

The People's Republic of Bangladesh
Dhaka Transportation Coordination Authority (DTCA)

**Preparation of Rules and Regulations under
Urban Mass Rapid Transit Act
(Dhaka, Bangladesh):
Technical Assistance Related to ODA Loan**

Final Report

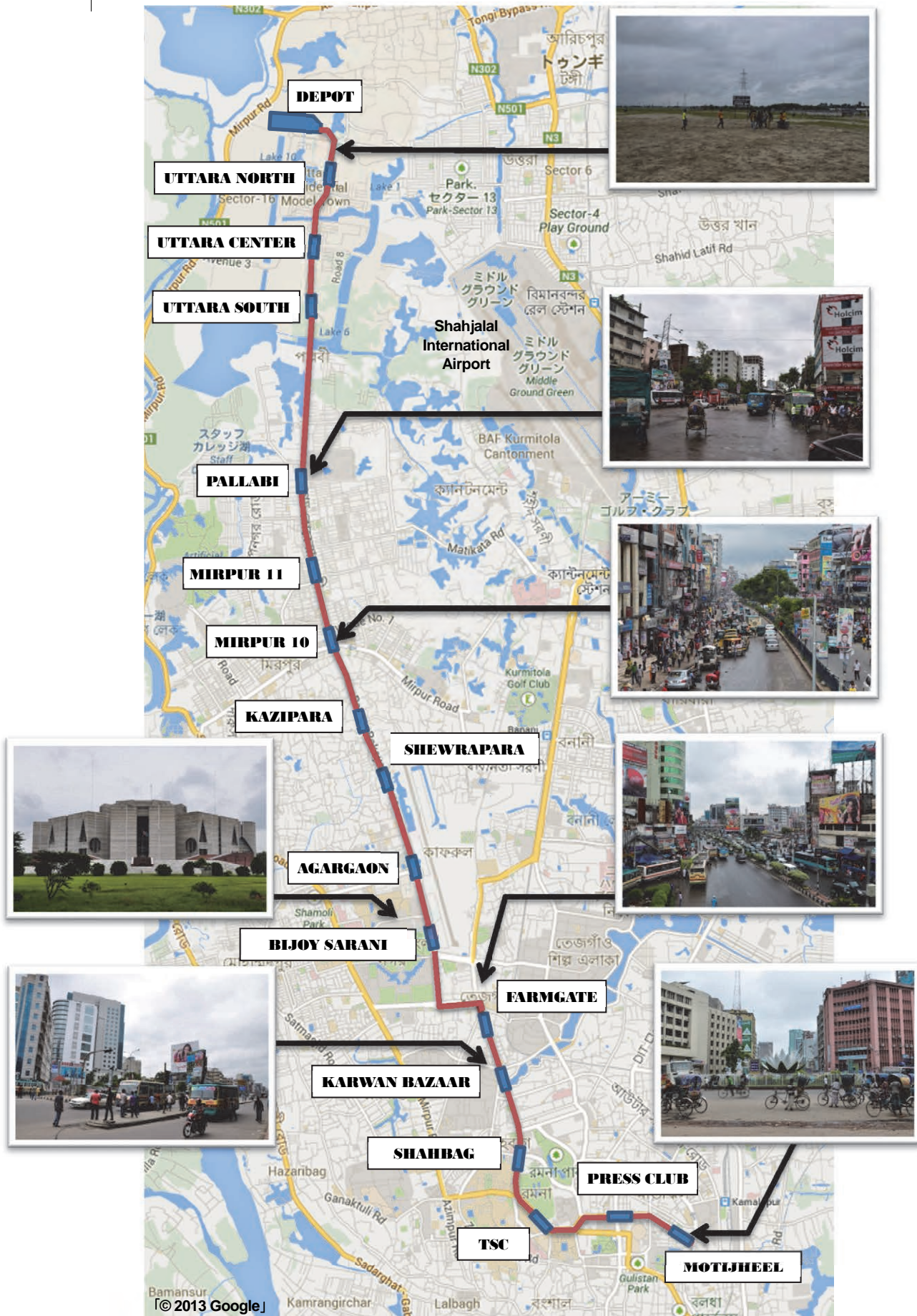
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**Japan International Cooperation Agency
(JICA)**

**Japan International Consultants for Transportation Co., Ltd.
Oriental Consultants Global Co., Ltd.
Metro Development Co., Ltd.**

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Present State of Areas along Proposed Dhaka MRT Line 6



SUMMARY

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Remark: Figures and Tables without writing source are compiled by Study Team.

Abbreviation

AASHTO	American Association of States Highway and Transportation Officials
ADB	Asian Development Bank
AFC	Automatic Fare Collection
AFD	Agence Francaise de Developpement
ATC	Automatic Train Control system
BBA	Bangladesh Bridge Authority
BBS	Bangladesh Bureau of Statistics
BIWTA	Bangladesh Inland Water Transport Authority
BNBC	Bangladesh National Building Code
BOO	Build-Own-Operate
BOT	Build-Own-Transfer
BR	Bangladesh Railway
BRT	Bus Rapid Transport
BRTA	Bangladesh Road Transport Authority
BS	British Standard
CASE Project	Clean Air and Sustainable Environment Project
CPD	Centre for Policy Dialogue
CTC	Centralized Traffic Control
DAP	Detailed Area Plan
DCC	Dhaka City Coordination
DHUTS	Dhaka Urban Transport Network Development Study
DMA	Dhaka Metropolitan Area
DMDP	Dhaka Metropolitan Development Plan
DMRC	Delhi Metro Rail Corporation Ltd
DMTC	Dhaka Mass Rapid Transit Company
DTCA	Dhaka Transport Coordination Authority
DTCB	Dhaka Transport Coordination Board
ED	Executive Director
ELC	Electric Inspector Clearance
EMU	Electric Multiple-Unit
FDI	Foreign Direct Investment
FS	Feasibility Study
GC	General Consulting Services
GDSUTP	Greater Dhaka Sustainable Urban Transport Project
GEF	Global Environment Facility

GIBR	General Inspector of Bangladesh Railway
IBA	Institutional Building Assistance for Dhaka Urban Transport Network Development
IC	Integrated Circuit
ICT	Information and Communication Technology
IDC	Institutional Development Consultant
IRC	Indian Railway Code
LGED	Local Government Engineering Department
LPAD	Legislative and Parliamentary Affairs Division
M/D	Minutes of Discussion
MEA	Metropolitan Electricity Authority
MOC	Ministry of Communication
MOEF	Ministry of Environment and Forest
MOP	Ministry of Power
MOR	Ministry of Railways
MoRTB	Ministry of Road Transport and Bridges (same as past MOC)
MRT	Mass Rapid Transit
MRTA	Mass Rapid Transit Authority of Thailand
NFPA	National Fire Protection Association
OCC	Operation Control Center
OTP	Office of Transport Planning
PPP	Public Private Partnership
PTC	Public Transport Council
RAJUK	Rajdhani Unnyan Kartipakkah
RDSO	Research Design and Standards Organization
RHD	Roads and Highways Department
STP	Strategic Transport Plan
STRASYA	Standard Urban Railway System for Asia
WB	World Bank

Chapter1 Outline of Work

1.1 Background of Work

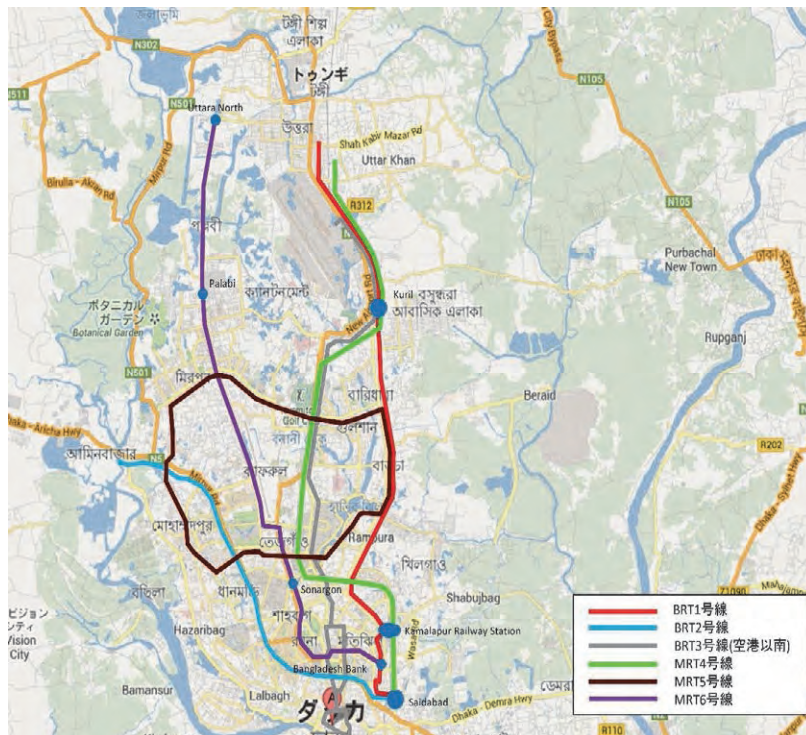
Dhaka, capital city of Bangladesh, and the surrounding areas (Dhaka Metropolitan Area: DMA), have a population of 9.15 million people. In the DMA, where there is no Mass Rapid Transit (MRT) system such as urban trains, urban transport depends heavily on road transport, and traffic congestion due to the intermingling of different modes of transportation such as automobiles, buses, and rickshaws has become a severe problem. Moreover, the deterioration of the transportation environment due to the air and noise pollution from traffic is growing worse and worse.

