start maintenance.

Attached Material:

Table 2.10-2 Standard values for finishing in track maintenance work (for reference)

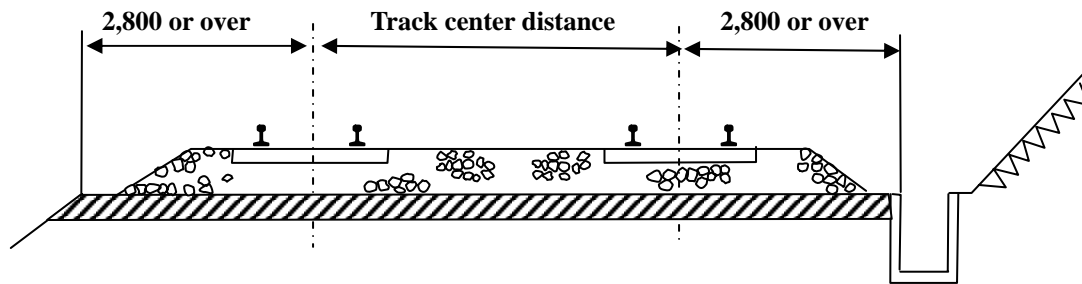
Item	Standard value to finish track maintenance (mm) (applicable to 130 km/h or less)	
	Crushed stone ballast track	Concrete roadbed track
Gauge	+1 ~ -3	+1 ~ -3
Track level	+4 ~ -4	+2 ~ -2
Longitudinal level	+4 ~ -4	+2 ~ -2
Alignment	+4 ~ -4	+2 ~ -2
Track distortion	+4 ~ -4	+4 ~ -4
Back gauge at turnout crossing	1393 - 1397 (G1435 mm)	
Gauge at crossing	+3 to -1	
Position of sleeper	+20 to -20	

Attached Material: (Item 2.10 Track structure of urban railways) An image of the track structure of urban railways

The width of formation level conforms to the following.

1. The width of the formation level of a main track is set at 2.8 m or over for embankments and cutting sections, and 3.10 m as a standard value. In unavoidable cases for topographic or other reasons, however, the width of the formation level is set at 2.5 m or over.
2. The width of formation level on viaducts and other structures is set at 2.75 m or over, which can be reduced in consideration of the track structure and existence of passing track provided that there are no hindrances.
3. The width of formation level in tunnel sections has a margin against the construction gauge.

Attached Material for reference,



Legends: On the assumption that the maximum rolling stock width B is 3,000 mm:
 $(B + 800) \times (1/2) + 900$ mm (a margin in width) = $3,800 \times (1/2) + 900 = 2,800$ mm
 $(B + 800) \times (1/2) + 600$ mm (a margin in width) = $3,800 \times (1/2) + 600 = 2,500$ mm

Fig. 2.10-1 Crushed stone ballast track on soil roadbed - Straight section

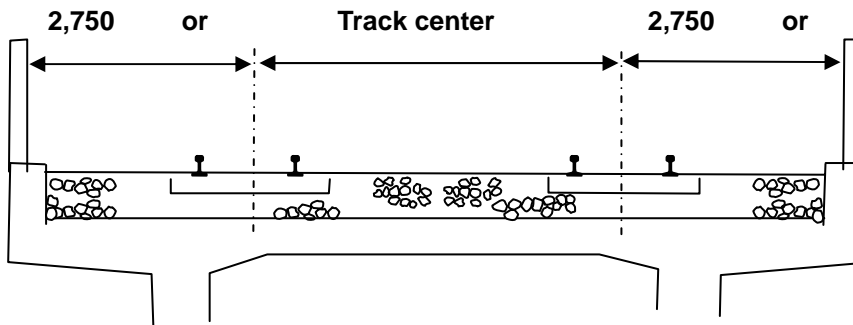
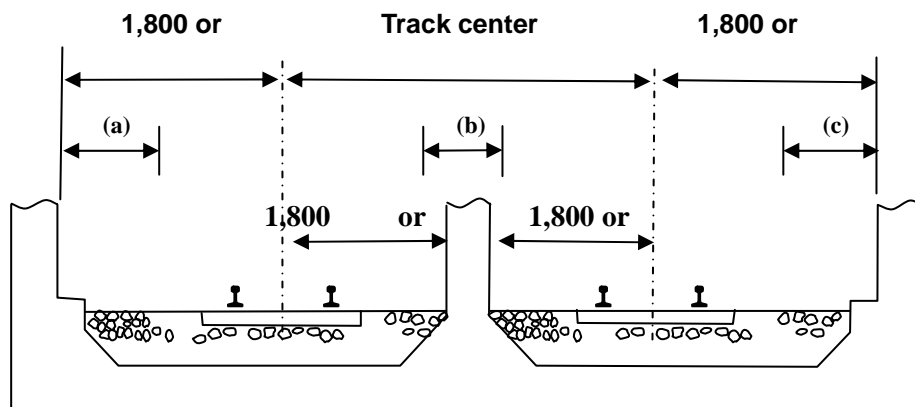


Fig. 2.10-2 Crushed stone ballast track on viaduct - Straight section



Legends:

1. On the assumption that the maximum rolling stock width B is 3,000 mm:
 $(B + 400) \times (1/2) + 100$ mm (a margin in width) = $3,400 \times (1/2) + 100 = 1,800$ mm
2. Add a circuiting pass for maintenance or a place for shelter to (a), (b) or (c).

Fig. 2.10-3 Crushed stone ballast track in tunnel - Straight section

W , $f(C)$: Curve expansion
 $f(C)$: Expansion for cant inclination
 D : Track center distance in straight sections

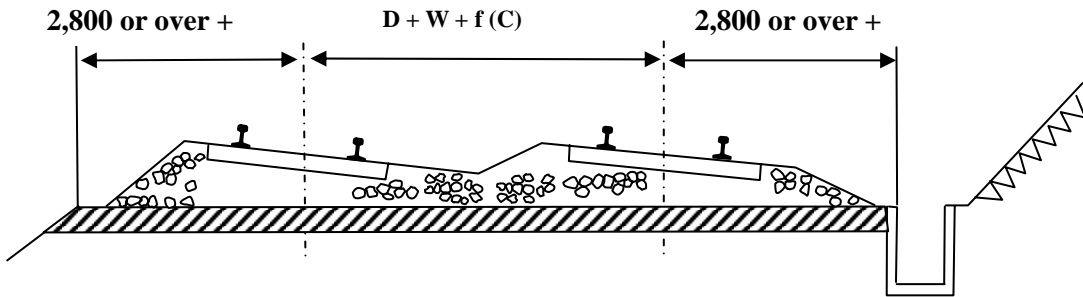


Fig. 2.10-4 Crushed stone ballast track on soil roadbed - Curve section

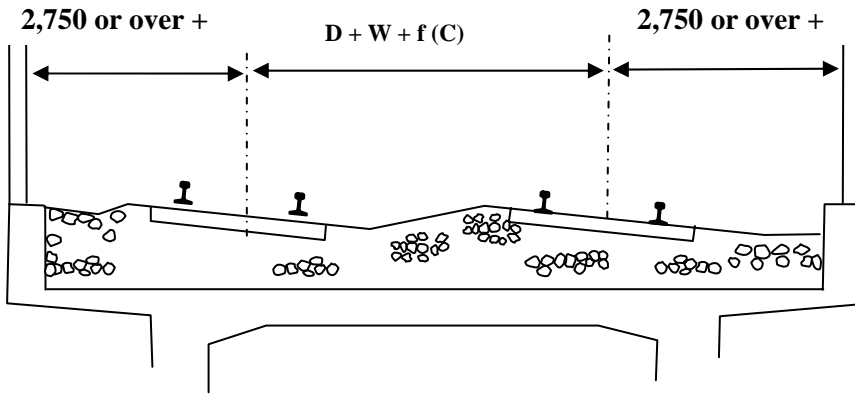


Fig. 2.10-5 Crushed stone ballast track on viaduct - Curve section

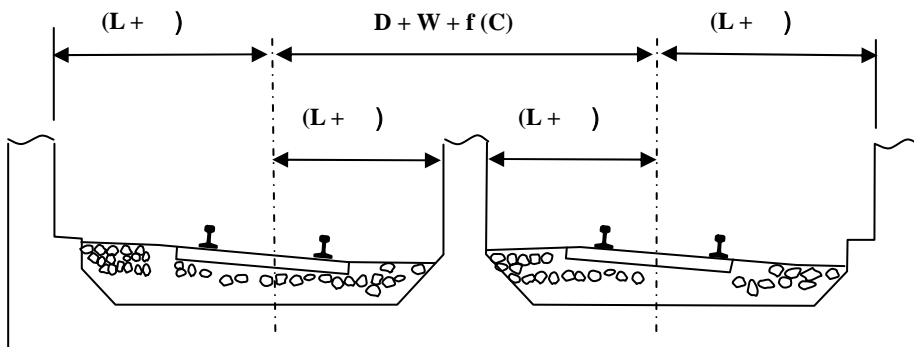


Fig. 2.10-6 Crushed stone ballast track in tunnel - Curve section

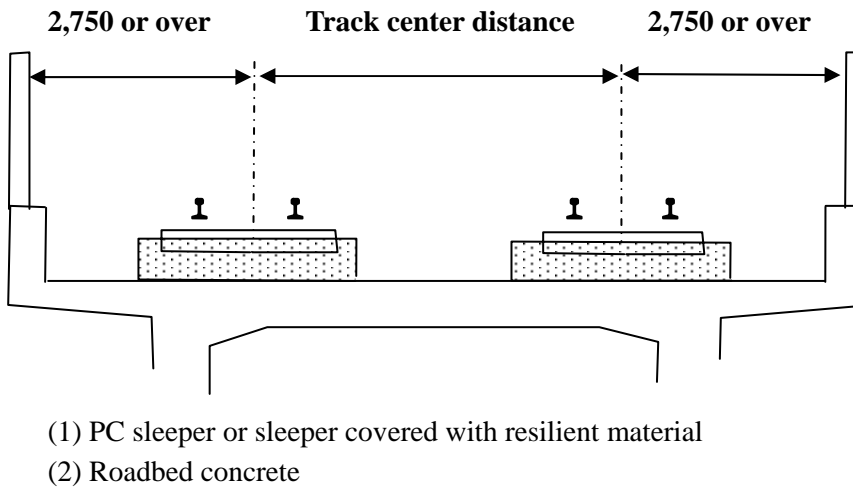
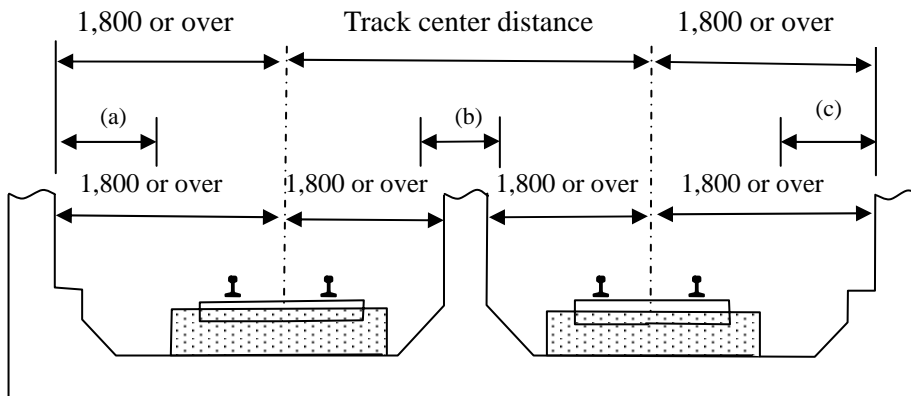


Fig. 2.10-7 Ballast-less PC sleeper track on viaduct - Straight section

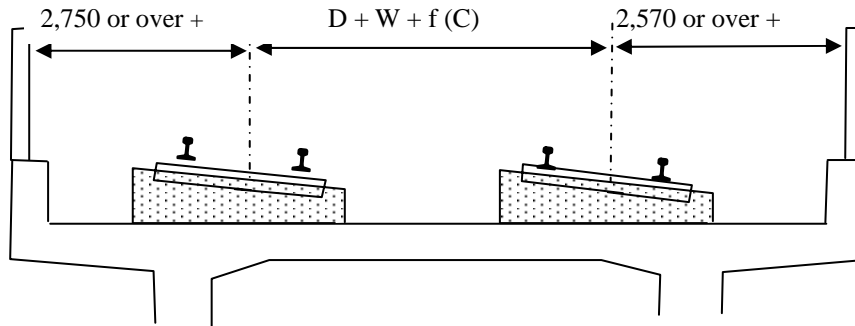


Legends:

- (1) On the assumption that the maximum rolling stock width B is 3,000 mm:
 $(B + 400) \times (1/2) + 100 \text{ mm}$ (a margin in width) = $3,400 \times (1/2) + 100 = 1,800 \text{ mm}$
- (2) Add a circuiting pass for maintenance or a place for shelter to (a), (b) or (c).

Fig. 2.10-8 Ballast-less PC sleeper track structure in tunnel - Straight section

W, , : Curve expansion
 f (C): Expansion for cant inclination
 D: Track center distance in straight sections



- (1) PC sleeper or sleeper covered with resilient material
- (2) Roadbed concrete OVER +

Fig. 2.10-9 Ballast-less PC sleeper track on viaduct - Curve section

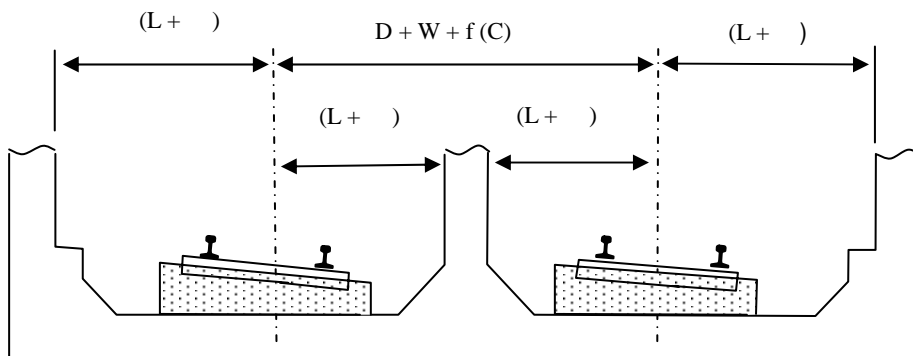


Fig. 2.10-10 Ballast-less PC sleeper track in tunnel - Curve section

2.11 Facilities for the prevention of disaster

2.11.1 Procedures are determined in advance to guard facilities against rainfall, floods, winds and earthquakes. Underground stations and facilities in particular are protected against inundation.

2.11.2 To prevent disaster due to rainfall, floods, winds and earthquakes, rain gauges, water gauges, anemometers, seismographs and other instruments are installed at appropriate places. Based on the information acquired with these instruments, ensure the safety of trains and tracks.

2.12 Facilities for evacuation

The following facilities are installed in tunnel, bridge and viaduct sections for passengers to flee on foot, in case trains stop at accident or for other reasons.

Table 2.12-1 List of facilities for evacuation

Position	Facilities for evacuation
Evacuation route	A walkway to walk on · Indication of obstacle for walking (side ditches, projections) · Facilities to prohibit entry into dangerous places or indication of danger
Bridge sleeper track	Plate for walking or side walkway
Tunnel	Lighting apparatus, guiding lamps, marks to indicate the distance to the nearest station

2.13 Facilities for over-bridge and waterway (excavated structure as trench) sections

2.13.1 In the sections where the track is stridden over by a road or runs through open-cut structures, necessary measures are taken to prevent road vehicles or other foreign articles from falling onto the track.

Crash barriers or fences are installed at over-bridges and other places where foreign articles are apprehended to fall onto the track.

Crash barriers or concrete walls are installed at open-cut structures where road vehicles are apprehended to fall.

2.13.2 At places where safety is ensured, equipment/facilities to detect falling articles is installed.

2.14 Intersections between tracks and with roads

2.14.1 Main tracks cross other tracks and roads at grade separation except level crossing is inevitable and so approved by authorized organizations.

2.14.2 Level crossings with roads may be set on a side track and in depots.

3. STATIONS

3.1 Station facilities

3.1.1 Passenger handling facilities are installed at stations to accommodate the design number of passengers.

Passenger handling facilities include platforms, those for passenger flow (passes, concourses, staircases, over-bridges, elevators and escalators) and passenger services (ticket windows and ticket barriers), waiting rooms, offices, toilets, lighting apparatus and water supply and drainage systems.

3.1.2 Stations are equipped with guiding signs, position systems, leading signs, restriction signs and other facilities appropriately to guide passengers to ticket windows/barriers, concourses, platforms and toilets.

3.2 Platform

3.2.1 Width and length of platform

3.2.1.1 The width of separate platforms is set at 1.5 m or over at the end, 2 m or over at the center and desirably 5 m or over in case a staircase or other structures is constructed. See Fig. 3.2-1.

3.2.1.2 The width of island platforms is set at 2 m or over at the end, 3 m or over at the center and desirably 7 m or over at other places in case a staircase is constructed. See Fig. 3.2-2.

3.2.1.3 The length of platforms is equal to the maximum length of trains plus 10 m as a standard. However, 10 m may be reduced when a platform door and a home fence are installed.

3.2.1.4 Where a staircase is installed on the platform, the distance from the platform edge on the trackside to the sidewall of the staircase is set at 1.5 m or over, and 1.2 m or over where platform doors or fences are installed. The corresponding distance to columns is set at 1.0 m or over.

3.2.2 Height of platform surface

3.2.2.1 The height of platform surface is set at 1,100 mm from the rail level as a standard.

3.2.2.2 The platform surface is set to be flush with the car floor as possible. The car floor may be higher than the platform surface up to 50 mm, or lower down to 20 mm.

3.2.3 Gap between train and platform

3.2.3.1 The minimum gap between a train and a platform is set at 50 mm or over, and 70 mm as a standard in straight sections.

3.2.3.2 Where the platform exists in a curve section, the minimum gap between train and platform is determined in consideration of the expansion of construction gauge and inclination due to the cant

3.2.3.3 In the case of above paragraph 3.2.3.2, the gap between the car body and the platform at the

train door position is set at 200 mm or less, except where a movable device to nullify this gap at boarding/alighting is installed. In case the gap is too large, draw attention of passengers by posting a notice or through a public address system.

3.2.4 Facilities for handicapped people

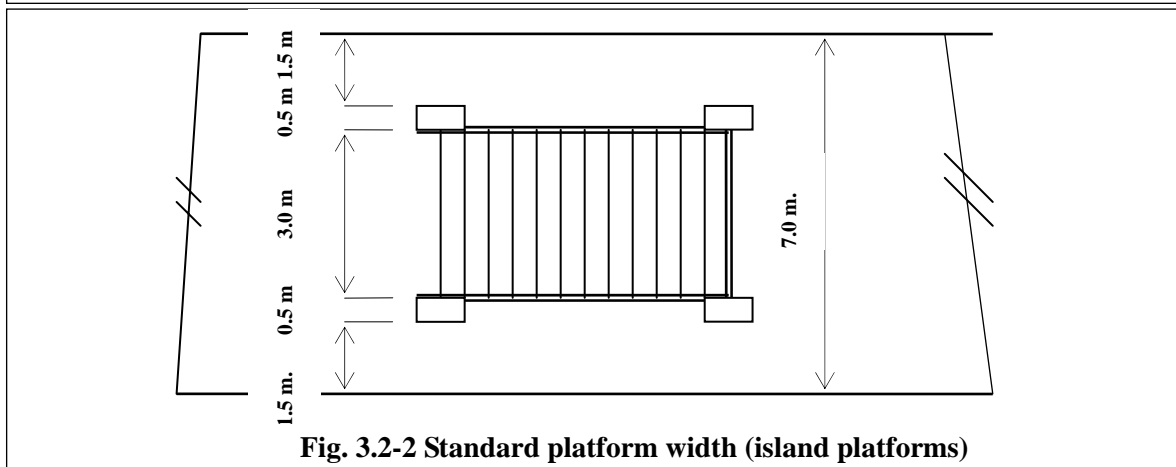
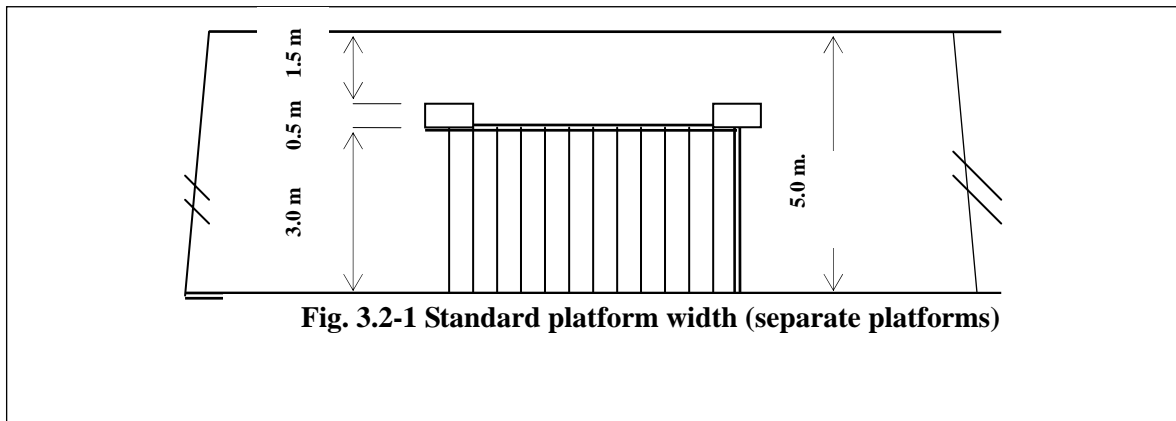
3.2.4.1 One or more routes exist between roads and station platforms through slopes, escalators and elevators to allow wheelchair passengers to use.

3.2.4.2 One or more routes are laid with braille-blocks between roads and station platforms for visually handicapped people.

3.2.5 Installation of platform doors and fences

3.2.5.1 To prevent passengers from falling onto the track or contacting running trains, platforms are equipped in principle with platform doors (including movable fences or half-size platform doors) or platform fences (fixed fences with openings at the train door position).

3.2.5.2 In case there are few boarding/alighting passengers and the platform width is large, application of the above paragraph 3.2.5.1 can be waived.



3.3 Depots and other maintenance facilities

Depots and rolling stock inspection/maintenance facilities have capacities to accommodate, inspect

and repair assigned rolling stock.

3.4 Underground station facilities

3.4.1 Ventilation and smoke exhaustion equipment

3.4.1.1 Underground stations are equipped with ventilation and smoke exhaustion equipment. The machine ventilation equipment can also be used as the smoke exhaustion equipment. The smoke exhaust equipment have an emergency power source. Installation of ventilation equipment is not required where sufficient natural ventilation is available.

3.4.1.2 Hanging walls are installed where necessary to prevent flow of smoke between platforms and tracks and at staircases/escalators at stations.

3.4.2 Air conditioning equipment

Air conditioning equipment is equipped at high-temperature underground stations used by a large number of boarding/alighting passengers. In case heat is removed from platforms by train winds, however, application of the above paragraph can be waived.

3.4.3 Water supply and drainage equipment

3.4.3.1 Stations are equipped with water supply and drainage equipment.

3.4.3.2 Water supply equipment

3.4.3.2.1 Underground stations are equipped with water supply equipment for use by passengers and station staff and for fire fighting operation.

3.4.3.2.2 The volume of water supply is determined in consideration of the time and place of consumption in order to supply sufficient volumes of water to different places.

3.4.3.2.3 Water is drawn from the water supply system of municipalities, with reservoir tanks installed at underground facilities, from which water is pumped to the water supply system of relevant places.

3.4.4 Installation of sewage disposal equipment at underground stations

Sewage means the waste water exhausted from bathrooms and toilets at stations and underground depots (outside the station premises).

Underground stations treat sewage according to the sewage treatment standard of municipalities before draining it into the sewage disposal system thereof.

Sewage is pumped up into a reservoir before draining into the sewage disposal system of municipalities.

3.4.5 Inundation prevention and drainage equipment

Measures are taken to prevent inundation from the openings at staircases of underground section and to provide drainage equipment against leakage and inundation from tunnels. Where the volume of water is small, drainage equipment is connected to that of adjacent tunnels.

3.4.5.1 Drain pumping equipment appropriate for the track gradient is installed where necessary in tunnels and at stations in underground sections.

3.4.5.2 Inundation prevention measures

Staircases at the entry and exit of tunnels are equipped with cut-off panels. Where it is impossible to stop water by cut-off panels for topographical or other reasons, iron cut-off doors are installed at staircase landings.

The ventilation openings and inspection openings thereof are located at the heights where inundation is not apprehended.

At the places of transition from tunnel to ground surface, inundation are prevented at the height of ditch-structure parapet (falling prevention retaining wall). Where this measure is not practical, iron cut-off doors are installed at the entrance/exit of tunnel.

3.4.6 Power supply and distribution equipment

Power is supplied to electrical equipment according to priority at underground stations.

3.4.6.1 Primary load

The power supply system is duplicated to prevent total shutdown of power supply for emergency lighting, automatic fire extinguishing equipment, fire prevention equipment, evacuation guidance equipment, ventilation/smoke exhaustion equipment, public address equipment, signal/telecommunication equipment, iron cut-off doors and drainage pumps.

3.4.6.2 Secondary load

Power is supplied through two power supply channels with one or two power sources to lighting systems on the ground, elevators, sewage draining pumps and station offices.

3.4.6.3 Tertiary load

Power is supplied from one or two power sources to air-conditioning equipment, water supply systems to bathrooms and lighting for advertisements and signposts, which can be stopped when the power sources are under repair or inspection.

3.4.7 Emergency power generating equipment

Underground stations are equipped with emergency power generation equipment, except where the power receiving system or power sources are duplicated.

3.5 Fire fighting measures at underground stations

3.5.1 Fire prevention measures

Incombustible materials are used in principle to construct underground structures.

3.5.2 Fire prevention control room

Stations have a fire prevention control room stationed with station staff for 24 hours a day to collect information, transmit orders, implement public addressing for passengers and monitor/control fire prevention shutters.

3.5.3 Warning, reporting and evacuation guiding systems

Stations are equipped with warning systems (including fire detection systems), reporting systems evacuation guiding equipment (including two or more routes for evacuation and emergency lighting systems) and fire prevention doors.

3.5.4 Fire extinguishing equipment

Underground stations are equipped with fire extinguishers, indoor fire hydrants, sprinklers,

water pumping hoses for fire extinguishing operation and other fire fighting devices.

Fire fighting measures at underground stations are taken in cooperation with the municipal fire fighting authorities and to be approved by them.

4. ELECTRIC EQUIPMENT

4.1 Types of electrification

Urban railways standardize on electrification using overhead single-line method, the standard voltages of contact lines is defined by 1,500VDC. However, when there is necessity in a route with a plan to perform through operation with other railway, the standard voltage of 25,000VAC, single-phase is available.

4.2 Height of contact line

The height above rail top of overhead single-line system contact lines is set at 5m as a standard, but not less than 4.4m at D.C., not less than 4.57m at A.C.

4.3 Supervisory Control and Data Acquisition (SCADA) System

A SCADA system standardizes installed to monitor and control each substation, which uses control cables to connect the centralized remote control system for substations and the monitor and control system equipped at the protection interlocking system at each substation.

5. SIGNALING AND TELECOMMUNICATIONS

5.1 System guaranteeing the interval between trains

System guaranteeing the interval between trains in urban railway is a system automatically stopping through continuously controlling interval between the trains on its route and the condition of its route (hereinafter called Automatic Train Control System -ATC).

In case of installing the screen door, the Automatic Train Operation System (ATO) will be installed.

5.2 Train operation control system

A Train Operation Control System operates following the management and concentrated control method.

5.3 Interlocking devices

Train occupation, points and ATC Signal are interlocked by interlocking devices.

5.4 Railway radio telecommunications

5.4.1 The duplex train radio system using leakage coaxial cable is used to ensure the direct communication between train dispatcher and trains.

5.4.2 The simplex radio system in station is used to ensure the communication between trains and stations.

5.4.3 The protective radio system should control the display of stop signals by radio signals in case of abnormalities in train operation.

5.5 Passenger service information equipment

Passenger service information equipment is used in order to provide significant train information with passengers.

5.6 Automatic fare collection equipment

AFC (Automatic fare collection equipment) with contactless cards (smart card) standardizes on the functions for fare collecting and access gate control for all stations, aiming at customer's security, convenience and cost-effectiveness in station tasks, common use with other train-modes and flexible payment method.

Attached material: Automatic Fare Collection System (AFC)



Touch panel ticket machine



Automatic gate



Passengers passing the automatic gate



Contactless IC card

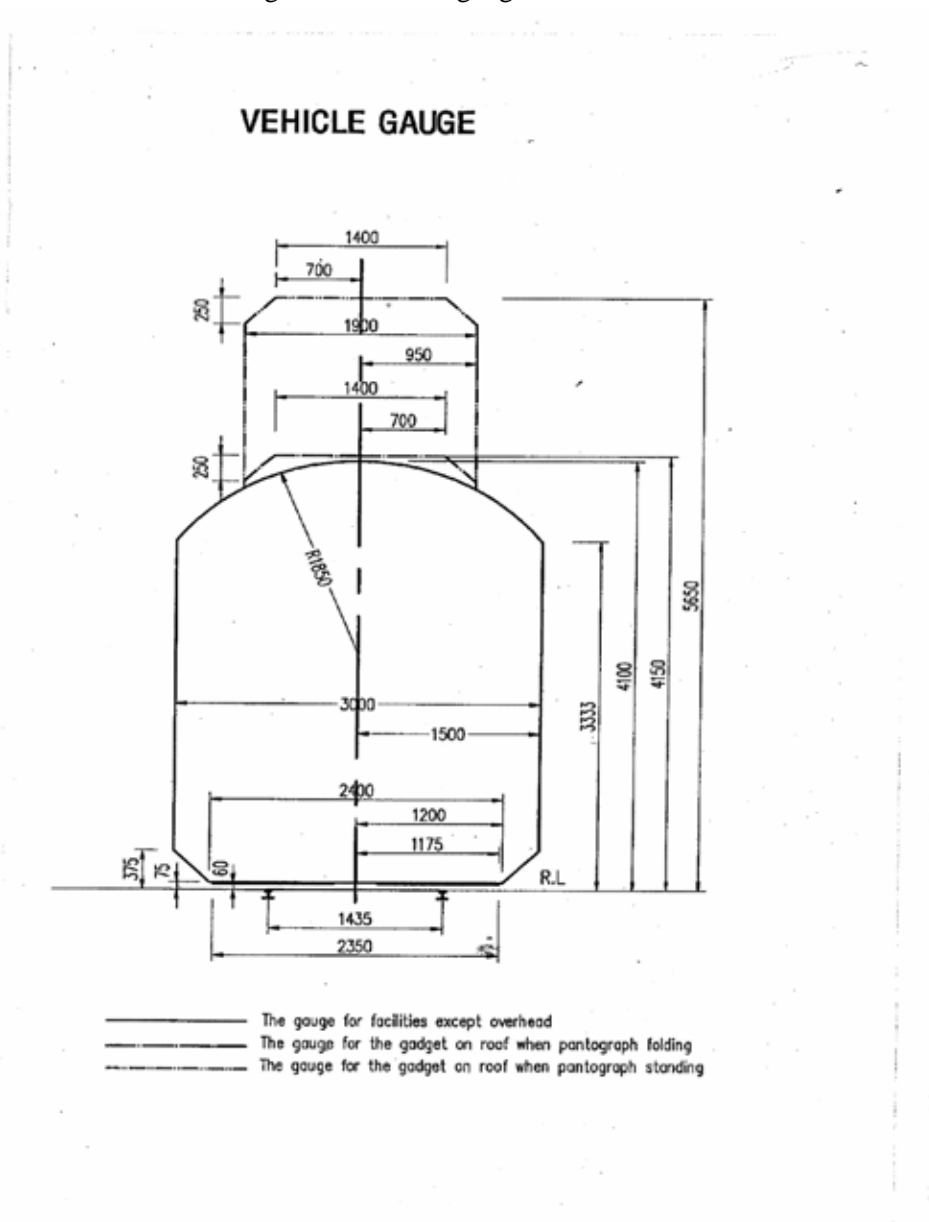
6. ROLLING STOCK

6.1 Rolling stock gauge

6.1.1 Cars shall not infringe the rolling stock gauge. Obstruction guards, cranes and other components that cannot be used unless they infringe the rolling stock gauge for structural reasons can infringe the rolling stock gauge to the extent that the safety of car running is ensured.