Given that the number of automobiles is also expected to increase further with the growth of the economy and the urban population in future, developing an urban transport system aimed at improving traffic conditions and the urban environment in the DMA has become a pressing issue. In light of these circumstances, in 2005 the Government of Bangladesh, with the Collaboration of the World Bank, formulated the Dhaka Strategic Transport Plan (STP) for the region.

The STP proposed that three lines in Bus Rapid Transit and three lines in Mass Rapid Transit were required.



Figure 1.1 A Traffic Jam in Dhaka



Source: Spprepared by the authors based on STP, DHUTS, etc.

Figure 1.2 Dhaka Urban Transport Network Plan

The Japan International Cooperation Agency (JICA) then conducted the Dhaka Urban Transport Network Development Study (DHUTS; 2009-2011) with the aim of constructing an urban transport system centered on MRT. Based on the results, it launched the Dhaka Mass Rapid Transit Development Project I (2012; loan-assisted; hereinafter referred to as MRT Line 6).

Meanwhile, the Government of Bangladesh had just begun institutional building relating to the MRT project. JICA dispatched Institutional Building Assistance for Dhaka Urban Transport Network Development (Dhaka IBA; 2011-2012; loan assistance specialists) as advisors to the government, who analyzed and assessed the basic organization system and proposed legislative framework. Specifically, JICA proposed that the Dhaka Transport Coordination Authority (DTCA) be responsible for planning and coordination relating to overall urban transport within the DMA and serve as a regulatory and supervisory institution once the system begins operation. It also proposed the formulation of the DTCA Act (already approved by the government) stipulating that the newly created Dhaka Mass Rapid Transit Company (DMTC) will handle project implementation and management/maintenance after the start of operations and the Metrorail Act, which will serve as the basis for company registration required for creating DMTC and urban railway business. However, legislation relating to railway business Technical Standards, General Rules (Standards), etc., which is required to implement the MRT Line 6 project, has not yet been developed.

At the present time, the General consultant (GC) for the MRT Line 6 project has been selected by the DMTC and basic design, detailed design, and preparations for bidding have been underway since February 2014. In order to ensure the efficacy of the MRT Line 6 project's outcomes, it is necessary to first develop Technical Standards, which is a basic requirement for the various types of design work, and structural rules (Standards) in the General Rules (Standards) (hereinafter collectively referred to as Technical Standards), and ensure that suitable project plans are formulated. In addition, this is the first MRT Project for the Government of Bangladesh, and there is no domestic expert or engineers who are well versed to the relevant expertise and knowledge. It is necessary; therefore, that railway operators of the countries with sufficient experience in MRT Projects should support the formulation of Technical Standards to be applied to the Dhaka MRT.

This work will be implemented to achieve the following as design Standards for Dhaka MRT projects, including the aforementioned MRT Line 6 project: developing the minimum required Technical Standards and formulating suitable designs; preparing legislative/regulatory proposals relating to Dhaka MRT, including MRT Line 6 and future lines, as well as producing a Road Map and Work Plan aimed at establishing an approval and licensing system under the various laws and regulations; and facilitating Cabinet approval of the Metrorail Act, which will serve as the basic law for MRT in Bangladesh.



Source: DHUTS Report
 Figure 1.3 MRT Line 6 Route Map (First Plan)

Objectives of Work

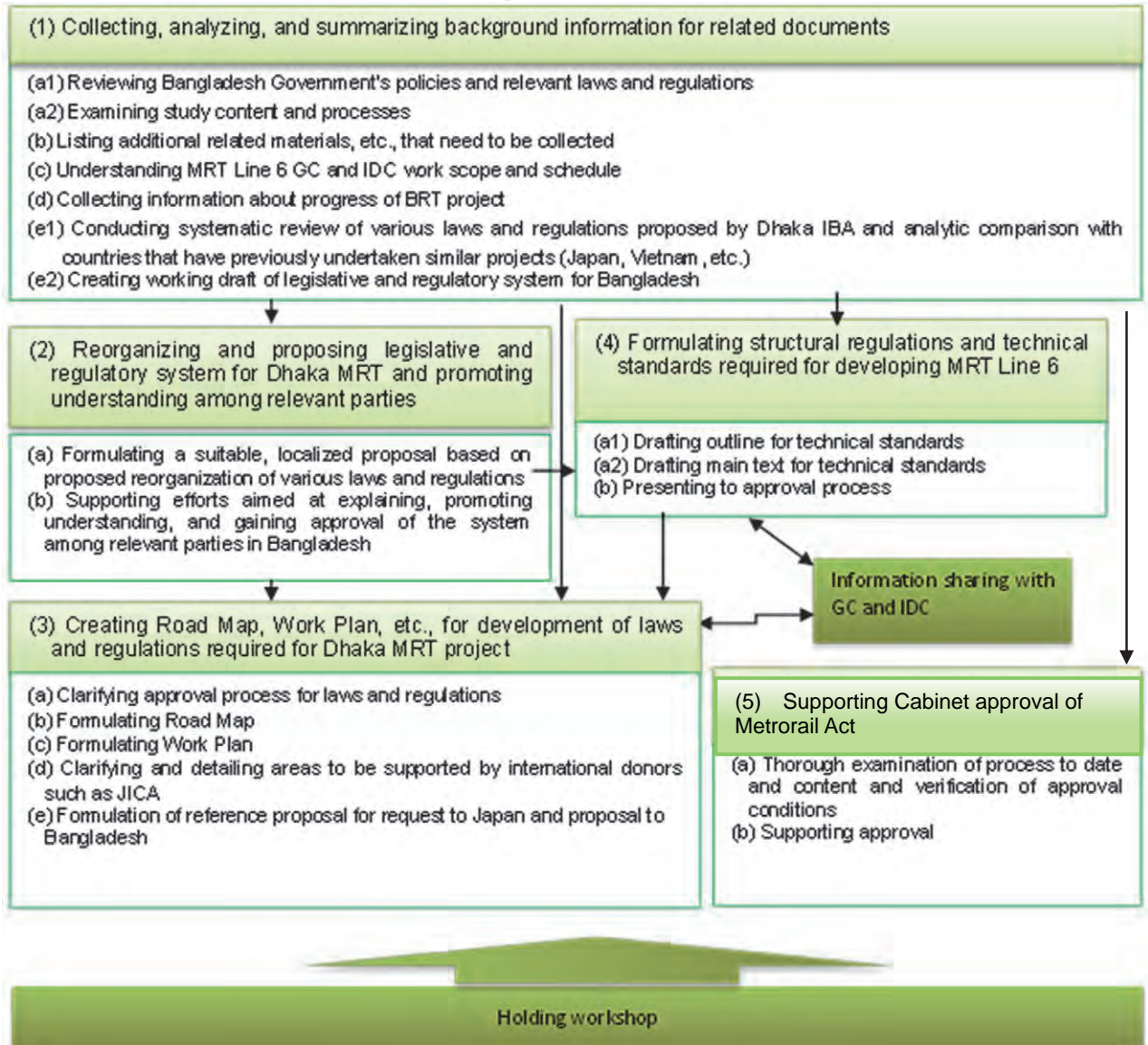
This work will be implemented to achieve the following objectives with respect to MRT projects in Dhaka, Bangladesh, including the aforementioned MRT Line 6 project.

Table 1.1 Objectives of Work

Objective 1	Developing the minimum required Technical Standards for formulating technical plans, etc.
Objective 2	Revising the legislative/regulatory system relating to Dhaka MRT, including MRT Line 6 and future lines
Objective 3	Preparing the relevant laws/regulations and producing a Road Map and Work Plan aimed at establishing an approval and licensing system
Objective 4	Facilitating Cabinet approval of the Metrorail Act, which will serve as the basic law for MRT in Bangladesh

For this work, based on the Minutes of Discussion (M/D) signed by both JICA and DTCA on June 26, 2013, in order to achieve the above Objectives of Work for Dhaka Mass Rapid Transit Development Project I, the study described in the Work Implementation Method will be conducted and the Deliverables (reports, etc.) will be prepared and submitted. In conjunction, the authors will monitor the progress of this work as a whole and the progress status of the overall MRT Line 6 project and verify consistency with the work scope, schedule, etc. of GC and IDC for MRT Line 6.

Table 1.2 Work Implementation Method



Chapter2 Background Review

2.1 Review High-Level Plans (Vision 2021, STP, etc.)

2.1.1 Vision 2021 (Bangladesh Vision 2021)

2.1.1.1 MRT Project-Related Review

Over the next 15 years, environmental problems will become severe due to increased population size and the continued advance advancement of urbanization as the economy grows. In order to solve these problems, it will be necessary to introduce integrated traffic management and efficient urban transport systems in major cities, and construction of an MRT elevated railroad by the Government and private businesses in Dhaka was proposed. The MRT project must be undertaken to overcome the city's extreme traffic congestion, and strong policies to this end are essential. There is a desire to introduce the bold, integrated traffic management policies proposed in the Vision.