6.1.2 The rolling stock gauge in straight sections is shown in the following prescription. Urban railway rolling stock gauge in Fig. 6.1-1

Fig. 6.1-1 Vehicle gauge



6.2 Main facilities to install in the cab

- 6.2.1 The driving cab used to operate the train shall be equipped with equipment/systems required for train operation, which shall easily be manipulated and checked for normality by the driver.
- 6.2.2 The equipment/systems to be installed in the driving cab include the following as a standard.
- 6.2.2.1 Automatic train control system (onboard)
- 6.2.2.1.1 Automatic train control (ATC) system
- 6.2.2.1.2 Automatic train operation (ATO) system
- 6.2.2.2 Train radio protection system
- Trains (except the locomotives used for shunting only) operated in the sections where the accident warning audible signal, a special audible signal to be issued by radio transmission, are equipped with devices to issue and transmit warning sounds.
- 6.2.2.3 Train radio system
- Passenger trains are equipped with a duplex operation train radio system to make direct communications with the transport dispatcher.
- 6.2.2.4 An emergency operation changeover switch (for operation at 25 km/h or less) in case ATC has failed.

6.3 Main facilities to be installed in a passenger room

The principal equipment/systems to be installed in the passenger room include the following as a standard.

- 6.3.1 Emergency communication system
- Passenger cars are equipped with an emergency communication system, except for cars having a driving cab where the driver can easily communicate with the staff on the ground.
- 6.3.2 Emergency stop system
- Passenger rooms having an emergency stop system are equipped with an operation device therefor, except for those where passengers can easily communicate with the driver in the driving cab cars attached thereto.
- 6.3.3 Air conditioning system
- Cars are equipped with an air conditioning system.
- 6.3.4 Lighting system
- The lighting system in passenger rooms shall provide the illuminance required for running in tunnels or in the nighttime and to ensure safety in emergency.

6.4 Running gears

- 6.4.1 Running gears shall have sufficient strength and rigidity to withstand loads and vibration and ensure safety against derailment and excessive snaking motion.
- 6.4.2 The axle arrangement, structure of axle installation and dimensions of other parts are set as follows.

Table 6.4-1 Structure of each part of rolling stock

a. Gauge of track	1,435 mm
b. Wheel base	2,500mm or less
c. Wheel diameter	780 mm ~ 860 mm
d. Rim width of wheel	120 mm or more 150 mm or less
e. Back gauge of wheel rims	1,350 mm or more 1,356 mm or less
f. Height of flange	25 mm or more 35 mm or less
g. Minimum curve radius	R min = 100 m

6.5 Propulsion system

The maximum speed and acceleration are set as follows.

6.5.1 Acceleration

When $M/T = 1$, the standard acceleration is set at 0.92 m/s^2 (3.3 km/h/s)

6.5.2 Speed

The design maximum speed is set at 130 km/h.

6.6 Brake system

The standard performance of brake equipment conforms to the following.

6.6.1 Deceleration

When $M/T = 1$:

Service brake: 0.97 m/s^2 (3.5 km/h/s) (standard)

Emergency brake: 1.25 m/s^2 (4.5 km/h/s) (standard)

6.6.2 Electric (regenerative) Brake

The electric (regenerative) and mechanical brakes are used in combination, with priority in brake application placed on the former.

6.6.3 Security brake equipment

Trains are equipped with a security brake system for use in case the service brake has failed.

6.7 Coupling system

6.7.1 Couplers shall be robust and have sufficient strength to withstand vibration/impact and securely connect cars.

6.7.2 The front of the head car and intermediate sections where cars are to be de-coupled are equipped with tight lock couplers and other sections with semi-permanent couplers.

6.8 Load restrictions on track and structures

Rolling stock is not impose loads on tracks or structures larger than their bearing capacity. The standard axle load is set at 16 t or less.

6.9 Car-body structure

The passenger car-body meets the following specifications.

6.9.1 The passenger car body shall have sufficient strength, rigidity and durability against the loads conceivable in normal revenue service operation.

6.9.2 Dimensions of car body

The standard dimensions of car body is set as follows

6.9.2.1 Entrance/exit doors of passenger car

6.9.2.1.1 Four entrance/exit doors are installed at pitches of 4,820 mm on each side as a standard.

6.9.2.1.2 The entrance/exit for passengers are installed with double sliding doors having fixed windows.

6.9.2.1.3 Doors are attached with tip rubber and finger protection rubber layers to protect passengers.

6.9.2.1.4 The effective width and height of entrance/exit for passengers are set at 1,300 mm or over and 1,800 mm or over, respectively as a standard.

6.9.2.2 Length of car body

19,500 mm (coupler-to-coupler distance of car body: 20,000 mm)

6.9.2.3 Width of car body

2,950 mm

6.9.2.4 Height of roof

3,655 mm (excluding pantographs and air conditioners)

6.9.2.5 Height of floor

The difference between the height of floor or steps and that of platforms is set as small as possible.

6.9.3 Metals or incombustible materials equivalent thereto are used for the car roof.

6.9.4 The roof of passenger EMUs to be operated in DC sections with overhead contact wires conform to the following.

6.9.4.1 The top surface of the roof is covered with fire-resistant insulation materials.

6.9.4.2 Components and metallic parts installed on the roof are insulated against the car body at the fixing points. Their surfaces are covered with fire-resistant insulation materials.

6.9.5 The ceiling, outside plates and linings are covered with incombustible materials or those having incombustible surface coating. For the outside plates at the car ends, however, fire-resistant materials can be used.

6.9.6 The ceiling, outside plates and linings are painted with incombustible materials.

6.9.7 Incombustible materials are used for floor carpets.

6.9.8 The car floor is constructed not to make smoke or flames penetrate.

6.9.9 The car floor bottom surface is covered with incombustible materials or metal plates.

6.10 Feeding voltage

Standard of car power source is 1,500 VDC.

7. TRAIN OPERATION

7.1 Aspects of Cab signal

Aspects of cab signal are speed information signal system

7.2 Types and indication methods of special signals

Types and indication methods of special signals are as specified in the following table.

Kind of special signals	Kind of signals	Indication methods
Accident warning audible signal	Stop signal	Alarming sound by train protection radio
Flashing light signal	Stop signal	Flashing red lamp

7.3 Home indicator and starting indicator

The following indicators are displayed for the track in which a train is operated by the ATC system.

7.3.1 Track for causing a train to enter the station; home indicator

7.3.2 Track for causing a train to leave from the station; starting indicator

7.4 Display of contact line terminal indicator

An indicator of contact wire terminal is installed at a location requiring display of the terminal of an overhead contact line.

8 RECOMMENDATIONS TO IMPROVE THE CONVENIENCE OF USERS

8.1 Recommendations to improve the convenience of users

To improve the convenience of users, it is recommended to stipulate the following items 8.1.1 to 8.1.6.

- 8.1.1 It is desirable to have passenger guidance panels/equipment installed in the passenger room to indicate the next station for the train to stop and provide other written or vocal information on the operation of the train.
- 8.1.2 It is desirable to make priority seats available for senior citizens, handicapped people, pregnant women and people with little children. The priority seats shall be located close to the doorways for easy access.
- 8.1.3 It is desirable to make room for one wheelchair or more in each passenger room.
- 8.1.4 It is desirable to use the common format of information display in guiding signs at stations.
- 8.1.5 It is desirable to consider the train in view of rapidity for long distance commuters. A pattern diagram of rapid and local trains is demonstrated in fig.5 as an example of rapidity.
- 8.1.6 It is desirable to consider the possibility of shortening the headway in prospect of growing demand for commuter transport in the future.

Attached materials:

(Item 8. Recommendations to improve the convenience of users)

1. Guidance display (in passenger rooms)

Indicator of next stop Chime for visually impaired passengers

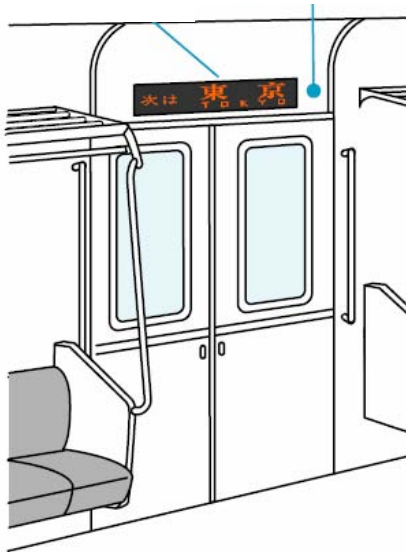


Fig. 8-1 Guidance display (in passenger rooms)

2. *Priority seat*

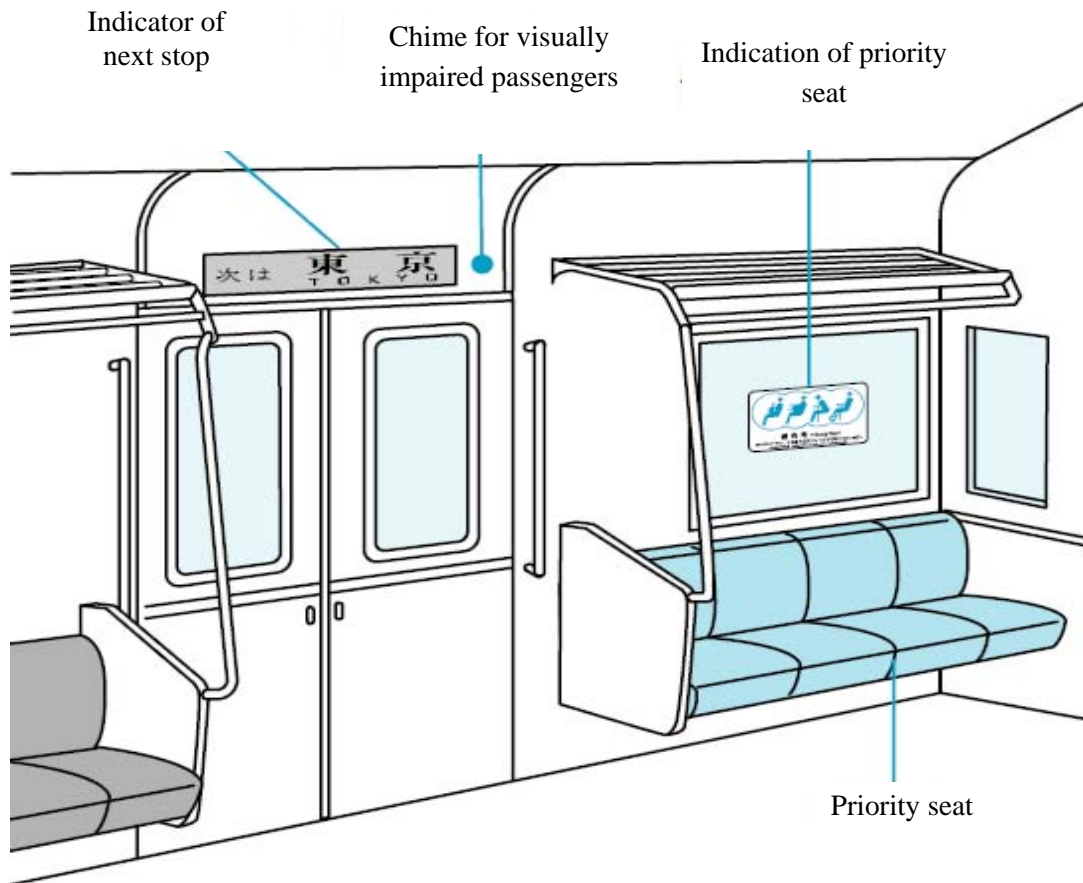


Fig. 8-2 Priority seats

3. Wheelchair space

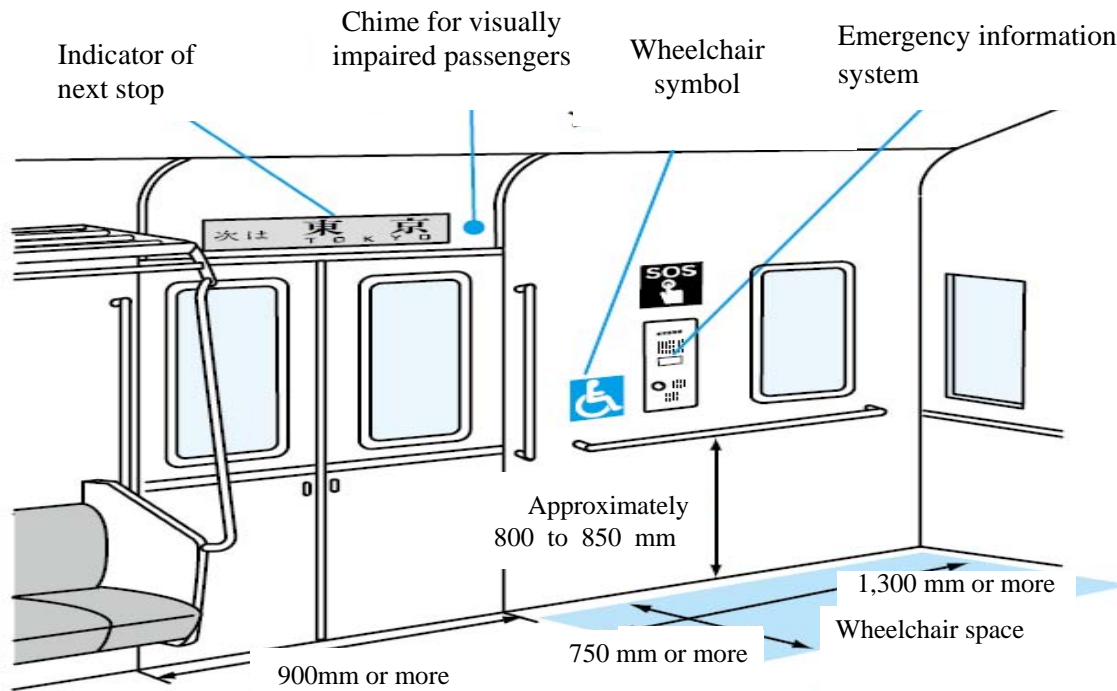


Fig. 8-3 Preparation of a wheelchair space close to doorway

3. Guide signs at stations



Fig. 8-4 Guide signs

5. Train operation diagram

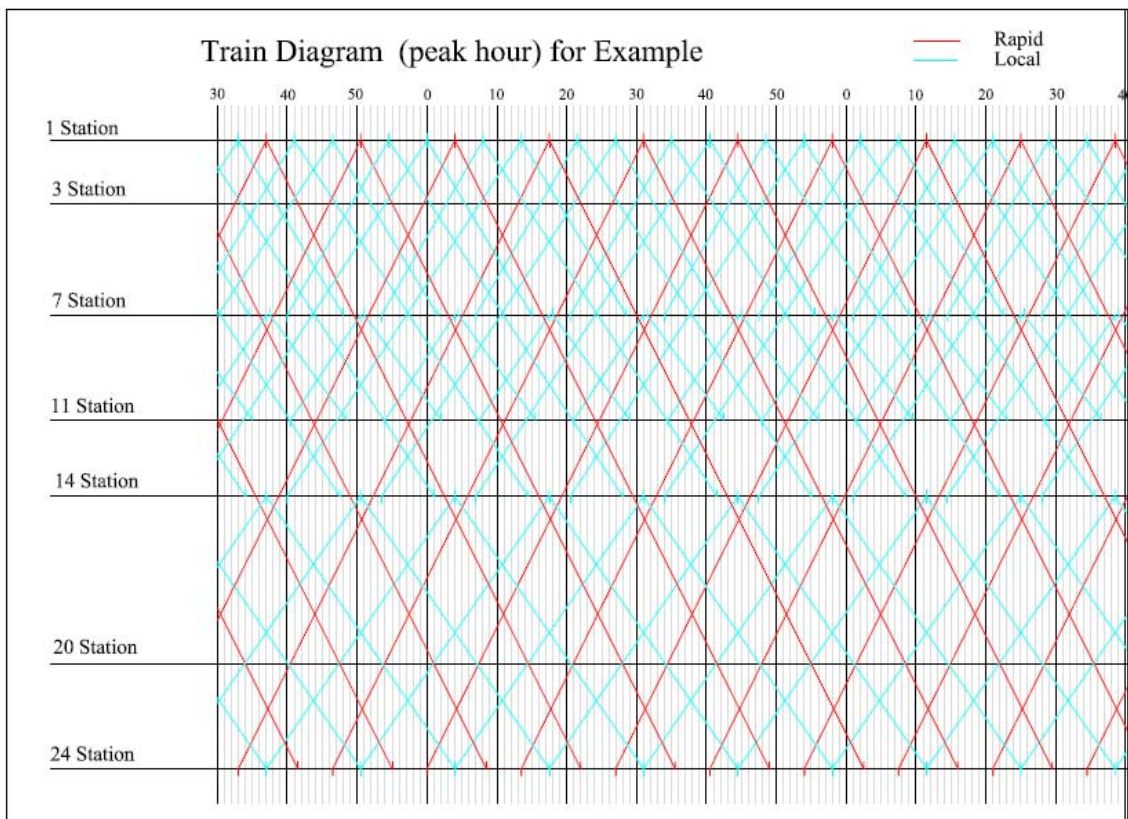


Fig. 8-5 Train operation diagram for peak hour

APPENDIX-1 LEGAL SYSTEM IN VIETNAM

Category	Competent authorities
Constitution	National Assembly
Law	National Assembly
Resolution of National Assembly	National Assembly
Ordinance	National Assembly Standing Committee
Resolution of the National Assembly Standing Committee	National Assembly Standing Committee
Order of the President, Decision by the President	President
Resolution of the Government	Government
Decree by the Government	Government (equivalent to a Ministerial Ordinance)
Decision by the Prime Minister	Government
Instruction by the Prime Minister	Government
Decision by a Minister, Decision by a Head	Ministers, Head of the organizations equivalent to a Ministry and Head of the organizations directly under the Government
Instruction by a Minister, Directive by a Head	Ministers, Head of the organizations equivalent to a Ministry and Head of the organizations directly under the Government
Circular by a Minister	Ministers, Head of the organizations equivalent to a Ministry and Head of the organizations directly under the Government
Resolution at the Supreme People's Court Judge Conference	Supreme People's Court
Decision, Instruction and Circular by the Head of the Supreme People's Court	Supreme People's Court
Decision by Director of the Institute of the Supreme People's Procuracy	Institute of Supreme People's Procuracy
Joint law and norm documents	Ministries, organizations equivalent to a Ministry and directly under the Government
Contact Information between the Supreme People's Court, Institute of Supreme People's Procuracy, Ministries, organizations equivalent to a Ministry and directly under the Government	Supreme People's Court, Institute of Supreme People's Procuracy, Ministries, organizations equivalent to a Ministry and directly under the Government
Joint resolution of the agreement and contact information between governmental authorities, political and social organizations	Ministries, Governmental organizations, political and social organizations
Resolution by the People's Council, Decision and Instruction by the People's Committee	Resolution by the People's Council, People's Committee

APPENDEX-2

VIETNAM RAILWAY LAW (35/2005/QH11)

NATIONAL ASSEMBLY Law No: 35/2005/QH11	SOCIALIST REPUBLIC OF VIETNAM Independence – Freedom - Happiness
---	---

VIETNAM RAILWAY LAW

Pursuant to the 1992 Constitution of the Socialist Republic of Vietnam, which was amended and supplemented under Resolution No.51/2001/QH10 of December 25, 2001 of the Xth National Assembly, the 10th session;
This Law prescribes railway activities.

Chapter 1

General Provisions

Article 1. - Scope of regulation

Vietnam Railway Law regulates planning, investment, construction and protection of railway infrastructure, railway traffic means; rights and obligations of organisations and individuals in railway transport activities; traffic regulations and signals, and ensuring security and safety of railway transport; railway business.

Article 2. - Subjects of application

1. This Law shall apply to local and foreign organisations as well as individuals engaged in railway activities in the territory of the Socialist Republic of Vietnam;
2. Where international treaties which the Socialist Republic of Vietnam has signed or acceded to contain different provisions, the provisions of such international treaties shall apply.

Article 3. - Definition of terms and phrases

In this Law, the terms and phrases below shall be construed as follows:

1. *Cargo luggage* means goods, cargoes of passenger delivered for carriage in any passenger train in which the consignor does not travel.
2. *Common bridges* are those with bridge surfaces are commonly used for both railway transport and land road transport vehicles;
3. *Train operation* means the activities to operate the movement of railway traffic means;
4. *Possessions* mean evidences for railway transport vehicles to move into the station-to-station sections. Possessions include colour signals, semaphore signals, line cards, licenses, line notes.
5. *Load pass* means the regulations on maximum load per axle and load per average length meter on specific route, station-to-station section or depot-to-depot.
6. *Speed pass* means the regulations on the maximum speed of railway traffic means on specific route, station-to-station section or depot-to-depot

7. *Railway works* shall be construction works for railway transport purposes, including rail road-beds, upper works, bridges, culverts, tunnels, embankment, retaining walls, stations, water drainage systems, communications and signalling systems, electricity supply systems and other railways works and support facilities;
8. A *crossroad* means a level crossing between railways and land roads, which is built and exploited in accordance with allowance of Ministry of Transport.
9. *Railway station* means a place where the railway traffic means to stop, shunt, overtake, load and unload cargoes, pick up and deliver passenger, carry out technical works and other services. Station comprise works: the tracks of station, buildings of station, plaza, cargo warehouses, station yards, station platforms, fences, service areas and other necessary facilities.
10. *Super-weight* cargoes mean undetectable goods which weights exceed the prescribed loading capacity of the wagon and the route infrastructure.
11. *Super-long* cargoes mean undetectable bale with the actual sizes exceeding the size limits of the locomotives and cars of the corresponding gauges;
12. *Railway activities* means the activities of organizations and individuals in railway planning, development, investment; in ensuring security and safety of railway traffic and other related activities.
13. *Station platform* means the railway works that support the getting on and off the train of passenger and cargoes.
14. *Railway infrastructure* include railway works, railway work protection areas and railway traffic safety corridors
15. *Gauge* means the shortest distance between two inner sides of rails
16. *Depot-to-depot* section means a collection of a number of station-to-station sections and successive stations suitable to railway operation activities;
17. *Station-to-station section* means the railway section linking two adjacent stations, calculating from the station-exit signalling post of one station to the nearest station-entry signalling post of the opposite station;
18. *Level crossing* means the intersection of two or more rail lines on the same level;
19. *Grade crossing* means a place where two or more rail lines intersect on different ground levels;
20. *Railway traffic means* include locomotives, cars, self-propelled wagons and specialized vehicles on rail tracks;
21. *Railway public products and services* mean the products and services, which are necessary for railway transport and cannot be commercially operated in the market mechanism.
22. A *train* means railway traffic mean, formed by a locomotive and cars, single locomotive or self-propelled car and propelling specialized vehicles on rail tracks;
23. *Rail route* includes one or some continuous depot-to-depot sections in one direction from the departure station to the destination station

Article 4. - Basic principles in railway activities

1. Basic principles are to ensure order, safe, smooth, exact and efficient railway transport activities; to

contribute to the social-economic development and ensure the national security, defence and environment protection.

2. Railway shall be developed in accordance with planning, plans and modern and synchronously between infrastructure, other transportation means and sources, integrated with other transport modes.
3. The railway transport shall be centrally and united controlled.
4. There shall be clear delimitation of state management of state authorities and business management of enterprises; railway infrastructure business and railway operation on the State financed railway network.

Article 5. - Policies on railway development

1. The State shall focus on the development investment of national and urban railway infrastructure with modern orientation.
2. The State shall encourage domestic and foreign individuals and organisations participating in investment and exploitation of railway infrastructure, railway operation, in public tender for railway public products and services.
3. The State shall ensure fair and non-discriminatory competition environment; protect the legitimate rights and interests for organisations and individuals of all economic sectors to invest in railway development and railway business.
4. The State encourages research and application of advanced technology and train of experts in order to develop a modern railway system.

Article 6. - Master plan for railway development

1. Master plan for railway development create the ground for developing detailed professional plans, investment and construction orientation, synchronized and united development of national railway traffic network; and creating conditions for exploitation of current potentials and improving railway's capacity.
2. Master plan for railway development shall be developed basing on socio – economic development strategy; meet the requirements of ensuring national defence and security; closely comply with master plan for other transport means development.
3. Master plan for railway development contain infrastructure development, traffic means, human resource training, science and technology, industry and support service network in railway sector.
4. Minister of Transport shall organize the development of master plan and submit to Prime Minister for approval.

Article 7. – Responsibility of state management over railway activities of the Government, ministries, ministerial level agencies, government-attached agencies.

1. The Government shall perform the uniform State management over railway communications and transport.
2. The Ministry of Communications and Transport is answerable to the Government for the performance of State management over railway communications and transport.
3. The Ministry of Public Security shall have to assume the prime responsibility for, and coordinate with the Ministry of Transport, people committees of provinces, central cities

(hereafter called provincial people committees) and relevant ministries and branches in applying measures to ensure social safety in railway communications and organizing police force to control, handle with violating activities toward people and means participating in railway transportation; reckon up and supply statistics on railway accidents.

4. The Ministry of Natural Resources and Environment shall assume the prime responsibility for, and coordinate with the Ministry of Transport in, managing the exploitation of natural resources inside and outside the railway land, surroundings of railway works protection corridor which affects the safety of railway works and/or railway traffic safety.

5. The Ministry of Industry shall have the responsibility to ensure the priority in supplying stable electricity sources for draught forces of electrified railways and railway communication and signaling systems.

6. The ministries, the ministerial-level agencies and the Government-attached agencies shall, within the scope of their respective tasks and powers, have the responsibility to coordinate with the Ministry of Transport in performing the State management over railway communications and transport.

Article 8. - Responsibilities for State management over railway of provincial people committees

1. To organize, direct the implementation of railway law and measures protecting railway infrastructure, protect railway traffic safety corridors; organise rescue operation, and settlement of consequences of railway traffic accidents occurred in their respective localities

2. To work out and organize the implementation of urban railroads development plans of localities.

3. To ensure railway traffic order and safety; to examine and handle violations of railway legislation in their respective localities;

Article 9. - Railway traffic inspectorate

1. Railway traffic inspectorate belongs to Inspectorate of Ministry of Transport taking responsibility for professional inspection of railway activities;

2. The organization, functions, responsibilities and rights of railway traffic Inspectorate shall be subject to the legal regulations on inspection.

Article 10 Propagating, disseminating and educating in railway communications and transport legislation

1. Railway organisations shall have the responsibility to propagate the railway communications and traffic legislation to all people, civil servants and staffs under their respective management; coordinate with local authorities where railways pass by to propagate the people to obey the railway law.

2. Local authorities have the responsibility to propagate, disseminate and educate railway traffic legislation to all people under their respective management.

3. The information and propagation agencies shall have the responsibility to propagate and disseminate the railway traffic legislation regularly and widely to the entire population.

4. Education agencies shall have the responsibility to direct the education of railway traffic legislation in legal education centres.

5. Vietnam Fatherland front and members of organisations shall have the responsibility to co-ordinate with agencies and local authorities in propagating and disseminating the people to follow and implement the railway traffic legislation.

Article 11. - Responsibilities of individuals and organisations when railway traffic accidents occur

1. Upon the occurrence of railway traffic accidents, the train divers or other railway staff on train must urgently stop the train. The train master takes the responsibility for organize railway staffs on the train and people present at the places to rescue the victims, protect the properties of the State and the victims, and immediately thereon inform railway traffic controlling agencies, the nearest police offices or People's Committees and implement the following tasks:

a) To make records of the accidents and supply information related to the accidents on requirement of competent bodies if the trains and tracks are damaged,

b) To send people representing for the train master to stay and work with relevant authorities after having made the report of the accident and continue to run the train, if the trains and tracks are not damaged.

2. Other transport means drivers, when travelling through places where the railway accidents occur, must carry victims to emergency treatment, excluding vehicles performing urgent tasks.

3. Police offices and relevant individuals and authorities, upon receiving reports on accidents, shall have the responsibility to immediately come to the scenes for settlement

4. The People's Committees of all level where accidents occur shall have to co-ordinate with the police offices and railway enterprises in rescuing the victims, protecting their properties. In cases where human deaths cannot be identified, have no relatives or their relatives cannot afford the burials, the People's Committees shall have to organize the burial thereof.

5. All organisations and individuals must not obstruct the restoration of railways and normal railway traffic operation after the accidents.

Article 12. - Prohibited acts

1. Destroying railway works and railway traffic means.

2. Encroaching upon railway traffic safety corridors and Railway works protection areas

3. Opening crossroads, overpasses, tunnels and culverts across railways without permission;

4. Removing or falsifying railway constructions, facilities and fixed railway signals without permission;

5. Hanging objects that cover or make change of the railway signals.

6. Blocking the train running, giving signals or using equipment to stop trains without permission; except the case of recognizing incidents menacing the safety of railway traffic.

7. moving over crossroad's fence, cross the crossroad when red light is on, surpass fence between railway and surrounding areas

8. Pouring hazardous substances or putting obstacles, construction wastes on railways, putting inflammable, explosive substances within the Railway works protection areas.

9. Tending cattle and holding marketplaces on railways and within the railway traffic safety corridors.

10. Walking, standing, lying or sitting on railways, on roofs of cars or locomotives; clinging to sides of cars or locomotives or the couplings between carriages or between the locomotives and carriages; standing or sitting on couplings or stairs of cars while trains are running, excluding authorized persons performing their duties;
11. Walking, standing, lying or sitting on the track, except railway staffs, polices on their working shift.
12. Throwing earth, rock or other things onto or from trains;
13. Carrying cargoes, which are forbidden to transport, animal with epidemic diseases and radioactive, inflammable, explosive substances, and wide animal into railway stations or onboard trains;
15. Transporting cargoes which are not allow to circulate and, illegal transport of wild animals,
16. Forging tickets, speculating tickets
17. Operating train over regulated speed.
18. Persons directly participating in train operation, when performing their tasks, their alcoholic contents exceed 80 mg/ 100 ml of blood or 40 mg/per litre of breathing air.
19. Make corrupt use of competences, which extort, annoy the implementation of tasks; make or allow acts violating railway law.
20. Other actions against the railway legislations.

Chapter

Railway Infrastructure

Section 1

Planning, Investment and Construction of Railway Infrastructure

Article 13. - Vietnam's railway system

1. Vietnam's railway system includes
 - a/ National railways serve the common transport demands of the whole country and economic regions and international transport;
 - b/ Urban railways serve the daily passenger transport demands in cities and sub-urban;
 - c/ specialized railways serve the specialized transport demands of organisations, individuals.
2. The Minister of Transport shall publicize the national railways, urban railways and specialized railways integrated into the national railway, and publicize the open –close of routes, sections, and depot-to-depot sections.
3. The provincial/municipal People's Committees shall publicize urban railways of their respective localities.
4. Ministries and provincial people's committee shall publicize exclusive railways, which are not integrated into the national railways.