With regard to new, modernized investment, Bangladesh should emphasize the relative roles of the state and the market and pursue a strategy aimed at an appropriate balance between public and private investment and FDI. In terms of the main project contractors, the proposed Metrorail Act plans for not just Government-affiliated contractors but also public-private partnership (PPP) contractors to be involved. As a result, it is necessary to clarify the division of roles between Government and private companies and develop an institutional environment for allocating development profits based on investment.

In addition, with Bangladesh in the process of transitioning to a poverty-free middle-class nation, poverty-related polices are needed for the MRT project. Accordingly, when it comes to fare policies, considering the actual living Standards of citizens, rather than just railway operation management principles, is called for. There is a host of issues that need to be resolved in order to determine how revenues and expenditures related to the MRT's construction and administration will be calculated.

2.1.2 Dhaka STP (Strategic Transport Plan)

2.1.2.1 Implementation Plan

The implementation plan, which start from 2005 and ends in 2024, is divided into four five-year plans. The key aspects of the various phases are as follows:

(1) Phase 1: First Five Years (2005-2009)

- Concentrating efforts on optimal use of existing resources and improvement of current transport services
- Implementing transport management measures for major routes, including first BRT line
- Formulating guidelines for development of Mass Rapid Transit system, including BRT and MRT system

(2) Phase 2: Second Five Years (2010-2014)

- Completing three major elevated highways, based on PPP and financing plan
- Continuing development of BRT line network and opening of 16 km of Line 3
- Final design of initial MRT line (Line 5) and financing plan
- Full rationalization of regular bus services to supplement Mass Rapid Transit system

(3) Phase 3A: Third Five Years (2015-2019)

- Final design of second and third MRT lines (Line 4, Line 6) and financing plan
- Completing construction of MRT Line 5

(4) Phase 3B: Final Five Years (2020-2024)

- Completing construction of MRT Line 4 and Line 6

2.1.2.2 Review Relating to MRT Project

In terms of the project implementation status, BRT Line 3 was scheduled to begin operation in 2014 (when STP Phase 2 ends); however, there have been delays and it is still at the execution design stage.

passengers, and to this end, it will construct, manufacture, install, renovate, commission, and operate facilities and equipment. As a transport-related company, it will perform land and property acquisition, buying and selling, and commercial use of land, and establish subsidiaries for these purposes. Basic design work is underway for MRT Line 6 instead of the planned Line 5. However, at present, it is assumed that Line 6 will open in 2022, so opening the other two planned MRT lines by the final STP phase (ending in 2024) is not realistic.

With regard to road traffic management, despite the fact that initial implementation of traffic management measures, optimization of use of existing resources, and improvement of current transport services management for key routes was planned for Phase 1 (ending in 2009), this work is progressing very slowly.

In terms of institutional issues relating to the implementation system, the establishment of an integrated organization was proposed, as a result of which the DTCA, which will fulfill an enhanced coordinating role instead of the DTCA, was established. However, the development of this organization is lagging behind, which is impeding the STP plan. The DTCA will undertake the coordination of many issues such as the acquisition of advanced technology in the case of the MRT project and links with other modes of transport, development of station-front plazas, collaboration in track-side development, etc. in the case of urban infrastructure development. In order to achieve this, it is necessary that a sufficient number of personnel be rapidly assigned to the DTCA and that the necessary skills development programs be implemented.

An initial review of the STP was to be conducted after five years, and at that point, a progress report was to be made, the construction plan was to be reviewed, and a more appropriate plan was to be proposed. In 2014, the STP review project was begun with the support of JICA.

2.1.3 The Dhaka Transport Coordination Authority Act (DTCA Act)

2.1.3.1 Review Relating to Development of MRT Legal System

Based on the DTCA Act, the DTCA is granted broad coordinating and approval powers with respect to overall urban transport affairs in Dhaka, from planning to implementation. With regard to MRT projects, it is necessary to establish a legal system framework that enables the DTCA to fulfill the powers and responsibilities stipulated by the DTCA Act as the ultimate decision-making body. Therefore, when formulating the Metrorail Act and regulations affected by it, it is necessary to ensure that the DTCA is able to make effective, timely decisions with regard to the consistency of urban policy and urban transport policy as well as MRT-specific safety, convenience, economic performance, efficiency, and social impact (environmental preservation).

The MRT Technical Standards will be the required examination Standards with regard to transport facilities, rolling stock, rail yards, terminals, transport technology plans, etc., covered by the DTCA Act and technical approval and licensing activities accompanying the design, construction, and operation of MRT system facilities. Technical decisions for approval and licensing of a technologically advanced MRT system need to be based on extremely sound reasoning. Along with the DTCA's intentions, it is essential to specify easily understood examination processes and premises to encourage appropriate, effective decisions that will contribute to the advancement of projects.

2.1.4 DMTC (Dhaka Mass Rapid Transit Company) Articles of Incorporation

2.1.4.1 MRT Project-Related Review

The articles of incorporation were stipulated based on the realities of railway companies in other countries. Overall, what may be taken away is the fact that the DMTC is a comprehensive urban transport-related company that handles development and management not just of a single MRT line (e.g. Line 6) but of multiple lines, other types of transportation (monorails, etc.), and urban facilities.

(1) Activities as a Public Transit Operator

The DMTC's main role is the construction of urban transport facilities and mass transit of

In addition, besides supplying and integrating urban transport facilities, including feeder transport and other facilities (parking lots, roundabouts, etc.), it will conclude contracts and treaties with the Government, RAJUK, other public institutions, and the private sector and be involved in the coordination of urban facilities.

With regard to the form of the railway business, in addition to BOO (build-own-operate) and BOT (build-own-transfer) approaches, it will operate and maintain the mass transit system by taking over, borrowing, and licensing from other organizations.

(2) Consulting Activities

The DMTC will perform technical consulting with regard to design, construction, maintenance, etc. Acting as a consultant, it will provide technical expertise and administrative services to Government corporations, individuals, associations, etc.

(3) MRT Facility Development Activities

The DMTC may construct facilities above or below land, roads, etc. of any kind in order to achieve its public purpose. With regard to MRT facilities, it will construct, procure, install, upgrade, maintain, and modernize:

- Tracks, bridge girders, structures, people movers, plants, rail yards, and all other fixed equipment
- Rolling stock, signaling/train control/coupling facilities, communication facilities, electrification/electrical supply systems, etc.

In addition, it will manufacture, supply, and lease mechanical equipment, etc.

2.1.5 The Bangladesh Railways Act

The purpose and principles of the Railways Act were described in a British India publication in 1887, and the Railways Act was first formulated in 1890 based on British railway laws. In 1949, when Pakistan separated from India, the terms "India" and "Indian" in the Act were deleted. Then, in 1973, when Bangladesh achieved independence from Pakistan, the term "Pakistan" was replaced by "Bangladesh" and "Rupees" by "Taka," based on the Act of 1973. Headings and representative provisions extracted from this Act are shown below.

2.1.5.1 Review of MRT Legal System Development

The MRT Act stipulates basic matters relating to railway operation and is similar to Japan's Railway Business Act. The Act assumes that there are multiple railway operators, but all are directly established by the state and under its supervision, so the Act includes almost no provisions relating to railway company approval and licensing. Therefore, in terms of the system, there is no clear division between regulators and railway operators, with the current Bangladesh Railway being an organization under the jurisdiction of the Ministry of Railway. Specific matters relating to railway facility development are stipulated based on railway operators' internal regulations (manuals).

A distinctive feature of the system is that railways developed by operators are inspected by Government-appointed inspectors, and the Government authorizes the opening of these railways as public transportation based on the inspector's report. This differs considerably from the Japanese system, which is based on an organizational responsibility structure that clearly

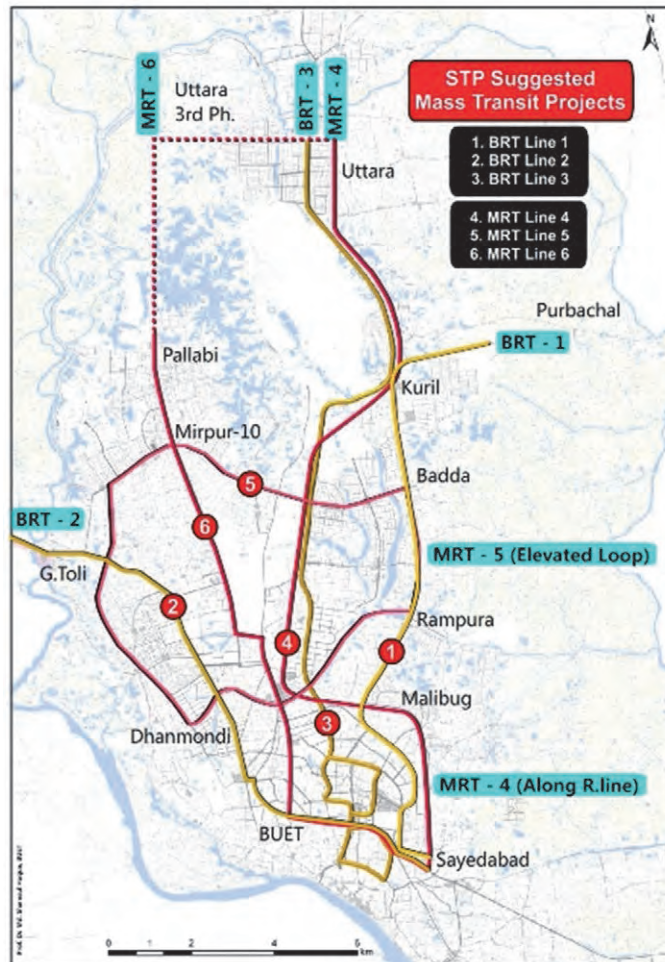
separates the responsibilities of regulators and operators. This follows the example of the British system of verification by a third-party (external person or company). There are many parts of the Metrorail Act, which is currently in the final stages of passage into law, that appear to have been stipulated in a perfunctory manner based on the Bangladesh Railways Act.