Article 14. - Railway infrastructure development planning

1. The railway infrastructure development planning must comply with the master development planning approved by Prime Minister, ensure national safety and security

requirements and in accordance with development planning of regions, economic areas other transport branches. National railway infrastructure development planning should be programmed for each period of 10 years and contain the orientation of the following 10 years.

2. The railway infrastructure development planning must comply with the master development planning approved by Prime Minister; in accordance with socio-economic development strategy of each province and in accordance with development planning of other public transport modes. Development planning on urban railway is worked out for periods of 10 years and contains the orientation of the following 10 years.

3. Railway infrastructure development plan must be included in traffic development planning of special cities, 1st grade cities, national sea ports, international airports

Article 15. - Formulate, approve and publicise the railway infrastructure development planning

1. The Ministry of Transport shall assume the responsibility to formulate and submit to the Prime Minister the state and urban railway infrastructure development master plans, to approve the detailed planning of railway infrastructure in each region, key railway transport area in accordance with the approved Master Plan.

2. The Provincial people's Committees shall assume the responsibility to formulate urban railway infrastructure development plans after submitting to people council of the same level for initial approval and then submit to the Minister of Transport for approval.

3. The authority, which approves railway infrastructure development plans regulated at point 1, 2 of this Article, shall have right to amend the plans when necessary

4. Minister of Transport, Presidents of provincial people committees shall assume the responsibility to widely publicize and organize the implementation of land bordering in the site.

Article 16- Finance for railway infrastructure development planning

1. The central state budget shall cover the expenditure for programming, appraising, publicising and setting up landmark for planed area and adjusting national railway infrastructure planning.

2. The local state budget shall cover the expenditure for programming, appraising and setting up landmark for planed area and adjusting urban railways infrastructure planning

3. Except for finance resources regulated in clauses 1, 2 and 3 of this Article, budget for railway infrastructure development can be mobilized from other finance resources as promulgated by the law

4. Ministry of finance, in coordination with Ministry of Transport, Ministry of Construction, promulgates the unit cost for programming, appraising and setting up landmark for planed area and adjusting national and urban railway infrastructure planning.

Article 17- Railway land

1. Railway land means land for construction of railway works, land in railway works protection areas and land in railway traffic safety corridors.

2. Railway land must be used for the approved right purposes and must not be used for other purposes without permission; and be in compliance with provisions of Land Law

3. The concerned local People's Committees shall have the following responsibilities:
 - a) To preside over and co-ordinate with the investor in the implementation of land clearance and arrangement of resettlement.
 - b) To manage planned land for railway.
4. The new construction in planned areas after placing landmark will not be compensated when implementing of land clearance except the construction works that are subject to the article 33 of this law.

Article 18- Investment and construction of railway infrastructure

1. Investment and construction of railway infrastructure is to invest in constructing new infrastructure, improve technology; to upgrade and renew existing infrastructure; to implement electricified solutions, to modernize for signalling and communication system or for infrastructure operation.
2. Investors when constructing railway infrastructure shall obey:
 - a) Approved planning, plans and projects
 - b) Ensure the technical grade-based synchronism
 - c) Ensure the scene and environment protection
3. Investors when constructing national railway infrastructure, urban railway infrastructure should be enjoyed the following preferences:
 - a) Being allocated free tariff lands, which are used for constructing the route. Being rented with the most privilege rate for lands used for constructing other railway infrastructure works.
 - b) Being compensated fully the cost for railway land clearance for construction of railway route.
 - c) Enjoying tax exemption and reduction on importing materials, technologies, technical facilities which domestic companies have not been able to produce in accordance with legal provisions on taxation.
 - d) Other preferences as prescribed by the law
4. Railway works, after being completely constructed, upgraded, renewed, must be pre-acceptance- tested by competent agencies.
5. Ministry of Transport, specialized branch- managing ministries, provincial people committees shall announce the list of projects calling for investment capital in specific periods and list of projects which have licensed in the scope of specific competence authorities.

Article 19. - Railway connection

1. Positions for connection of domestic railway lines must be located at railway stations. The Minister of Transport shall prescribe the order and procedures of licensing the connection of urban railways and specialized railways to national railways.
2. Only national railway shall be allowed to connect to international railways. The Prime Minister shall decide the connection between national railways and international railways.

Article 20. - Railway gauges and technical standards of railways

1. The national railways have the gauges of 1435 mm and 1000 mm. The urban railways have the gauges of 1435 mm or monorail. Specialized railways not integrated into the national railway have the gauges determined by organisations, individuals due to their usage requirements
2. The railways are classified according to different technical grades. The Minister of Transport shall specify the standards of technical grades of railways.

Article 21. - Railway stations

1. Railway station includes:
 - a. Passenger station constitutes a system for receiving and sending passengers, operating services relating to passenger transport and technical services; Passenger station must have facilities supporting the old and the disable.
 - b. Freight station constitutes a system for receiving, sending, loading and unloading, protecting cargos and other operations and services relating to cargos transportation.
 - c. Technical station means a system for operating technical services of locomotive and wagon supporting train operation;
 - d. Mixed station is a station meeting all conditions regulated at item a, b and c of this clause.
2. Railway stations should have names, duplicate name is not allowed. At stations which have several lines for receiving and sending passengers, there should be boards of platform name indicating direction of train. Rail tracks within stations must have clear code, duplicate code is not allowed.
3. Stations must be equipped properly emergency exists; fire fighting facilities and tools which are always read for use; lighting, ventilation and environmental sanitation systems.
4. The Minister of Transport shall prescribe the technical procedures of exploitation and technical standards of railway stations and publicize the opening and closing of railway stations.

Article 22. - Works, facilities and fixed signals on railways

1. Works, facilities and fixed signals on railways include:
 - a) Signal posts, signal lamps;
 - b) Signboards, sign markers;
 - c) Signs;
 - d) Barricades, barriers;
 - e) Boundary markers;
 - f) Other signals.
2. Works, facilities and fixed signals on railways must be adequately constructed and installed for the respective railway technical grades and types; and must be regularly tested and maintained in safe working conditions.

Article 23. - Railways intersections and intersections between land roads and railways

1. Newly constructed railways must intersect at different levels, excluding where specialized railways intersect other specialized railways.
2. The construction of intersection between land roads and railways must be organized at different ground levels in the following cases where:
 - a/ Railways which have the designed speed of at least 160km/h intersect land roads.

b/ Railways intersect land roads of grade III or higher grades and urban roads

c/ Urban railways intersect land roads, excluding tram line.

3. When building new railways, the investors in the construction of railways works shall have to build the intersections in accordance with the clause 1 and 2 of this article; when building new land roads, the investors in the construction of land roads shall have to build the intersections in accordance with the clause 2 of this article.

4. Other cases which do not subject to the regulations in Clause 2 of this Article and when do not have sufficient conditions for grade crossings, Ministry of Transport, people committees of all levels, investors or individuals, organizations wanting to cross the railways must obey the following regulations:

a) At places where the construction of level crossings is allowed, regulations of Minister of Transport shall be obeyed.

b) At places where the construction of level crossings is not allowed, collection roads shall be constructed outside the railway traffic safety corridors in order to lead to the nearest crossings or different level intersections

Article 24. - Railways and land roads run in parallel

1. For railway and newly built land road sections running in parallel, a distance not smaller than the maximum value of the railway traffic safety corridor or land road traffic safety corridor must be ensured between them. If this regulation cannot be followed due to topography reasons, the protective works separating the railways from the land roads must be built on the land roadsides close to the railway, excluding the case that the rail tracks are at least 3 meter above the road surface.

2. Where the rail road and land road run in vertically parallel at different ground levels, the vertical distance between the top of the lower one and the lowest point of the higher one must legally ensure the clearance space of the lower one.

Section 2

Protection of Railway Infrastructures

Article 25. -Protection of railway infrastructures

The protection of railway infrastructure covers activities of ensuring safety and lifetime of railway works; measures to prevent, handle acts of God, accidents; prevent, stop and handle acts of infringing upon railway works, railway works protection area and railway traffic safety corridors.

Article 26. - Railway works protection scope,

The railway works protection scope includes:

- 1) *Railway protection scope*
- 2) *Railway bridge protection scope*
- 3) *Railway tunnel protection scope*
- 4) *Railway station protection scope*
- 5) *Railway communication, signalling and electric works protection scope*
- 6) *Underground protection scope*

Article 27. - Railway protection scope

The railway protection scope includes land along the road, the space above and under roadbed and is regulated as follow:

1. Protection scope for space above of roadbed measuring from the top track in vertical direction is 5.3m for gauge 1,000 mm and 6.55m for standard gauge of 1.435mm. The distance between the railway line and the electricity transmission line over crossing the railway line is subject to the Law on Electricity.

2. Protection scope for land along railways is:

a) For non-embanked or non-dug roadbeds, it is 7 m measuring from the outer edge of the outmost rail outwards;

b) For embanked roadbeds, it is 5 m from the foot of the roadbed or 3 m from the outer edge foot of the horizontal sewage ditch outwards;

c) For dug roadbeds, it is 5 m from the top edge of dug road or 3 m from the outer edge or top sewage ditch outwards.

3. Protection scope for under roadbed is stipulated at Article 32 of this Law

Article 28. - Railway bridge protection scope

1. The scope of railway bridge protection covers the bridge and the aerial space, land areas and land area with water around the bridge.

2. The vertical overhead protection limit of the bridge is 2m from the highest point of the bridge structure upwards. If the bridge has handrail only, the vertical overhead protection shall not be shorter than the limited height stipulated in Clause 1 of this article 27.

3. The lengthwise protection limit of the bridge shall be as follows:

a) For bridges with protection signal posts, it is calculated from the protection signal post on one end of the bridge to the protection signal post on the other end of the bridge;

b) For bridges having no protection signal posts, it is calculated from the end of the abutment on one end of the bridge to the end of the other abutment plus 50m to each end of the bridge.

4. The breadth wise protection limit shall be as follows

a) For bridges inside cities, urban centres, it is 5m from the outer edge of the outmost handrail to each side of the bridge;

b) For bridges inside cities with over 20 m long and bridges outside cities, urban centres, it is 20m from the outmost edge of the bridge structure outwards to each side of the bridge, for bridges of under 20 m long; 50 m for bridges of between 20m and under 60m long; 100 m for bridges of between 60m and under 300m long; 150m for bridges of over 300m long.

Article 29. - Railway tunnel protection scope

The railway tunnel protection scope covers the tunnel and the land areas as well as aerial space around the tunnel, 50m from the outmost point of the tunnel structure outwards. In special case, when the tunnel protection scope does not meet this provisions, special technical measures are necessary for safety and must be approved by the Minister of Transport.

Article 30. - Protection scope of railway station areas

The protection scope of a railway station area shall cover fences, boundary markers, land areas within the fence walls of the station or inside the boundary markers and the area from

outside the protection scope of the station-entry signal post on one end of the station to outside the protection scope of the station-entry signal post on the other end of the station

Article 31. - Protection scope of railway communications, signalling and electric supplying works

The railway communications and signalling works protection scope covers the entire works and the aerial space and land areas around such works as follows:

1. The railway communications, signalling and electric supplying post protection scope shall be 3.5m counting from the hearts of the post outwards.
2. The railway communications, signal and electric line protection scope shall be 2.5m from the outmost wire lines outwards along the horizontal and vertical directions.

Article 32. – Protection scope of under roadbed

Minister of Transport decides protection scope of under roadbed of railway works when there are works constructed under railway works.

Article 33. - Construction and activities within railway works protection areas

1. The following works and activities when have to be constructed or operated within protection scope must be licensed as provisions promulgated by the Minister of Transport.
2. Investor or organisation, individual executing the works or operating other activities within protection area shall obey the following regulations:
 - a) Have opinion of railway infrastructure management enterprise in written form when preparing projects; operating other activities
 - b) Have measures ensuring safety of railway works and railway transport approved in written form by railway infrastructure management enterprise before executing works or operating other activities
 - c) When finishing the works or other activities, impediments created by the construction of railway works or operation of activities which possibly affect safety of railway works, railway transportation should be eliminated; handling construction completion documents to the infrastructure management enterprise;
3. The investors, individuals and organization that operate other activities within protection area shall compensate for damages caused to railway works and safety of railway transportation in accordance with laws.

Article 34. - Project construction, natural resource exploitation and activities nearby railway works protection areas

1. The project construction, natural resource exploitation and implementation of other activities nearby the railway work protection area shall still have to ensure safety of railway infrastructures and railway traffic safety corridors.
2. In case the construction, exploitation of natural resources and implementation of other activities may affect the safety of the railway works and railway transport, the investor of the construction works, organisations or individuals who exploit the natural resources and implement other activities, must apply necessary safety protection measures for the railway works and railway transport.

3. Investor of construction works, organisation, individual executing natural resource exploitation and other activities shall compensate for damages of their fault to railway works and safety of railway transportation.

Article 35. - Railway traffic safety corridors

1. The railway traffic safety corridor limits are specified as follows:

a) The limited overhead height from the rail top upward along to the vertical direction shall be stipulated in clause 1 of article 27 of this law.

b) The width to both sides of the railways, calculating from the outmost edge of the roadbed to each side and the top edge of embarked railroad and the outmost edge of non-embarked, non-dug railroad shall be 15m for railways in the station-to-station sections; 2m for railways in railway stations, ports, within fence walls of enterprises.

2. In the area of intersection between railways and land roads, the railway traffic safety corridors shall be regulated according to the grade of the crossroad in order to ensure the vision of traffic participants.

3. In the area of railway traffic safety corridor, it is allowed to plan only plants which are not higher than 1,5m and must be at least 2m away from the outmost edge of the rail, at least 5 m away from left side of dug lines or 3m from outmost edge of vertical sewage ditch of line or upper sewage ditch

4. Minister of Transport shall prescribe in detailed the railway traffic safety corridor at crossroad areas, urban railroads.

Article 36. - Responsibility to protect the railway infrastructures

1. Railway infrastructure enterprise shall have to frequently examine, repair and maintain railway works to ensure the safe and smooth railway transport.

2. Organisations and individuals who use the infrastructure for railway operation shall have the responsibility to follow the safety regulations on railway infrastructure.

3. The People Committees at all levels in the areas where railways cross have the responsibility to organize propaganda and education activities on the people to protect railway infrastructure, organize prevention activities and properly solutions against acts of infringing upon railway infrastructure and railway traffic safety corridors.

4. All organisations and individuals shall have the responsibility and obligation to protect the safety of railway works and railway traffic safety corridors, and participate in rescue activities when railway works are damaged. When discovering damaged railway works or acts of infringing upon railway infrastructure, organisation or individual shall immediately inform the people committees, railway infrastructure enterprise or the nearest police stations. The people receiving the information shall carry out necessary activities in order to ensure the safety of railway transport.

5. For railway works of special importance, the Ministry of Transport shall co-ordinate with the Ministry of Public Security and/or the Ministry of Defence in organizing the protection thereof.

6. Any acts of infringing upon railway works and railway safety corridors shall be timely discovered and settled strictly and clearly in accordance with legal provisions

Article 37: Prevention, handling with incidents, acts of God, accidents to railway infrastructure

1. Railway infrastructure enterprise shall assume the responsibility to preside, in co-ordination with people committees of locals where railways cross and related organizations, individuals, over the prevention and handling with incidents, acts of God and railway transport accidents.
2. When incidents, accidents or acts of God occur damaging railway infrastructure, railway infrastructure enterprise shall assume the responsibility to properly organize measures to deal with consequences, recover traffic of the routes, recover railway infrastructure ensuring technical and safety standards and environment protection.
3. In cases incidents, accidents block railway traffic, railway traffic controlling organization shall assume the right to mobilize all facilities, materials, human sources and preside over, in coordination with local people committee where incidents occur, organization of handling consequences, recovering transport on the route. Organizations, individuals who are mobilized should obey and be compensated.
4. Organizations, individuals causing incidents, accidents must properly cover costs for the recovery of incidents, accidents, compensate for damages and shall be judged as provisions of law.

Chapter III
Railway traffic means

Article 38: Conditions for operation of railway traffic means

Railway traffic means, when being put into operation, must have ownership registration certificate; valid inspection certificates of satisfaction of the quality, technical safety and environmental protection standards.

Article 39: Registration of railway traffic means

1. Railway traffic means with the following conditions shall be granted registration papers:
 - a) Lawful origins
 - b) Satisfaction of Technical safety and environmental protection standards.
2. Railway traffic means must be re-registered upon the change of their utility properties or the change of their main technical parameters
3. Upon the transfer of their ownership, the new owner has to submit legal transfer documents, in-force certificate of technical and environmental satisfaction in order to re-register the ownership.
4. Railway traffic means owners must make declaration for deletion of names and have their registration papers withdrawn in the following cases:
 - a) Their railway traffic means are no longer used for railway traffic.
 - b) Their railway traffic means are lost or damaged
 - c) Their railway traffic means are changed in ownership
5. The Minister of Transport shall prescribe the registration regulation for railway traffic means.

Article 40. - Inspection of railway traffic means

1. The railway traffic means being manufactured, assembled in Vietnam must be in conformity with the design that has been approved in term of quality, technical safety and environmental satisfaction by Vietnam Registration agency or foreign registration agencies authorised by Vietnam Registration agency.
2. Railway traffic means under process of manufacturing, assembling or after being transformed, restored must be monitored in term of quality, technical and environmental satisfaction by Vietnam Registration agency or foreign registration agencies authorised by Vietnam Registration agency .
3. Railway traffic means being in the course of exploitation must be periodically inspected and granted certificates of satisfaction of quality, technical safety and environmental protection standards by the registries.
4. Railway traffic means owners shall have to repair and maintain their means to ensure the quality, technical safety and environmental protection standards between two periods of inspection by the registries.
5. When conducting the inspection, railway traffic means registries must comply with the process and standards of Vietnam and standards of the industry. The heads of the registries and the persons directly performing the inspection must bear responsibility for the inspection results.
6. The Minister of Transport shall prescribe quality, safety technical and environmental protection standards of vehicle; prescribe standards and the unified implementations of organizing the inspection of railway traffic means.

Article 41: Necessary information and instruction on rail traffic means

1. On railway traffic means, there should have the sign of Vietnam Railways, sign of the owners, place and year of installation, name of management enterprise, size, axle load, dead weight, load weight, code and type, capacity and force transmission type.
2. In addition to regulation at Clause 1, for passenger cars, there shall be instruction boards or communication means that instruct and inform passenger about train route and name of station along train lines, train running speed, solutions when fire or accident happens, train rules.
3. Information and instructions shall be clear, understandable; information boards shall be at the position that is easy to recognize and read.

Article 42. Braking equipment, linking hook

1. Railway traffic means should have automatic braking equipment, manual brakes. Brakes shall always be checked to ensure that they are in good conditions, at high safety level and easy to use.
2. In all passenger cars and at train master's working place, there shall have emergency brake valve. Emergency brake valve should be periodly inspected and sealed.
3. In some passenger cars and at train master's working place, pressure meter must be installed.
4. Linking hook between locomotives and wagons should be installed with right types suitable with each model and type of locomotive and wagon.

Article 43: Equipments on railway traffic means

1. Railway traffic means shall be equipped with rescue hammer, fire fighting tools and materials, first-aid facilities and medicines, choke, tools and materials for simple repair, portable signals.
2. On locomotive, self-propelled wagons and railway specialized self-propelled means, there shall be speed meter, speed and other information recording equipment (black-box), warning equipment for driver. At the train captain's working place, there shall have speedometer and communication with the train driver.
3. On passenger cars there shall be lights, ventilation, cooling equipment, and equipment supporting the disable, sanitary facilities except of urban train.

Article 44. Railway traffic means that are temporary terminated to operate

1. Railway traffic means shall be temporary terminated to operate in the following cases:
 - a) Inspection certificates expire
 - b) Railway traffic means do not meet the technical and safety standards
2. The movement of broken railway traffic means, newly imported railway traffic means and railway traffic means under test operation to workshops shall be in accordance with railway process and standards.

Article 45. - Import of railway traffic vehicles

Imported railway traffic means must be in conformity with the Vietnamese railway technical standards; have the quality, technical safety and environmental protection standards certificate issued by Vietnam Registration Authority or foreign registration agencies accepted by the Vietnam Registration Authority. Import of railway traffic means shall be done in accordance with laws.

Chapter IV

Railwaymen directly participating in railway transport

Article 46. - Conditions for persons directly participating in railway transport

1. The persons directly participating in train operation include:
 - a) Train captains;
 - b) Train drivers; Train assistant- drivers
 - c) Train running controllers (dispatchers);
 - d) Direct station train operators
 - e) Chief shunters;
 - i) Switchmen;
 - j) Couplers;
 - k) Railway, bridge and tunnel patrollers;
 - l) Crossroad, common bridge, tunnel guards;
2. The direct participants in railway transport as prescribed in clause 1 of this Article, while being on duty, must fully satisfy the following conditions:

- a) Possessing suitable professional-practice licenses, certificates issued by the training institutions accepted by Ministry of Transport.
 - b) Being given periodical health examinations in accordance with regulations by the Health Ministry.
 - c) For train driver, apart from the conditions prescribed in Clause 2 of this article, must possess train driving license.
3. During performance, direct participants in train operation shall have the following responsibilities:
- a) To fulfil all tasks as stipulated in the respective title, in accordance with codes and standards.
 - b) To absolutely obey train operation commands, regulations and guidelines of the managers.
 - c) To wear right uniform, insignia, title and nameplate as regulated.
4. Minister of Transport shall prescribe the content, training curricular, conditions of training institutions; the criteria for the train titles stipulated in this Clause 1; content, examination process and organization of issuing, renewing and withdrawing train driving license.

Article 47- Train driving license

- 1/. Train driving license is the certificate issued to the person who directly drives the railway traffic means.
- 2/. The person who owes the certificate shall be only allowed to drive the types of railway traffic means that are specified in the driving license.
- 3/. The applicant for the train-driving license must fulfil the following conditions:
 - a) Being at age range from full 23 to 55 years old for men, and from full 23 to 50 years old for women; holding health certificate
 - b) Having professional graduation certificate on driving the railway traffic means issued by training institutions.
 - c) Having continuous working period, not less than 24 months as driving assistant.
 - d) Successfully passing the exam of driving such types of railway traffic means as specified in his intended driving license

Article 48: Train captains

1. Train captain is the person with highest power on block train, responsible for ensuring safety, security and order; serving customer; operating the train as schedule and commands of train operators, in accordance with procedures and standards of railway traffic; handling with railway traffic accident as regulated at Article 11 of this Law
2. During train itinerary, train captains are entitled to temporally hold in custody persons committing criminal acts, violating orders and safety on the train in accordance with provisions of law and have to pass that person to station masters or polices, local authorities when train stop at the nearest station.
3. In urgent case of ensuring train safety, train captain has the right to give necessary orders toward passenger on the train and has to report immediately to the railway line train operators or the nearest station about the urgent situations.

4. Train captain can refuse to operate train, if it seems to be not enough safety for operating the train; refuse to receive staff working on the train that are lack of professional skill and health, temporarily stop the job of staff who have acts violating rules during their performance on the train. The train captain must report to competent levels for decision when executing the refusal right as stipulated at this clause.
5. Train captain is responsible for making report with the present of 2 witnesses about birth, death, injury occurred on the train; train captain can command stopping the train at where is most convenient for emergency activity and has to pass that person along with his/her property, related document to station master, hospital, police, local authority.
6. Before and during train operation, train captain is responsible for carrying out inspection to ensure that trains meet needed safety conditions and other issues related to safety of traffic means and people.
7. Making diary, reports, documents related to train path.
8. In case of having many trains on a mixed train the captain of the last train shall be responsible as the train captain of the mixed train.

Article 49. Train drivers & Train assistant- drivers

1. Train driver is the person directly control the train, responsible for safely operating locomotive , at the right speed, right path as describes in timetable, in accordance with train running command, law provisions, procedure and standard issued by competent agency; handling with railway transport accident as regulated at Article 11 of this Law.
2. Driver shall only be entitle to direct the train if he has train driving license.
3. Train driver can refuse to operate locomotive, if it seems to be not safe enough for operation and report immediately to competent agency for decision.
4. Before operating the train, train driver is responsible for checking and confirming possessions allowing occupying the station-to-station depot, clearly identifying signals of train captain and of direct railway station operators.
5. When operating the train, train driver is responsible for checking technical situation of locomotive and other issues relating to safety of locomotive, safety of train operation as regulated.
6. When performing assigned tasks, train driver and train- assistant driver must be of sound mind to follow and implement exactly the instructions of signs, signing boards, signing posts along the route, observe situations of line and bridge and signals.
7. When operating the train, train driver must check affect of automatic brake in accordance with process and standard, especially in case train climbs or goes down a high and long slope
8. Train assistant driver is the person assisting train driver during train driving process, monitoring train speed and observing signals in order to timely inform the train drivers for solutions.

Article 50. Train running controller (dispatcher)

Train running controller means the person who directly commands the train operation in accordance with the timetable in his assigned route, depot-to-depot section; directly orders to organize rescue trains when incidents occur; commands to block station-to-station section,

gives speed warning commands to concerned units; commands to temporally terminate the operation of train if it seems to be not safety for train operation.

Article 51. Direct railway station train controller

1. *Direct station train controller* mean the persons controlling the establishment of train , freight loading and unloading, passenger services, shunting activities, train receiving and sending, and other related activities in stations in accordance with time table, train operation commands, railway codes and procedure, and participating in handling railway incidents accordance with the article 11 of this law.

2. Direct station train controller can refuse the operation of train, if it seems to be not safe enough and must inform immediately train running controller.

3. Direct station *train controller* take responsibility for controlling needed safety conditions in accordance with regulations on technical standards, professional standards, and other issues relating to safety for transport means, facilities, freight and people during their missions .

Article 50. Switch man

1. Switch man means the person under direct management of direct station train *controllers* managing, controlling, using switch for organisation of train operation in accordance with time table, train operation commands, procedure and detailed technical management rules of stations.

2. Switch man takes responsibility for controlling safety conditions in accordance with regulations on technical standards, professional standards, and other issues relating to safety of train operation during performance of tasks.

Article 53. Chief shunter, coupler

1. Chief shunter means the person, under management of direct station train operators, organizing and implementing wagon- locomotive shunting activities to support organisation of train operation, freight loading/ unloading, passenger services at stations in conformity with train operation commands, procedure and detailed technical management rules of stations.

2. Couplers mean the person under direct management and command of shunting men to implement locomotive, wagon shunting, coupling activities in accordance with process and procedure and detailed technical management rules of stations

3. Chief shunter and coupler take responsibility for controlling safety conditions in accordance with regulations on technical standards, professional standards, and other issues relating to safety during performance of tasks.

Article 54. Railway, bridge, tunnel patrollers; tunnel guards, crossroads and common bridge guards

1. Railway, bridge, tunnel patrollers, tunnel guards shall assume the following responsibilities:

a. Frequently control, monitor and properly detect failure, obstacle and have solution to ensure safe train operation within patrolling section; make record into patrolling note book and report to authority level as regulated.

- b. To repair, timely solve small failures, obstacles; participate in bridge, tunnel, and railroad maintenance as assigned.
 - c. To timely protect, stop train when failure, obstacle occurs menacing railway transport safety, to participate in protection of railway infrastructure and railway traffic means running within managing, guarding area.
2. Crossroad, common bridges guards shall take the following responsibilities:
- a. to timely close and open barrier ensures safety for people and transport means participating in road transport when railway traffic vehicles running over crossroad.
 - b. to directly check, maintain, use facilities, works and crossroad tools as regulations on technical standards and codes, professional procedures.

Chapter V

Urban Railway

Article 55. Urban railway types

- 1. Urban railway includes underground metro, light railway, monorail with automatic direction, tram operating.
- 2. Urban railway system is invested, constructed, managed and exploited by the provincial people committees.

Article 56. Urban railway development policies

- 1. The state shall attract all resources to develop urban railway system as one of key transport modes in big cities.
- 2. Provincial people committees propose policy on construction, special priorities in order to attract all resources to construction and exploration of urban railway.
- 3. The organizations and individuals who invested in construction of urban railway systems shall enjoy the following priorities:
 - a) to enjoy priorities as regulated at Clause 3 Article 18 of this Law.
 - b) The Government shall support partially the total investment for approved urban railway projects financed by State Budget.
- 4. Every year, the Government shall extract an amount from the State Budget to support expenses for public transport services in cities including urban railway transport.

Article 57. Conditions for investment project formulation

- 1/. The formulation of urban railway investment project should meet the following conditions:
 - a. Big cities which meet the socio-economic conditions regulated by the Government.
 - b. Plans for investment in urban railway must be approved by provincial people committees.
 - c. Investment projects must comply with urban transport development planning of provinces, central cities.
 - d. Investors must have sufficient financial sources to develop the urban railway project and ensure the stable, long-term and effective operation of the system after completion.

2. The Government shall stipulate the implementation of clause 3, 4 of the article 56 of this law and conditions for cities and provinces, which shall be allowed to develop urban railways.

Article 58. Basic requirements for construction of urban railway infrastructure.

The construction of urban railway infrastructure should meet the following basic requirements:

1. In accordance with technical standards for urban railway, ensuring the technical quality of the railway works as stipulated by Minister of Transport
2. To ensure the connection to other urban public transport modes and the national railway for easy transit of the passengers.
3. To meet the public passenger transport demand in long term in accordance with the urban development policies.
4. Do not damage urban landscape and be friendly with environment

Article 59. Urban Railway bridge, tunnels, station and stop

1. Bridge pillar lying beside land transport routes or metro tunnel pillars at dangerous position should be strong enough in order to bear crash of traffic means.
2. Urban railway tunnel shall be equipped with fire protection and fighting, be strong enough during fire; ensure the dry condition and avoid flood; have ventilation system, emergency exists and rescue system.
3. Urban railway stations and stops shall have signs and instructions about routes, stations and stop on the route; ensure convenient and safe movement of passengers; have facilities providing information, selling tickets and controlling the passengers getting on and off the train and in and out the station; have emergency telephone, medicine, first aid facilities and reserved electric sources for metro stations.

Article 60. Urban railway infrastructure works protection area and safety corridor

1. Urban railway infrastructure works protection areas and safety corridors should ensure traffic safety for transport vehicles and traffic users and be suitable with urban railway transport mode as well as urban geography and structure.
2. Minister of Transport shall prescribe infrastructure works protection areas and safety corridors for specific urban railway transport mode.

Article 61. Urban railway infrastructure management and maintenance

- 1/. The urban railway enterprise shall be responsible to maintain state financed infrastructure through public tender or public service orders by provincial people's committee
- 2/. Provincial people's committees shall stipulate the management, maintenance of the urban railway infrastructure invested by organisations and individuals.

Article 62. Urban railway operation

1. Urban railway operation is conditional business.
2. Provincial People Committees shall determine price of urban railway ticket. Subsidize to urban railway shall be implemented through contract between the Provincial People Committees and the urban railway operators.

3. Urban railway operators should ensure safety, punctuality and frequency of train operation
4. Urban railway operators should buy civil liability insurance as regulated by Law on Insurance.