2.2 Progress Report on BRT Plan

2.2.1 Position of BRT in STP

In the Dhaka Metropolitan Area (DMA), there is an overconcentration of transportation and distribution is excessively concentrated on the roads, and while there has been sufficient traffic infrastructure development, the various types of traffic regulation that control the various modes of transportation (automobiles, buses, rickshaws, etc.) have not kept pace with this development, so traffic congestion is becoming a chronic problem. In addition to this, the worsening of traffic pollution including automobile exhaust and noise is also a problem. Given the projected future population expansion, the development of mass transit (bus- and train-related transportation) is a pressing issue.

As an urban transportation policy, the Dhaka Strategic Transport Plan (STP) formulated in 2005 proposed an urban transit network comprised of a three Bus Rapid Transport (BRT) lines system and three mass rapid transport (MRT) lines (see Fig. 2.1). It would accommodate the transit needs of the DMA while also helping to alleviate climate change by suppressing air pollution in the DMA through switching to a public transportation system.



Source: DTCA Home page

Figure 2.1 MRT and BRT Alignment

2.2.2 Outline of Dhaka BRT Project

Of the three planned BRT lines, work is currently progressing only on Line 3.

The World Bank (WB) supported the formulation of the aforementioned STP, and in 2009, as part of the Clean Air and Sustainable Environment (CASE) Project, it supported

development of an approximately 22.5 km section of the line between the Uttara and Sadhargat areas proposed in the STP.

As well, development of an approximately 20km section from Uttara north to the Gazipur area, which connects with the aforementioned section, has been underway since 2010 as the Greater Dhaka Sustainable Urban Transport Project (GDSUTP), with the support of the Asian Development Bank (ADB).

The two routes connect at Airport Terminal near Hazrat Shahjalal Airport in the Uttara area, with the total length of BRT Line 3 being 42.5 km. Operation is scheduled to begin in 2017.

In addition, with a view to commercial development and serving as a hub for the BRT line, Hazrat Shahjalal Airport, Bangladesh Railways Airport station, etc., construction of a multi-mode airport terminal under a public-private partnership (PPP) scheme is being planned for Airport Terminal.

BRT will be operated by the Dhaka Bus Rapid Transit Company Ltd. (Dhaka BRT), a wholly owned Government corporation established in June 2013.

2.2.2.1 Project Timeframe and Costs

The project is set to be implemented from December 1, 2012, to December 1, 2016. The costs are as shown below.

- Total cost: US\$ 255 million
- Investment breakdown:
 - GoB US\$ 45.4million (17.8%) Government of Bangladesh
 - ADB US\$ 160.0million (62.75%) Asian Development Bank
 - AFD US\$ 45.0million (17.65%) Agence Francaise de Developpement
 - GEF US\$ 4.6million (1.8%) Global Environment Facility

2.3 Progress Status of Project for establishment of clearing house for integrating transport ticketing system in Dhaka city area

In 2011 and 2012, an ICT upgrade project for the Dhaka urban transportation fare collection system was carried out by JICA. Using a contactless FeliCa-type IC card, it was implemented on BRTC bus line 2 with the name Spass. It has since been added to Bus Line 1 and BR, and at the present time, the pilot program is still ongoing. In addition, Spass system is planned to introduce to the car ferry operated by BIWTC (Bangladesh Inland Water Transport Corporation).

At present, in order to found the integrated clearing house for expanding the fare collection by the IC card and preparing the introduction to the Metrorail and BRT, “Project for establishment of clearing house for integrating transport ticketing system in Dhaka city” conducted by JICA was started in May, 2014 and is scheduled to be carried out by March, 2017. In this project, coordination with related organization and the system design and development is now ongoing. The objectives of the project are as follows,

- (1) Formulating operation strategy of Clearing House based on Common IC Card,
- (2) Establishing Integrated Clearing House
- (3) Improving operation of fare collection of the existing public transport operator who Introduce ICT Fare Collection System.

The steps completed to date and future steps for introducing the IC card are shown below.

- Step 1: Start of trial use on BRTC (buses) – from 2012
 - Step 2: Start of trial use on BR (railway) – from October 2013
 - Step 3: Start of full use on BRTC (buses) – from 2015
 - Step 4: Start of full use on BRT (buses) – from 2017
 - Step 5: Start of full use on MRT – from 2020 or after
- Source: Project for establishing Clearing House One card for all public transportation

2.4 BR Technical Standards, Etc.

2.4.1 Civil and Track Structures

In terms of materials relating to Technical Standards for railway facilities in Bangladesh, the Way & Works Manual by Bangladesh Railway is available. This is a guideline for performing maintenance work on railway facilities and describes maintenance-related reference values for railroad tracks, etc. Bangladesh does not have its own design Standards for railway structures.

2.4.1.1 Overview of Bangladesh Railway

(1) Total route length, etc.

Bangladesh Railway is the national railway of Bangladesh, owned and operated by the Government. The total route length is 2,835 km. The eastern region uses 1,000 mm-gauge track (meter gauge) and has a total route length of 1,266 km, of which 34 km is dual-gauge track combined with 1,676 mm (broad gauge) track. The western region has 659 km of broad-gauge sections, 535 km of meter-gauge sections, and 375 km of dual-gauge sections. There are a total of 440 stations, including one interchange point, 13 train halts, and four goods stations.

2.4.2 Rolling Stock

The existing regulations relating to rolling stock for the Bangladesh Railway (BR) are described in internal manuals. There are three manuals with regard to rolling stock: the Locomotive and Running Shed Manual, Carriage and Wagon Manual, and Mechanical Workshop Manual. The present versions were written in 1964 and 1965, during the period when it was still the Pakistan Eastern Railway, but fundamentally, they were inherited from the period

of British rule. All three manuals are predicated on locomotive-hauled trains, and since the MRT Line 6 system differs considerably, there are no specific parts to be used as reference for the present MRT plan.

2.4.3 Operation

2.4.3.1 General Rules

Rules relating to the operation of Bangladesh Railway are described in the General Rules, which are BR's internal regulations. These regulations describe the details of operations such as signaling, block systems, CTC, train departure procedures, etc.

However, these regulations are based on the assumption that diesel locomotive trains will be operated, and there are no parts that can be specifically referred to with regard to the present MRT plan featuring an ATC system.

Chapter3 Legal Framework for Dhaka Metrorail Project

3.1 General

Since the period of rule, the United Kingdom influenced the legal culture in Bangladesh, where Act sets forth every power of the Government, rights and duties of the citizens. Without delegation by the Act, no legal forms may impose any duties on the citizens. In Bangladesh, such legal forms include Rule and Regulation, which shall be established by the public administration. Choice of Rule or Regulation depends on the entity to which the Act delegates the power, i.e. the Government or the Authority. It means power to make Rule and Regulation belongs to the Government and the Authority, respectively. Both of them are legally binding and require consultation with the Government, particularly the Ministry of Law. With respect to the legal framework for the Metrorail Project, however, the Authority drafted the Metrorail Rules to be enforced by the Government.

Directive is another form of administrative documents. As this it has no legal binding power, either the Government or the Authority by itself may issue through the internal procedures without consultation with other entities. In this sense, Directive is in the similar form as Circular Notice in Japan. Meanwhile, in Bangladesh, Act may delegate its power to impose duties, offences and penalties to Directive. In light of ease of issuing, Directive is a preferred form for the subject requiring frequent alterations, e.g. technical statements.

The legal framework in Bangladesh is, therefore, summarized in the following table 3.1.

Table 3.1 Legal Framework and Statutory Power in Bangladesh

	Statutory Power	Issuing Body	Consultation	Remarks
Act	Power of the Government, rights and duties of the citizens	Parliament		
Rule	Discretionary power of the Government delegated by Act	Government	Ministry of Law	
Regulation	Discretionary power of the Authority delegated by Act	Authority	Respective Ministry and Ministry of Law	
Directive	No legally binding power	Government or Authority	Board of Authority	Specific Directive may become legally binding if delegation of power is stated in the Act

3.2 Legal Framework for Dhaka Metrorail Project

Bangladesh earlier decided to build the Metrorail Act as a fundamental law for Metrorail development in the nation and compose the legal framework through a combination of Rule, Regulation and Directive by delegation of powers from the Act. Therefore, every power of the Government, rights and duties of the Metrorail business operator and the citizens must be vested in the Act, while actual administrative procedures for the exercise of powers in the Act shall be prescribed in the rules.

For the choice of legal forms, special attentions must be paid to the ease of issuing. Otherwise, it will be hard to meet the implementation schedule of the Metrorail Project. Also, ease of issuing becomes important when any amendments in the legal forms are required, e.g. from time

to time making changes in the technical standards to reflect technology innovations. For these reasons, with respect to the legal framework for Metrorail development in Bangladesh, all the necessary administrative procedures are incorporated in the Rules, while technical standards and other subjects that require frequent changes are defined in the Directives.

Chapter4 Assistance for Enactment of Metrorail Act

4.1 Policy and Approach for Assistance

Prior to this study, JICA dispatched experts since 2011 on "Institutional Building Assistance (IBA) for Dhaka Mass Rapid Transit System Project". The IBA confirmed the legal framework for development of Dhaka MRT and prepared the first draft of Urban MRT Act. Based on the result of these activities, Bangladesh side prepared "the Metrorail Act" in 2013.

This study pertaining to legal setup is to assist the enactment of the Metrorail Act over the approval process. In particular, the Study Team from time to time addressed requirements of the concerned ministries for clarifications and enhancements of the draft Act during the review inside MoRTB, amendments to obtain cabinet nods, until the parliament approval.

Policy and approach of the Team's assistance for enactment of the Metrorail Act are as follows.

- Ensuring flexible, adaptable, and well-balanced assistance to meet the needs of Bangladesh side as well as to enhance the effect of MRT Line 6 Project.
- Ensuring timely approval and institution of the Act in close liaison with Bangladesh side in order to accelerate the implementation of MRT Line 6 Project.
- Dispatching information about the progress on enactment of legislations, regulatory framework, and outlines in order to promote the activities of the entities interested in the MRT Project.
- Strengthening the function of public administration and enhancing public service through the development of sound regulatory system and structuring of good governance.
- Building capacity of the personnel involved in institutions and enforcement of the Act, rules, and directives till completion of the Project and after commencement of service.

4.2 Procedures and Anticipated Schedule for Enactment

4.2.1 Procedures and Progress

In 2011, the Institutional Development Assistance (JICA expert dispatching program) confirmed the necessity of new legal framework for the mass transit development in Dhaka. This was based on the decision of the Bangladesh Government to completely separate the institutional systems from the existing Bangladesh Railway. In the course of the said IBA program, the JICA expert team prepared the first draft of the Act and presented to the Secretary of ex-MOC and the Executive Director of DTCA. The Bangladesh side later determined the policy to simplify the Act and give broad power and duties in accordance with the legal culture of the nation. The first revision was prepared by the Bangladesh side and made available in September 2013 when this study began. Since then, the Team provided continuous assistance in review of the Act, answers to the queries and comments from ministries, and preparation of enhanced drafts.

Procedures and progress for enactment of the Metrorail Act, 2014, are illustrated in the following table. The Act is now in force by virtue of ordinary operation of the parliament despite political imbroglio and thanks to the attention of Bangladesh side to keep the Act as the highest priority. Cabinet nods and parliament approval were widely reported in the local media.

Table 4.1 Procedures and Schedule for Enactment

General Admin. Procedures for Passing a Bill of an Act	Progress	Expected timing
- Preparation of the draft Act by DTCA	Completed	Beginning of this study
- Endorsement by MOC (by the Deputy Secretary)	Completed	October 2013
- Inter-ministerial coordination	Completed	Since October 2013
- Public comment period	Completed	November 2013
- Circulation to the line ministries and other entities	Completed	April 2014
- Receiving of comments and making of a draft bill	Completed	Since May 2014
- Cabinet meeting	Completed	27 April 2014
- Review by MOL, preparation of the final bill	Completed	Since May 2014
- Cabinet meeting	Completed	28 November 2014
- Notification to MOC the result of review by MOL	Completed	January 2015
- Parliamentary approval of the bill	Completed	2 February 2015



Source : bdnews 24 (Left) the Daily Star (Right)

Figure 4.1 Media Report (Left: Cabinet Nods, Right: Parliament Approval)

4.2.2 Engagement of Local Consultant

In preparation of the draft Act and subordinate rules, etc., the Team hired a local consultant for the purpose to review the legal framework, prepare texts in English and Bengali, catch up the progress of enactment and institution, etc.

Till now, the consultant attended the meeting organized by the ministries, gave legal advice during the inter-ministerial meetings, checked progress of enactment from time to time, and delivered English translation whenever major revisions of any provisions were made. In close liaison with the Team, the consultant made significant contribution to the enactment within the study period.

4.3 Basic Research on Legal Framework

4.3.1 MRT Act in Japan and Asian Countries

Referable legislations to the draft Metrorail Act vary in each country. Some apply “Railway Act” covering nationwide railway network, while others established a kind of “Metrorail Act” separately from such Railway Act. Comparing these legislations in a single uniform is generally hard as the backgrounds of railway development, legal culture (Common Law and Civil Law), scheme of railway business, regulatory regime (direct government regulation or regulation based on market principle), extent of privatization, asset ownership, etc., are different in each country. With this understanding, the Team reviewed the following legislations in Asia.

- Japan Railway Law, Railway Business Law
- India Metrorail Construction Act, Delhi Metro Act, Kolkata Metro Act
- Singapore Rapid Transit Systems Act, Public Transport Council Act
- Thailand Mass Rapid Transit Authority Act

4.3.1.1 Scheme of Railway Business

Each country has different scheme of railway business, i.e. direct (in-house) management by the public entity (India, Thailand), licensing (permission) system (Japan, Bangladesh), or both (Singapore). Choice of business scheme is largely influenced by the institutional framework for public service and the extent of deregulation.

Table 4.2 Scheme of Railway Business

Japan	<ul style="list-style-type: none"> • In response to the application, the Government assesses and grants license (or give permission) to the applicant.
India Thailand	<ul style="list-style-type: none"> • In compliance with the business plan designed by the Government, a public entity (e.g. State-Owned Enterprise) directly manages and carries out railway business. • Through exchange of concession contract, public entity may appoint concessionaire to carry out railway business on its behalf.
Singapore	<ul style="list-style-type: none"> • In compliance with the business plan designed by the Government, a public entity (e.g. State-Owned Enterprise) directly manages and carry out railway business, or; • In response to the application, the Government assesses and grants license (or give permission) to the private entity.

4.3.1.2 Fare Fixation

Each country has different approach for fare fixation, i.e. direct fixation by the Government (India, Bangladesh), fixation of upper limit by the Government and determination of fare within the limit by the Operator (Japan, Singapore, Thailand). Choice of fare fixation model is largely influenced by the degree of maturity of the market economy and the extent of privatization.

Table 4.3 Approaches for Fare Fixation

Japan Singapore	<ul style="list-style-type: none"> • Application of upper limit by the Operator and fixation of upper limit by the Government • The Operator determines the fare within the limit.
Thailand	<ul style="list-style-type: none"> • Application by the Operator (normally Concessionaire) and approval by the Government • Determination of fare under Concession Agreement

India	<ul style="list-style-type: none"> • Direct fare fixation by Fare Fixation Committee appointed by the Government
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4.3.1.3 Confirmation of Safety, etc.

Where the Government directly manages and carries out railway business, such as in India and Singapore, site-entry inspection is required for opening of the system to the public. In the meantime, no technical examinations are mandated till completion of works. When carrying out this on-the-spot inspection, the Government or the Authority appoints individual inspectors or commissioners giving power to such individuals. In the case of Thailand, no legislations give such power of inspection to the Authority. It means the Authority must carry out internal supervisions and audits with the power of the project owner.

Meanwhile in Japan, where the private sector shall obtain license for carrying out railway business, the Government examine technical soundness through drawings prior to the commencement of construction works. In addition, site-entry inspection is mandated for opening of the system to the public which is similar to the case of Singapore and India. In the case of Japan, however, the Government shall appoint inspectors and commissioners from public administration (not individuals) to carry out site-entry inspection. Therefore, such orders shall also be made by the public administration.

Table 4.4 Confirmation of Safety, etc.

India Singapore	<ul style="list-style-type: none"> • Specialist appointed by the Government (Inspector or Commissioner) shall, as and when required, carry out inspections and audits with the jurisdiction as an individual. • In India and Singapore, any person may be appointed.
Japan	<ul style="list-style-type: none"> • Officer of the Ministry shall carry out inspection and audit as prescribed in the provisions of permission under the Law and Ordinance. • As and when required, ad-hoc inspection may be performed.
Thailand	<ul style="list-style-type: none"> • Without any legal bases, inspections and audits are performed by the public entity as the project owner.

4.3.1.4 Technical Standards

Each country has different approach for the status of technical standards, i.e. “standards specified by the Government and the Operator to develop detailed standards for execution” or “leaving the responsibility of developing technical standards to the Operator”.