Chapter VI
Railway traffic rules and signals
Ensuring railway traffic order and safety

Section 1
Railway traffic rules and signals

Article 63- Railway traffic signals

1. The railway traffic signal system comprises orders of person operating train, colour light signals, semaphore signals, signboards, flares, torches and signals of trains. Signal's display means orders and conditions for train operation and shunting.
2. Orders of person operating train may be expressed by banners, whistles or telephone, lights and hand signals
3. The colour light signals are those that signal the train drivers to operate their trains to enter or exits stations, to get through stations, to stop.
4. Semaphore signals are those that signal the train drivers to operate their trains to enter or exit stations, to get through stations, to stop at places where colour light signals are not yet available.
5. Signal boards are classified into two groups:
 - a) Signal boards providing necessary information for train drivers;
 - b) Signboards and sign markers compelling train drivers to observe.
6. Flares, torches, red lights, and things held and rotated by hand signalling emergency stop.
7. Signals of train, including lamps, whistle, signboard at the end of train and banners.
8. The Minister of Communications and Transport shall prescribe in detail railway traffic signals.

Article 64. Train operation commander

1. At each station-to-station section, train operation shall be under command of one train running controller. Train operation orders of superior shall be through train running controller. Direct station train controller, train captain, train driver shall absolutely obey command of *train running controller*
2. In the area of station, direct station train controller is the commander of train operation. Train captain or train driver shall obey command of direct station *train controller* or display of train operation signals.
3. On the train, train captain is the commander for safe train operation.
4. On the single locomotive, urban train, the driver is the commander.

Article 64. Train running speed

1. Speed shall not be over the speed pass for each route, depot-to-depot section and station-to-station section and the timetable.
2. In any railway section there is warning signs indicating speeds different from speeds regulated in speed pass; train shall run at the lowest speed for safe operation.

Article 65. Establishment of train

1. The establishment of train shall be in accordance with railway technical codes and procedures.
2. Before being installed into a block train, all wagons should pass standard checking.
2. It is not allowed to link into passenger train wagon carrying animals, stink goods; wagon carrying dangerous goods, explosive materials, inflammable materials, toxic and other dangerous goods.

Article 67. - Shunting trains

1. Shunting of train are activities moving locomotives and wagons from this position to other position in the area of station, station-to-station section. The shunting of train shall be done in according to commands of station operators or direct station *train controllers* s.
- 2 Train drivers, during shunting process, must obey the direction of the chief shunters

Article 68. - Driving trains

1. When driving a train, the driver shall follow the below rules:
 - a). When operating train to run from stations, through stations, to stop, give ways or overtake in the stations, train drivers shall obey the orders of direct station *train controllers*.
 - b. Into station-to-station sections only when having possessions,
 - c) Into stations, through stations by colour light signals or semaphore signals and signals of direct station *train controllers*.
 - d) Running the train at the speed stipulated in the article 65 of this law.
 - e) During the operation of the train, the driver and his assistant in their working shift are not allowed to leave the working places.
2. For passenger train, the train shall only be allowed to departure when all passenger doors are closed and the door shall be only opened when the train had stopped at stations.

Article 69- Giving ways, overtaking by train

1. Giving ways or overtaking by train shall only be allowed at stations.
2. Train driver shall operate giving ways or overtaking on the national and specialized railway system on orders of direct station *train controllers*; and on orders of urban railways train operators for giving ways or overtaking on urban railways.

Article 70. – Halting, reversing trains

Train drivers must halt the train when seeing the halting signals; where they realize circumstances jeopardizing the train safety or receiving signal of urgent halting train, they shall be allowed to stop or urgently reverse the train. In case of urgently halting or reversing the train, train master, train driver shall assume the responsibility to inform the station in accordance with regulations on train operation process.

Article 71 - Traffic at crossroads, common bridges, tunnels

1. At crossroads, common bridges and tunnels, the priority right shall belong to trains.
2. Train drivers must blow whistles when travelling through crossroads or switch on light when travelling in tunnels.
3. Land road transport users, when travelling on land road-railroad intersections and common bridges must comply with regulation article 23 of land road transport law.
4. At the crossroads, common bridges with guards, when signal lights are out of order or wrong signal or land road barriers are broken, the crossroad guards and common bridge guards must direct traffic.

Article 72- Obey railway traffic signals

1. The person directly participating in train operation must obey railway traffic signals.
2. Train drivers must abide by signals in order to ensure safety for people and transport means when simultaneously receiving many different signals or unclear signals; where appear signals of direct operators they must abide by the signals of such persons.
3. In case of trams that participate in road traffic, the drivers have to obey the road traffic signals.

Section 2

Ensuring railway transport order and safety

Article 73. – Activities ensuring railway transport order and safety

1. Ensuring railway transport order and safety covers activities:
 - a) Ensuring safety for people, means, property of the State and people in railway transport activities.
 - b) Ensuring the united and centrally control of railway transport in the national and urban railways.
2. All organisations and individuals must follow regulations on ensuring railway transport order and safety of railway legislation.
3. All acts of breaking railway transport order and safety must be detected in time and severely handled according to law.
4. Organisations, individuals participating in railway transport, railway security force, police, and local authorities of all levels in the area where railway cross shall take responsibility to ensure safety, order and security of railway transport.

Article 74 - Railway transport controlling

1. The railway transport controlling shall consist of the following activities:
 - a) To make timetable and path allocation, ensuring non-discrimination among railway operators; publicize the timetable.
 - b) To centrally and united control the train operation, ensuring the safety and smoothness of train operation in according to the published timetable, paths, codes and standards, the management commands.
 - c) To give commands in solving emergent and unforeseen problems in railway transport; to mobilize vehicles, equipment and human resources of rail operators supporting railway

rescue and incidents recovery activities; to participate in analysing reasons of problems and defining measures to avoid the incidents; to request infrastructure operators, railway transport operators to apply measures to prevent incidents, improve quality, reliability, safety of railway transport.

d) to temporarily terminate the traffic in case it seems to be unsafe for the traffic; to adjust time table and train path on each section, route and the whole network to recover the time table after accidents or break-downs.

e) To sign contracts with railway infrastructure operators on using railway infrastructure for railway transport; to sign contracts with railway transport operators on supplying controlling and other services related to railway transport;

g) To gather and classify information related railway transport control activities;

h) To ask the competent state management authority to withdraw the safety certificate of railway business enterprises in case the unit find that the enterprises do not meet requirements stipulated in the safety certificate;

i) to coordinate with international railway organisations in controlling international railway transport

2. *Finance resource for Railway Transport controlling activities in national and urban railways* consists of:

a) Fees for railway transport controlling services

b) Other sources in accordance with laws.

Article 75. Safety certificate

1. In order to be allowed to participate in railway transport operations, every railway business enterprise shall have safety certificate issued by the railway state management authority.

2. Railway business enterprises shall be granted safety certificate when meeting the following conditions:

a. Management staff, control staff and service staff of that enterprise are trained in accordance with their title and professions.

b. Railway traffic means owned or rented by that enterprises shall meet the technical and safety requirements checked by Vietnamese registration agency and comply with the infrastructure.

c. The railway infrastructure of the railway infrastructure enterprises shall be safe and comply with the railway technical grade announced by the enterprise in its speed pass, load pass, information relating to railway transport.

3. Minister of Transport shall prescribe conditions, contents and procedure of safety certificates and types of enterprises that must have safety certificates.

Article 76. - Train timetable

1. Train timetable shall be a basis for organizing train operation, established annually, periodically or seasonally for specific route or the whole network. The timetable shall be established on the principle of non-discrimination and openly publicized to all railway operators.

2. The timetable shall be established based on the following factors:

a) Traffic demand of rail operators, including: time, freight and passenger volume, transport quality, route and departure stations, stops and destination;

- b) Capacities of infrastructure and traffic means
 - d) Needed path for maintenance and repair of railway infrastructure
 - e) Priority order for trains on the same route
3. Priority order for trains shall be regulated by Minister of Transport

Article 77. Timetabling procedures

- 1., Draft timetable shall be based on the provisions stipulated in the Clause 2 of Article 76 and sent to all railway business enterprises and railway state management authority.
2. In case, there are railway operators who do not agree with the draft timetable, railway traffic controlling units shall preside over the discussion, negotiation between the relevant railway operators and railway infrastructure managers. In case, the conflicts are not solved, a tender will be opened and which rail operator pays the highest infrastructure fee shall occupy the demanded paths.
3. The timetabling process as stipulated in the Clause 1, 2 of this Article shall be under the supervision of railway state management authority.

Article 78. Principles for traffic controlling

Railway traffic controlling shall obey the following principles

1. be central and united; to comply with procedures, codes and legal provisions
2. Ensure safety, smoothness and punctuality of railway transport
3. Non- discrimination exists among enterprises participating in railway transport.

Article 79. - Handling detected incidents, violations on railways

1. Persons detecting incidents that may obstruct railway traffic, threaten railway traffic safety, have responsibility to promptly report them to **Station**, railway units, local administrations or nearest police offices for handling measures. In case of urgency, they must apply measures to immediately signal the railway traffic means operators to halt the trains.
2. When receiving such reports or train halting signals, the organisations, individuals shall have immediate handling measures to ensure safety of railway traffic and inform the units directly managing the railway infrastructures thereof so as to actively co-ordinate with the concerned agencies in quickly taking remedial measures.
3. Organisations and/or individuals who have acts causing railway traffic incidents, threatening safety of railway traffic must be handled according to law

Article 80. Responsibility for ensuring the Railway security and order of railway transport operators.

- 1, Railway transport operators shall take responsibility to ensure security and order in railway activities within their respective management; to preside over, to coordinate with police, local authority to prevent, protect and solve infringement of railway law as authorized competence and take responsible to the law for their decisions.
2. Security force on train has equipments, uniforms, and insignia, supporting tools as regulated by the Government and have the following tasks and functions:
 - a) Detecting, preventing acts threatening passengers' life, health and property, disturbing railway transport safety and order and other acts violating law provision on the

train; holding in custody and hand over to station's master, police or local authority when the train stop at the nearest stations;

- b) For those who have acts of illegal preventing trains operation, throwing stone that damage trains, security forces shall have the right to prevent and force them out of scene; hold in custody and expedite to station's master, police or local authority when the train stop at the nearest stations.
- c) Co-ordinating with railway infrastructure security force, police, local authorities in timely detecting and preventing infringements of infrastructure, railway facilities causing harm to railway transport safety.
- d) Participating in solving railway traffic accidents, incidents according to Article 11 and Article 37 of this Law

Article 81. Responsibility of police force in ensuring order, safety, security of railway transport

Police of all levels shall, within the scope of their respective tasks and powers, co-ordinate with railway security force, railway traffic investigators, railway staff and local authorities in the areas where railroad cross, in presiding over the organisation of ensuring order, security and safety of railway transport operations.

Article 82. Responsibility of local authorities in ensuring order, security, safety of railway transport

1. People committees of all levels shall, within the scope of their respective tasks and powers, shall assume responsibility to organize the implementation of Clause 2 Article 10 of this law to improve the people's awareness of protecting safety and security of railway transport.

2. People committees at all levels in the areas where railroads cross shall take responsibility to:

- a) Direct the local police to coordinate with railway security force in preventing and timely dealing with infringement of railway infrastructure, railway transport facilities, and other acts violating regulations on railway transport safety.
- b) Participate in solving railway traffic accidents according to Article 11 of this Law

Chapter VII
Railway business

Article 83. Railway business activities

1. Railway business activities mean railway infrastructure business, railway transport operation and supplying services supporting railway traffic.

2. Railway operation is conditional business mode. The government shall regulate in detailed the conditions, contents and procedures for issuing, amendments and withdrawal of railway business license.

Article 84. Ensuring non-discrimination in railway business

The following discriminatory activities shall be not allowed in railway business:

- 1) Allow usage of railway infrastructure and services supporting railway transport operations in preferred conditions without proper reasons.

- 2) Request enterprises to meet safety conditions at higher level than those regulated by Minister of transport;
- 3) Publicize conditions that clearly give priority to a specific enterprise.
- 4) Not allow railway operators to use railway infrastructure without proper reasons
- 5) Not issue safety certificate or delay the issuance without proper reasons.
- 6) Create unreasonable conditions in order to leave enterprises out of railway operations

Article 85-Railway infrastructures Business

- 1/. Railway infrastructure business is the activity to invest, manage, and maintain infrastructure for selling, giving concession of, leasing or collecting fee from using railway infrastructure system and to provide railway supporting services and other services on the base of exploiting their managed railway infrastructure capacity.
- 2/ Organisations and individuals using railway infrastructures owned by the State or other organisations for their business activities must pay fees or charges for such usages.
- 3/. Railway infrastructure invested by the State shall be allocated to enterprises through tender, orders or plans.
- 4/. Organizations, individuals investing in railway infrastructure shall have the right to do business on their invested railway infrastructure.

Article 86. Fees, charges for using railway infrastructure

- 1/. Infrastructure fee is the payment for running trains on routes, sections, or depot-to-depot sections.
- 2/. Rental fee of infrastructure is the payment for using one or some railway works that are not directly related to train running.
- 3/. The Prime Minister shall prescribe fee rate, collecting procedure and rental rate for state financed railway infrastructure. Charge for using non-state railway infrastructure shall be prescribed by the investors.

Article 87 - Financial sources for management, maintenance of state invested railway infrastructures

1. For the railways financed by the state, the financial source shall include:
 - a) The State budget;
 - b) Other revenues as prescribed by law.
2. The Government shall specify the management and use of financial sources for management and maintenance of railway infrastructures used the state budget

Article 88- Rights and obligations of railway infrastructure business Enterprises (IM).

1. Rights:
 - a) Do business with the railway infrastructure in accordance to its granted business license.
 - b) Request all organisations or individuals whose activities are related to its managed railway infrastructure to follow the technical standards and procedures of railway infrastructure.
 - c) Be given orders, plans by the State or participate in tender for the management and maintenance of State financed railway infrastructure within their management scope.

- d). Be entitled to participate in any tender for implementation of all infrastructure projects invested by other investors.
- e) Rent out their invested railway infrastructure
- f) Propose and submit for approval of infrastructure fee, rental rate for the state financed infrastructure, decide by itself those fees for their owned invested railway infrastructure.
- g). Temporally terminate the traffic if it foresees the fact that the infrastructure system can cause unsafe train operation.
- h). Be compensated for damages if the damages are due to the faults of other organisations and individuals.
- i/. Other rights in accordance with laws.

2. Obligations

- a) Manage all properties and capitals belonged to the infrastructure that is allocated by State to the IM or its owned invested infrastructure in accordance with the laws.
- b) Maintain and improve their managed infrastructure in good technical quality in order to ensure the safe and smooth railway transport.
- c) Publish the yearly speed, weight load passes on all routes, sections managed by the IM in accordance with the infrastructure technical conditions in their managed routes, depot-to-depot sections, and railway line sections.
- d) Provide technical and economic parameters regarding the infrastructure capacity as requested by the customers, the railway transport controlling organization and railway state-management authority;
- e). Formulate plans for management, maintenance and development of railway infrastructure in order to meet the transport demand and railway development planning.
- f). Prevent and repair properly natural disasters, accidents and ensure the smooth railway operation. To be directed by the Accident and Natural Disaster Protection Agency in accordance to regulations and laws.
- g) Properly inform the traffic threaten and temporally termination of traffic to train operators at two stations of the station-to-station section where the incidences are happened.
- h). Compensate the organisations and individuals for the damage caused by its faults as regulated by the law.
- i) Other obligations in accordance with laws.

Article 89. - Railway transport business

- 1. Railway transport business includes activities related to operating passenger, luggage, cargo luggage and cargo transport on railways.
- 2. Railway transport operators are allowed to use railway infrastructure and be supplied services supporting railway transport when ensuring the following conditions
 - a) Having business license
 - b) Having safety certificate
 - c) Having contracts with railway transport controlling organization for railway traffic controlling services.

Article 90: rights and obligations of the rail operators

1/. Rights

- a) Be entitled to operate in accordance to its business license.