Table 4.5 Status of Technical Standards

Japan, India	<ul style="list-style-type: none"> • Standards specified by the Government and the Operator to develop detailed standards for execution in compliance with the requirement.
Thailand, Singapore	<ul style="list-style-type: none"> • Leaving the responsibility of developing technical standards to the Operator.

4.3.2 Review of Existing Legislations Relative to Metrorail

For the development of Act, rules and directives in relation to implementation and operations of MRT Line 6, the Team identified the existing legislations requiring coordination with the new Act.

4.4 Analysis of the Metrorail Act

This section provides the result of analysis of the Act in comparison with the similar legislations in Japan (Railway Law and Railway Business Law), India (Metrorail Construction Act, Delhi Metro O&M Act, and Kolkata Metro O&M Act), Singapore (Rapid Transit Systems Act), and Thailand (Mass Rapid Transit Act). It should be noted, however, each country has

differences in their historical backgrounds, legal culture (Common Law or Civil Law), regulatory regimes (direct government regulation or regulation based on market principles), extent of privatization, asset ownership, etc., which significantly influence on the provisions of each legislation.

4.4.1 Comparative Analysis of Regulatory Systems

4.4.1.1 Scheme of Railway Business

In Bangladesh, the relationship of the Authority (regulatory body) and Corporation (operating body) is commonly applied to public transport services, such as public bus and inland water transport sectors. The same approach is envisaged for institutional framework of the MRT Line 6 with the provision of licensing system.

4.4.1.2 Fare Fixation

In Bangladesh, the Government directly fixes fare based on the recommendation of the Fare Fixation Committee. This decision was made because of the opinion that the Operator should not have a freedom to set fare as the entity is to receive subsidy for O&M service (this idea resembles to the case in India where the Government directly appoints railway business entity). It implies, in other words, the Government should determine the upper limit of the fare as in Japan and Singapore when the Operator becomes financially sustainable by itself.

4.4.1.3 Confirmation of Safety, etc.

In Bangladesh, the Act gives DTCA the comprehensive power of technical authorization, including facility, rolling stock, maintenance, and safety management. Similar to the case in Japan, the licensee must obtain such approvals prior to the commencement of works or use. The concrete procedures need to be framed in the subordinate rules.

The Act gives power to the Inspector as an individual as in India and Singapore. Meanwhile, the inspectors shall be appointed from the members of regulatory authority unlike in India and Singapore.

4.4.1.4 Technical Standards

In Bangladesh, technical standards are framed as "the directive" that the regulatory authority has the power to mandate to the licensees. Any departures from the technical standards shall obtain prior approval from the authority.

4.4.2 Comparative Analysis of Each Provision of the Act

Section 1: Short title, application and commencement

Section 2: Definition

Section 3 : Overriding Effect of the Act

Section 4: Acquisition of Land for Implementation of Metrorail

Section 5: Special Provision

Section 6: Overriding Effect of Section 5

Section 7: Requirement of License for the Operation of Metrorail

Section 8: Application for license, renewal of license, etc.

Section 9: Issuance of license, etc.

Section 10: Transfer of license

Section 11: Selection Committee

Section 12: Establishment, operation and maintenance of Metrorail on the basis of PPP

Section 13: Right to entry

Section 14: Restriction on stopping civic facilities, etc. without prior approval

- Section 15:** Compliance to technical standards, etc.
- Section 16:** Submission of report to the authority
- Section 17:** Fare Assessment
- Section 18:** Fare Assessment Committee
- Section 19:** Publication of Fare Related Information
- Section 20:** Reservation of Seat
- Section 21:** Appointment of Inspector
- Section 22:** Power of Inspector
- Section 23:** Providing assistance to the Inspector
- Section 24:** Appellate Authority
- Section 25:** Awarding compensation
- Section 26:** Medical Treatment of Accident Victim
- Section 27:** Report on fatal accident
- Section 28:** Compulsory insurance for Metrorail and passenger
- Section 29:** Compensation of third party for accident of Metrorail
- Section 30:** Establishment, Operation, Maintenance and Development of Metrorail without License
- Section 31:** Penalty for Transfer License
- Section 32:** Penalty for obstructing right to entry
- Section 33:** Penalty for creating obstruction on Metrorail construction, development, operation and performing any other activities including maintenance
- Section 34:** Penalty for unauthorized trespass to the restricted area of Metrorail
- Section 35:** Penalty for impeding safety of Metrorail and its passengers
- Section 36:** Penalty for selling Metrorail ticket or pass without authorization or distorting or counterfeiting ticket or pass
- Section 37:** Penalty for abuse of Metrorail or its machinery by employee
- Section 38:** Obstructing Inspector in Performing Duty or Providing False or Misleading Information
- Section 39:** Penalty for not causing insurance
- Section 40:** Penalty for Travelling by Metrorail without Ticket or a valid pass
- Section 41:** Penalty for not Following Technical Standards
- Section 42:** Commission of Offence by Operator
- Section 43:** Penalty for Abatement, Instigation and Conspiracy of Commission of Offence
- Section 44:** Penalty for Recommitting Offence
- Section 45:** Cognizance of Offence
- Section 46:** Application of the Criminal Procedure
- Section 47:** Jurisdiction of Mobile Court
- Section 48 :** Delegation of Powers
- Section 49:** Power to Make Rules
- Section 50 :** Powers to Make Regulations
- Section 51 :** Publication of English Translated Text

4.4.3 Comments on Metrorail Act

The Metrorail Act adequately prescribes obligations, offences and penalties, and powers and duties of the licensees and individuals in execution of Metrorail business. According to the provisions of the Act, involvement of the public administration over the Metrorail business consists of the following.

- [Licensing System] Metrorail business is regulated by licensing system and initiated by the application of the interested entity.

- [Fare Fixation by Committee] Fare is fixed by the Fare Assessment Committee appointed by the Government and assessed once a year by the same Committee.
- [Technical Authorization System] Technical inspections and audits, etc., are under the jurisdictions of the Inspector appointed from the officers of DTCA.
- [Reporting System] The licensee shall report necessary information to the public administration.

The entire regulatory system is thought to be built in combination of the 4 regulatory tools above. Therefore, the Team is of the opinion that the draft Act has, at least, necessary provisions to be functional for Metrorail business.

In the meantime, the Team identified the following issues for the practical operation of the regulatory system. In the opinion of the Team, attentions must be paid in development of the subordinate rules and enforcement of the entire system.

- With the regulatory systems embodied in the Metrorail Act, namely licensing, fare assessment, technical authorization and reporting, the entire administrative procedures can be structured. However, enforcement of the same will be made possible only when the actual procedures are specified in the subordinate rules. This is the reason why continuous efforts are required for establishment of rules and directives.
- Notwithstanding the licensing provision of the Act, the first-ever Metrorail project in Bangladesh envisages the business scheme similar to the direct appointment to DMTC. It means the regulatory regime is hard to understand as the regulatory authority and the licensee are substantially the same body. Besides, there are some contradictions due to the mixture of the several regulatory systems, e.g. direct fare fixation by the government under licensing system. For this reason, further assistance may be required for effective execution of the regulatory system.
- The Act was based on the case studies in overseas, yet highly adjusted to the local requirements, e.g. the license has its definitive period and fee must be charged upon every update. Although the Team paid due attentions to the differences in the legal culture, i.e. Common Law and Civil Law, actual execution of the legal system should require, from time to time, interpretation in accordance with the legal precedent or otherwise amendment of the provision itself.

Chapter5 Assistance for Institution of Rules Framed under Metrorail Act

5.1 Policy and Approach

In institution of rules framed under the Metrorail Act, the Team assisted the Bangladeshi side with, in addition to the policy and approach for enactment of the Act, the following.

- Ensuring consistent and undeviating designs of institutions from the Metrorail Act.
- Ensuring highly effective regulatory regime even under the briefed Act by clearly stating the entire procedures without omission and being just enough.
- Developing the regulatory system on the basis of Japanese execution standards to enable continuous support for implementation with the initiative of JICA, while adjusting and fitting to the practice of Bangladesh.

5.2 Structure of Necessary Rules

The Team firstly introduced the regulatory systems and administrative procedures of Japan as the most referable case for the better understanding of the Bangladesh side. Subsequently, the Team prepared the first draft and adjusted sentence by sentence with the DTCA officers and the Bangladeshi legal expert. During this exercise, each rule was adjusted and refined in consideration of institutional framework, administrative culture, administrative capacity, future development of Metrorail network, etc., in Bangladesh.

5.2.1 Regulatory Tools of the Government and the Authority

The regulatory systems under the Metrorail Act in Bangladesh encompass several categories putting into;

- Licensing System prescribing that no person may operate Metrorail Business without a license. Any person who intends to operate the business shall submit the application to the Authority.
- Fare Assessment System prescribing that Fare Assessment Committee appointed by the Government shall determine the fare and assess it at least once a year.
- Technical Authorization System enforced by the regulatory authority.
- Safety Management System where the regulatory authority has a power to collect reporting and information to ensure safety.
- Entry Inspection which shall be performed by an Inspector appointed from the officers of the Authority.

Therefore, the regulatory system must be structured with the regulatory tools of the above.

5.3 Approach for Designing of Regulatory System

The Team designed each regulatory system with the following approach.

5.3.1 Licensing System

Railway Law of Japan prescribes permission (licensing) of railway business, deviation of basic business plan, approval of transfer of license upon organizational changes of the licensee etc., order for improvement, cancelation and termination of license. In the meantime, the Metrorail Act specifies that the subordinate rules shall set forth these procedures. For this reason, the Team prepared the draft rules on licensing based on the Railway Law and the execution standards of Japan.

5.3.2 Fare Assessment System

In Japan the Minister of MLIT approves the upper limit of the fare in consideration of the

application made by the Operator, while the Metrorail Act of Bangladesh prescribes that the Fare Assessment Committee directly determines the fare, taking the financial capacity of the Operator and the affordability of the citizens, which may be comparable to the provision of the Delhi Metro O&M Act of India (According to the opinions of the Bangladeshi side, the Operator should not have a freedom to set fare as the entity should receive subsidy for O&M service. It implies, in other words, the Government should determine the upper limit of the fare as in Japan and Singapore when the Operator becomes financially sustainable by itself). However, none of the subordinate rules for fare fixation is framed under the Delhi Metro Act.

As seen in the case of India, the Government secures flexibility of fare determination by not clearly specifying the fare formulae, yet keeps high independence of the Committee in order to avoid arbitrary interference and political intervention (in particular, the Committee consists of 3 persons including the chairperson from the judge of high court and one member each from the Central Government and the Local Government, plus one sitting judge from the high court).

In preparation of the draft rule on fare assessment, the Team clearly states that the Operator shall adapt the fare determined by the Committee, fare shall be assessed by the Committee once a year, yet in the event of radical inflation, etc., the Operator may request for fare assessment.

5.3.3 Technical Authorization

Under the licensing system such as in Japan and United Kingdom, where only outlines of the railway business is being examined at the time of granting license, the regulatory authority must assess the proposed railway in the design stage. This assessment focuses on, not only the technical soundness to ensure safety, but also the compliance to the requirements of the license.

A series of this assessment may be carried out by the regulatory authority or the Inspector with the power as an individual. Whereas individual power tends to be respected particularly under the Common Law Culture, it is highly recommended to give the final decision making power to the regulatory authority itself as the assessment is part of the enforcement to make the licensing system effective.

From this standpoint, the Metrorail Act clearly specifies that the power of technical authorization shall be vested to the regulatory authority. Therefore, the Team designed the technical authorization procedures, including approval for commencement of construction works, confirmation of rolling stock designs, inspection upon completion of works, notification of train operation plan, notification of Safety Management System, to enforce control over Metrorail facility, rolling stock, train operation and safety management.

5.3.4 Reporting System

As the scope of this study does not include the regulatory systems after opening of the Metrorail system to public, reporting system (annual and occasional on accidents and business) must be developed in the next phase of this assistance.

5.3.5 Inspection System

Act prescribes that the Authority may appoint an Inspector, duties and powers of the Inspector shall include the right to entry and collect information from the Operator. Therefore, the inspection system envisages that the inspection upon completion of works shall be performed by the Inspector as it requires "power to entry", while final decision shall be made by the regulatory authority based on the result of inspection by the Inspector.

The rules on technical audit after opening of the system to public are not included in the rules developed in this study.

5.3.6 Procedures and Authorizations Structured in the Rules

The following table indicates the structure of approving procedures and authorizations under the rules.

Table 5.1 Regulatory System of Japan and according to the Provisions of Metrorail Act of Bangladesh

Procedures in Japan	Procedures in Metrorail Act
Licensing	Licensing System
Change of basic business plan	
Approval of transfer of business	
Order to improve business activities	
Suspension of business	
Rescission of business	
Safety management regulation	Inspection System
Notification of technical standards	
Approval of execution of construction (incl. deviation of const. plan)	
Validation of rolling stock	
Notification of operation plan	Inspection System (incl. On-the-spot Inspection)
Completion inspection of construction	
Inspection & audit (safety, account, service)	Inspection System (On-the-spot Inspection)
Reports (annual and occasional on accidents and business)	Reporting System
Obtaining reports, on-site inspection	Inspection System (On-the-spot Inspection)
Investigation of accidents (by Japan Transport Safety Board)	
Fare fixation and adjustment	Fare Assessment System

Note: The rules on pre-opening procedures are highlighted in color.

5.4 Progress and the Latest Draft of the Rules

With the draft Rules, the Study Team made a continuous efforts to explain and discuss with DTCA, MOC and MOL on the regulatory system to be enforced by DTCA. In particular, DTCA was promoted to have a better understanding of rules till the opening of the first line structured by 5 regulatory tools, namely i) licensing, ii) fare fixation, iii) technical authorization, iv) reporting, and v) inspection. DTCA and the legal expert successfully reviewed and refined the draft rules sentence by sentence with the attendance of the Team.

In drafting the rules,

- The Team paid full attention to the difference of administrative procedures in Bangladesh and Japan and highly adjusted to meet the local requirements, e.g. renewal of licence.
- The Team carefully proposed the choice of "application - approval" and "notification - acknowledgement", i.e. the licensee shall obtain approval from the regulatory authority under technical authorization (as this is mandated in the Act), while the licensee shall just notify the Safety Management System (as any delays in the procedure is unacceptable for the timely opening of the Metrorail system)

The draft rules are summarized as follows:

5.4.1 Chapter 1 (Preliminary)

Section 1 : Short title

Section 2: Definition

5.4.2 Chapter 2 (Licence)

Section 3: Formation of Selection Committee

Section 4: Application for a licence

Section 5: Procedures to examine the application for a license

Section 6: Recommendation by the Selection Committee

Section 7: Issue of licence

Section 8: Cause of Disqualification

Section 9: Amendment of condition of licence

Section 10: Application for amendment

Section 11: Transfer of licence

Section 12: Suspension or cancelation of licence

Section 13: Notification for suspension by operator

Section 14: Notification for cancelation by operator

Section 15: Application for renewal of licence

Section 16: Renewal of licence

Section 17: Licence fee

Section 18: Licence re-issue fee

Section 19: Re-fundability of licence

Section 20: Licence preservation and display

Section 21: Type of Metrorail System

Section 22: Salient features of Metrorail System

Section 23: Necessary documents regarding financial ability

Section 24: Route alignment drawing

Section 25: Order to improve Metrorail business

5.4.3 Chapter 3 (Right to Entry)

Section 26: Restriction to right to entry

5.4.4 Chapter 4 (Technical Authorization)

Section 27: Permission for departure from technical standards

Section 28: Approval of construction plan of Metrorail system

Section 29: Metrorail System

Section 30: Application for approval of construction plan

Section 31: Construction plan

Section 32: Track alignment drawing

Section 33: Deviation of construction plan

Section 34: Application for deviation from approved construction plan

Section 35: Notification of minor deviation of construction plan

Section 36: Approval of completion of construction works

Section 37: The report of the Inspector and authorization of the Authority

Section 38: Inspection areas and period

Section 39: Application for approval of completion of construction works

Section 40: Preparation for taking inspection

Section 41: Approval of construction plan for alteration of existing Metrorail facility

Section 42: Application for approval of construction plan for alteration of existing Metrorail facility

Section 43: Notification of construction plan for minor alternation of existing Metrorail facility

Section 44: Approval of completion of revised Metrorail facility

Section 45: Approval of structure of rolling stock

- Section 46:** Manner of giving approval of structure of rolling stock
- Section 47:** Application for approval of structure of rolling stock
- Section 48:** Application for approval of alteration of structure or device of rolling stock
- Section 49:** Notification of alteration of structure or device of rolling stock
- Section 50:** Approval of train operation plan
- Section 51:** Application for approval of train operation plan
- Section 52:** Determination of safety management system 定
- Section 53:** Application for determination of Safety Management System
- Section 54:** Qualifications of Safety Manager
- Section 55:** Qualifications of Operations Manager
- Section 56:** Appointment and dismissal of Safety Manager and Operations Manager.
- Section 57:** Driver Instruction Manager

5.4.5 Chapter 5 (Fare)

- Section 58:** Qualification of members of Fare Assessment Committee
- Section 59:** Recommendation of the Fare Assessment Committee
- Section 60:** Determination of fare
- Section 61:** Fare collection etc.
- Section 62:** Application for review of fare

5.4.6 Chapter 6 (Appeal etc.)

- Section 63:** Appellate Authority
- Section 64:** Appeal
- Section 65:** Procedure followed by Appellate Authority
- Section 66:** Procedure during Appeal Hearing

5.5 Procedures and Anticipated Schedule for Institution of the Rules

5.5.1 Procedures and Progress

General administrative procedures for institution of the Rules and the progress as of July 2015 are illustrated as follows:

Table 5.2 Procedures and Progress for Institution of Rules

General Administrative Procedures for Institution of Rules (source: MOL)	Progress
- Preparation of the draft Rule by DTCA	Since April 2014
- Endorsement by MOC (practically by the Deputy Secretary)	Since April 2015
- Review by MOL, preliminary examination, preparation of the enhanced draft	In progress
- Notification of the result of examination to MOC	In progress
- Submission of the draft to the Prime Minister	Not started
- Approval by the President	Not started
- Finalization by MOL and verdict	Not started
- Submission to MOL, official announcement in national gazette	Not started

5.5.2 Action Plan toward Institution

The Team proposes the action plan toward institution as follows. At the same time as the following procedures, DMTC should prepare licensing application.