- b) Be treated non-discriminatory in railway transport operation
- c) Have right to use rail infrastructure on routes, sections in accordance to using infrastructure contract.
- d) Be ensured by the Railway Transport Controlling organization about the infrastructure quality and capacity as committed.
- e) Be provided information, materials about technical and economical characteristics of infrastructure capacity.
- f) Be entitled to temporally terminate the train operation if it sees that the operation will not safe due to the infrastructure condition.
- g) Be paid for damages due to faults of the railway controlling activities or railway infrastructure enterprises.
- h) Other rights in accordance with laws.

2/. Obligations

- a) Run the train in accordance with timetable, speed passes, load passes published by the IMs.
- b) Pay fees, rental rates for using railway infrastructure and other railway services
- c) Ensure sufficient safety conditions of train operation during exploration process.
- d) Properly inform the railway controller about the temporary termination of its train.
- e) To be directed and assigned by the railway controlling centres, the Accidence and Natural Disaster Protection Agency in accordance to regulations and laws.
- f) Compensate for the damages caused by its faults as regulated by the law.
- g) Provide information about transport demand, quantity and quality of railway vehicles to the railway controlling organization for the establishment of timetable and path allocation and to the IMs for the development of plans for construction, upgrading and maintenance of infrastructure.
- h) Other obligations in accordance with laws.

Article 91. Passenger transportation contract

1. Passenger transportation contracts mean the agreement between railway transport enterprises and passengers, under which the railway transport enterprises undertake the transportation of passengers, luggage and cargo luggage from the departure station to the arrival station. The passenger, luggage and cargo luggage transportation contracts shall identify the relation of responsibilities and obligations of the parties and be made in writing or in other forms agreed by the parties.

2. Passenger ticket is an evident for signing passenger transport contract. Passenger ticket is issued by passenger transport enterprises in accordance with forms registered with state authority.

Article 92. - Cargo transportation contract

1. Cargo transportation contracts mean the agreement between railway transport enterprises and cargo owners, under which the railway transport enterprises undertake the transportation of cargoes from the places where cargoes are received to the places where cargoes are delivered to consignees, already prescribed in the contracts, and the cargo owners must pay freight. The cargo transportation contracts must identify the relation of responsibility and

obligation of the parties and be made in writing or by transport bills or other form agreed by the parties.

2. Cargo transportation invoice is a part of transportation contract made by railway transport enterprise *in forms registered with competent authority; Railway transport enterprise shall make invoice and send them to the customer after having delivered the freight;* the invoice should have signature of customer or person empowered by the customer. Cargo transportation invoice is cargo transportation document between railway transport enterprise and customer, and is evident to solve dispute.

3. Cargo transport invoices must clearly inscribed type of goods, sign and code of goods, quantity and weight of goods, delivery and receiving place, name and address of sender and receiver, transport fare and other arising costs, other contents that railway transport enterprise and customer agree to put into the invoice, confirmation of railway transport enterprise current conditions of cargo.

Article 93 – Railway transport fare, price of ticket

1. Fares for passenger, luggage and cargo luggage transportation on railways are set by railway transport enterprises.

2. Transport fares must be publicized and posted up at railway stations before the implementation dates at least 5 days for passenger, luggage and cargo luggage transportation and 10 days for cargo transportation, except for fare reduction.

3. Fares of transportation of supper-long and supper-weight cargoes are agreed by rail operators and customers.

4. Ticket remission, priority for beneficiary of social welfare shall be regulated by Ministry of Transport.

Article 94. - International transport

1. International transport means the transportation from Vietnam to foreign countries and vice versa or transportation from foreign countries to the third countries by trains, but transit in Vietnam.

2. Railway transport enterprises of all economic sectors when participating in international transport shall meet the conditions regulated in article 89 of this law and international treaties concerning railway transport, which Vietnam has signed or acceded to

Article 95. - Transportation for special purposes

1/. Transportation for special purposes is the transport of people, cargoes and equipment in service of the tasks of overcoming natural calamities, fighting epidemics, taking urgent security and defence tasks.

2/. Railway transport enterprises shall have the responsibility to implement the special transportation as requested by the manager of national competent agencies in accordance with the law.

Article 95. - Support services of railway transport

Support services of railway transport shall include:

- 1) Railway transport controlling services
- 2) Cargo loading and unloading;

- 3) Cargo storage and preservation;
- 4) Forwarding;
- 5) Transport agents;
- 6) Vehicle leasing and repair;
- 7) Other services related to the organisation and implementation of passenger, luggage, and cargo luggage and cargo transportation on railway.

Article 97. - Rights and Obligations of railway transport enterprises when transporting passengers, luggage and cargo luggage

1. Rights:

- a. Rights stipulated at Clause 1 Article 90 of this law.
- b. To request passengers fully pay fares for passengers and fares for accompanied luggage in excess of the prescribed limits.
- c. To check the weight, packing specifications of cargo luggage of consignors and consigned baggage of passengers before undertaking to carry them; in case of doubts about the truthfulness of declaration on the categories of cargo luggage, consigned baggage as compared with reality, to request the consignors or passengers to open the cargo luggage or consigned baggage packages for examination.
- d. To refuse to carry passengers having acts violating regulations of transport enterprises.

2. Obligations

- a. Obligations stipulated at clause 2 Article 90 of this law.
- b. To publicly post up necessary regulations related to train passengers.
- c. To carry passengers, luggage and cargo luggage from the departure stations to the arrival stations, already inscribed in tickets, safely and punctually.
- d. To provide services to passengers in a civilized, urbane and thoughtful manner, and make convenient for the disable when going into station, getting in and off the train.
- e. To ensure minimum conditions for passengers' daily-life activities in case of interrupted transportation due to accidents, natural disasters or enemy sabotage.
- f. To hand passenger, luggage and cargo luggage tickets to passengers who have made full payment.
- g. To refund passenger of ticket price or to pay compensations and arising costs to passengers for damage, losses caused by railway transport enterprises which are at fault.
- h. To obey and create favourable conditions for competent State agencies to check passengers, luggage and/or cargo luggage when necessary.

Article 98. - Insurance responsibility in railway passenger transport business

1. Passenger transport enterprises must buy insurance for civil liability of transport enterprise to passengers. The insurance premiums are included in the ticket prices.
2. Passenger tickets, train travel papers shall serve as evidences to settle the insurance when insurance incidents occur.
3. The passenger insurance shall comply with law on insurance.

Article 99- Obligations and rights of passengers, consignees

1. Rights

- a. To be carried in accordance with their tickets.
- b. To be exempt from fares for accompanied luggage not less than 20kg. The exemption from fares in case of exceeding 20 kg shall be described by railway transport enterprises.
- c. To be refunded ticket price or the amount of money equivalent to the non used ticket after making minus for cases regulated at point g, Clause 2, Article 97 of this law.
- d. To return their tickets at the departure stations in prescribed period and get back the ticket money after subtracting fees.
- e. To be enjoying life and health insurance as regulated by Law provisions,

2. Obligations

- a. Train travellers must have regular passenger and luggage tickets and take care of their accompanied luggage by themselves. Train travellers having no tickets or irregular tickets must buy supplementary tickets and pay a fine as regulated by railway transport enterprises.
- b. Passengers having consigned luggage, *consignees* must declare the names and quantity of their goods, pack them according to regulations and deliver them to railway transport enterprises on time and at the right places and bear responsibility for their declarations.
- c. Passengers, *consignees* must pay compensations if causing damage to, or loss of, properties of railway transport enterprises.
- d. Passengers must strictly abide by train travel rules and other relevant law provisions on passenger transportation.

Article 100. - Rights and Obligations of railway transport enterprises when transporting cargoes

1. Rights

- a. Rights stipulated at Clause 1 Article 90 of this law.
- b. To refuse to transport cargoes, which fail to comply with the regulations on goods, packing, symbols and codes as well as cargoes banned from circulation by the State.
- c. To request cargo owners to open cargo packages for examination in case of doubts about the truthfulness of their declaration on goods categories as compared to reality.
- d. To request cargo owners to pay fully transport fare and other arising costs.
- e. To request cargo owners to pay compensations for damage caused by their faults
- f. To request cargo inspection when necessary.
- g. To keep the cargo in case cargo owners do not pay fully transport fare and other arising costs as agreed in the contract.
- h. To handle with cargoes refused by cargo receivers, cargoes without receivers after a period of time prescribed *at Article 106 of this Law*.
- i. To penalize the cargo owners for slow unloading;

2. Obligations

- a. Obligations stipulated at clause 2 Article 90 of this law.
- b. To publicly post up necessary regulations on cargo transportation.
- c. To transport cargoes to the destination places and deliver them to the consignees under the signed contracts.
- d. To notify in time the cargo owners when the cargoes have been transported to the delivery places and when the transportation is interrupted.
- e. To keep and store the cargoes in cases where the consignees refuse to receive the cargoes or the cargoes cannot be delivered to the consignees and notify the cargo owners thereof.

f. To pay compensations to cargo owners when railway transport enterprises are at fault in causing cargo losses

Article 101. - Rights and Obligations of cargo owners

1. Rights

a. To change cargo transport contracts even when cargoes have already been delivered to railway transport enterprises or cargoes have already been loaded onto wagons and bear all costs arising from the change of transport contracts.

b. To re-designate cargo consignees when such cargoes have not yet been delivered to the previous eligible cargo consignees, to change delivery venues or request the transportation of cargoes back to places of departure and to bear all arising costs.

c. To be compensated for damage when cargoes are lost, reduced in weight or quality, broken or transported beyond the prescribed time limits if railway transport enterprises are at fault.

2. Obligations

a. To honestly declare their cargoes and take responsibility for such declaration.

b. To pay freight on time and by payment mode agreed upon in the contracts.

c. To pack their cargoes and meet conditions on cargo transportation under the guidance of railway transport enterprises

d. To deliver cargoes to railway transport enterprises on time and at the right places.

e. To supply papers, documents and other necessary information on cargoes.

f. To pay compensations for damage caused to railway transport enterprises by their untruthful cargo declarations or other faults of cargo owners.

Article 102. - Transportation of dangerous cargoes

1. Dangerous cargoes mean those which, when being transported on route, may cause harms to human health or lives, environment.

2. The transportation of dangerous cargoes on railway must comply with law provisions on transportation of dangerous cargoes.

3. Only when railways transport means satisfy the technical safety conditions can they be used for transportation of dangerous cargoes.

4. Dangerous cargoes must not be loaded and/or unloaded at crowded stations or stations in urban centres.

5. The Government shall prescribe the list of dangerous cargoes and conditions for railway transportation of dangerous cargoes

Article 103. - Transportation of live animals

1. Transportation of live animals shall request an escort. The escorts must have regular train tickets.

2. The goods owners take self-responsibility for loading and unloading of live animals, cleaning the wagons after unloading the cargoes. If not, they must pay charges for loading, unloading of live animals and cleaning, purifying the wagons to railway transport enterprises.

3. The railway transportation of live animals must comply with the regulation on hygiene, epidemics prevention and environmental protection as well as regulations on railway transportation of cargoes

Article 104. - Transportation of corpses remains

1. Corpses and remains shall be transported with escorts. The escorts must have train tickets.
2. Corpses and remains shall be transported only when they are fully accompanied with the law-prescribed papers and the transport procedures must be carried out at least 24 hours before the trains depart. Corpses must be put into coffins; remains must be packaged in according to regulations on epidemic prevention and environment protection. The transportation of corps and remains shall be regulated by railway transport enterprises.
3. Corpses and remains must be removed within no more than two hours as from the time the trains arrive at the destination stations; in cases where this provision is breached, the railway transport enterprises shall take timely handling measures and have the right to request owners of such corpses and/or remains to pay all arising costs.

Article 105. - Transportation of super-long and/or super-weight cargoes

1. The railway transportation of super-long or super-weight cargoes must be permitted by competent bodies.
2. Railway transport enterprises, when transporting super-long or super-weight cargoes, must draw up plans on cargo loading and unloading, transportation, assuring the safety of train operation and railway infrastructures.

Article 106. - Handle with luggage, cargoes which have no receiver or the receivers reject to accept.

1. When luggage, cargoes sent to destination but having no receiver or the receiver reject to receive, railway transport enterprises have the right to transport the luggage, cargoes to safe and suitable places and inform immediately the cargo, luggage' owners within 10 days starting from the date when railway transport enterprises inform cargo, luggage owners; all arising costs shall be covered by the cargoes', luggage' owners.
2. 90days after the date when railway transport enterprises inform cargo owners but receive no reply or no payment for arising costs, railway transport enterprises assume the right to auction luggage, cargoes in accordance with law on auction in order to compensate for arising costs; for damageable goods or in case transport fare is too high, railway transport enterprises assume the right to auction those goods earlier than the above mentioned time and have to inform the cargoes owners.
3. Luggage, cargoes belonging to list of forbidden cargoes or subjecting to transport limitation regulations, having no receivers or the receiver reject to receive shall be delivered to competent agencies.

Article 107. - Damage compensation liability exemption

Railway transport enterprises shall be exempt from liability to pay compensations for damage due to the loss, damage, and shortage of cargoes, cargo luggage and consigned luggage during the transportation process in the following cases:

1. It is due to the natural properties or latent defects of cargoes, cargo luggage and consigned luggage;
2. It is due to the seizure by, or other coercive actions of, competent bodies against the consigned cargoes and/or luggage;

3. It is due to force majeure as regulated by civil law.
4. It is due to the faults of passengers, owners and/or recipients of cargoes consigned luggage, cargo luggage or the faults of goods escorts sent by goods owners or consignees.

Article 108. - Damage compensation limits of railway operator

1. Railway transport enterprises must pay compensations for the loss, shortage or damage of cargoes, cargo luggage and consigned luggage according to the following regulations:

- a) According to the declared value of cargoes, cargo luggage and consigned luggage with value declaration; in cases where transport enterprises can prove that the actual damage value is lower than the declared value, the compensation levels shall be calculated according to the actual damage value;
- b) According to the value recorded in purchase bill or market price at the compensation time of the categories and weight of cargoes without value declaration, depending on which is higher;
- c) For cargoes, cargo luggage and consigned luggage which values are not declared and do not have purchase bill, shall be compensated by average value of the same cargo but shall not be excess the price prescribed by Ministry of Transport and Communications

2. In addition to the compensation levels prescribed in Clause 1 of this Article, railway transport enterprises shall have to reimburse to passengers and/or goods owners the freight and transport surcharges for the volume of cargoes, cargo luggage and consigned luggage, which are damaged.

Article 109. - Settlement of disputes

1. Disputes in railway transport contract must be settled in the following forms:
 - a. Through negotiations, conciliation;
 - b. Being brought to Arbitration or initiating lawsuits at courts
2. Order and procedure of dispute settlement shall be regulated by legislation.

Article 110. - Time limits for sending requirement for compensation, time limits for compensation settlement

1. The time limit for sending complaints and vouchers related to compensation claims shall be agreed by parties. In case all parties do not reach agreement, the time limit for sending complaints shall be as followed:

- a. 30 days from the date incident happened damaging passengers' health and life
- b. 60 days for damaged or lost cargoes counting from the date of goods delivery, reception or from the proposed delivery date.
- c. 30 days for damaged luggage, cargo luggage as from the date of luggage, cargo luggage delivery, reception or from the proposed delivery date.

2. Within 60 days, as from the date of receiving complaint, railway transport enterprises shall take responsibility to settle the complaint.

Article 111. - Time limits for complaints

Time limits for settling disputes relating to contracts in railway business shall comply with regulations of Civil Law and law on trade arbitration.

Chapter VIII

Implementation Provisions

Article 112. - Regulations for existing organisations, individuals operating railway transport

1. Contracts or agreements in written forms relating to railway operating which existed before the date this Law takes effect shall remain the implementation value as inscribed in the contracts or agreements.
2. After this Law takes effect, amendments, additions of contracts or agreements stipulated at clause 1 of this Article must comply with regulations of this law.
3. The Government shall stipulate conditions and schedule for organisations, individuals operating railway transport to adjust organisational structure and activities in accordance with regulations of this law.

Article 113- Implementation effect

This Law takes implementation effect as from 1st January 2006

Article 114- Implementation guidance

The Government shall detail and guide the implementation of this Law.-