Table 5.3 Action Plan toward Institution

	Action	In charge	Due
1.	Review by MOL, preparation of the enhanced draft	MOL, MOC	August 2015
2.	Submission to the PM Office and approval by the PM	DTCA	September 2015
3.	Finalization by MOL and verdict	MOL	October 2015
4.	Official announcement in national gazette	MOC	October 2015

At the same time as the above procedures, DMTC should prepare licensing application. The following figure shows the procedures of granting license for the MRT project.

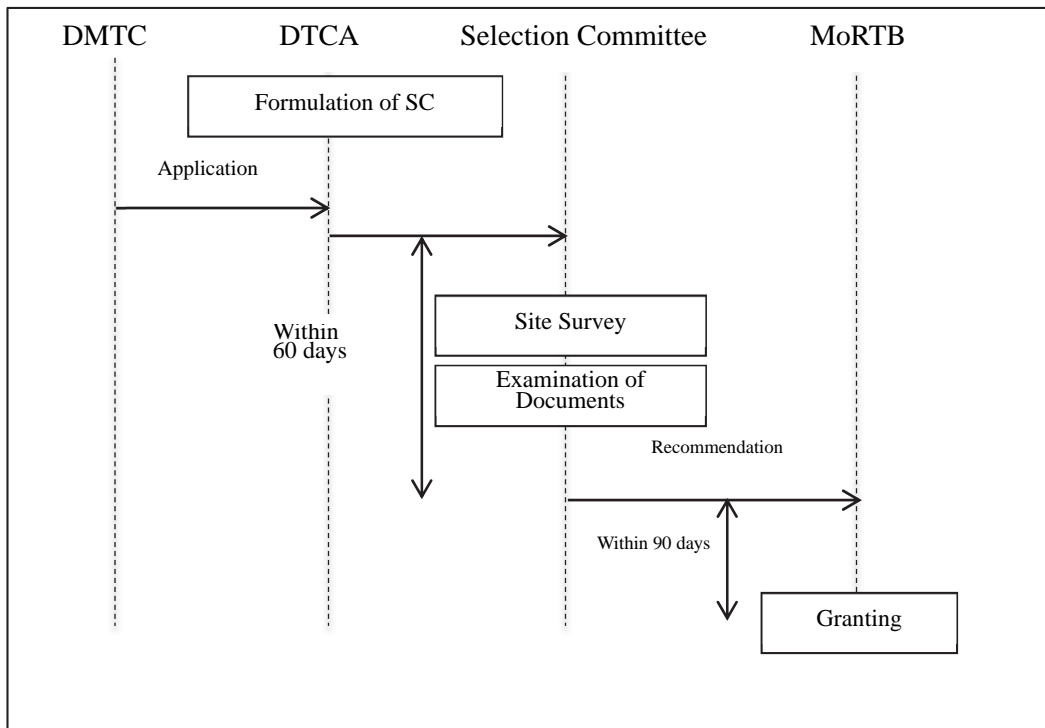


Figure 5.1 Procedures for Application and Granting Licence for MRT Project

Chapter6 Policy for Developing Technical Standards Required for Establishing MRT Line 6

6.1 Basic Policy for Development of Technical Standards

The situation with respect to developing Technical Standards was acknowledged at the stage when the first on-site study was completed. Regarding future Technical Standards development work, the various issues will be studied based on the terms and policies below.

6.1.1 Position of Technical Standards in the Legal System

Institutional Building Assistance for Dhaka Urban Transport Network Development in Bangladesh (Dhaka IBA) made proposals regarding the framework for the basic organizational system and development of laws. These proposals included the following:

- DTCA will be the MRT supervisory institution and receive support from an organization support system as a regulatory and supervisory institution.
- The DMTC must be supervised and an MRT with a high level of safety, security, and convenience must be achieved.
- The planning and regulatory/supervisory systems must be clearly defined in the related articles.

In line with this legal framework, Metrorail Technical Standards are to be prepared as examination Standards for the DTCA, which is the managing and supervisory institution.

6.1.2 Characteristics of Technical Standards

All matters concerning Metrorail structures and operations, including not only Technical Standards but also verification procedures, shall be set down in the provisions and sub-provisions of the Metrorail Act. Technical Standards in the sub-provisions are being created in order to emphasize the characteristics of Line 6.

Accordingly, given that related institutions in Bangladesh lack extensive technical expertise, the scope of the content and items covered by the Act's provisions was narrowed down, specified, and simplified as much as possible in order to facilitate moving forward with various procedures for MRT Line 6, taking into account the characteristics that the line should have.

6.1.3 Relationship to Japanese Technical Standards

Railway Technical Standards in Japan are comprised of the following:

- A “Ministerial Ordinance” stipulating obligatory performance requirements
- “Interpretation Standards” stipulating specific, quantified reference criteria which are non-binding, with no performance requirements.
- “Commentaries” that indicate reference documents, actual calculation examples, how to deal with special cases, etc.

In principle, all railway operators must observe the Ministerial Ordinance. Meanwhile, each operator must establish its own “Implementation Standards” (detailed Standards that reflect their actual individual circumstances while falling within the range of performance requirements), using

the Interpretation Standards, Commentaries, etc., as reference, which are submitted to the supervisory agency in advance to confirm that they comply with the Ministerial Ordinance.

Since the Technical Standards for Dhaka MRT are to be established specifically as Standards for MRT Line 6, it was decided to create them by excerpting sections from the Japanese Ministerial Ordinance, Interpretation Standards, and Commentaries which are necessary for the construction of Line 6. Given this, there are a high proportion of mandatory regulations that include specific numbers. Despite this, however, it is also necessary to take into account the view that, since the line may be developed with support from various other countries, the Standards have to be versatile.

Therefore, when it came to considering the nature of the Technical Standards that will form the basis of Dhaka MRT technology, the work was pursued by keeping in mind the aforementioned factors while determining the following:

- The extent to which specific numbers and methods should be incorporated as mandatory regulations
- The portion of the regulations which should be discretionary and flexible in light of global railway technology development trends

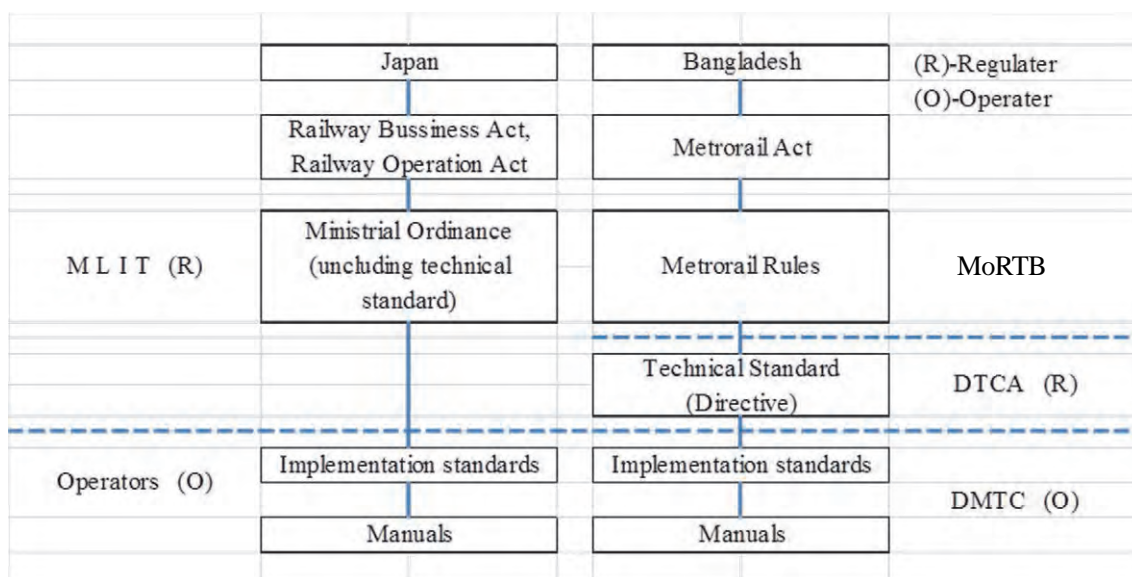


Figure 6.1 Regulatory Framework

6.1.4 Organizational Structure of DTCA

Based on the results of the first on-site investigation:

- At present, the DTCA's adaptive capability is limited with respect to MRT Technical Standards, structural regulations, etc., while its technical capability to perform management, supervision, and reviews of planning, design, construction, operation, and maintenance is completely non-existent.
- It is clear that it will not be easy to establish a review system for the impending Line 6 project.

- As a solution, it will be essential to have the support (proposed by the IBA) of an organizational support system when it comes to implementing the Technical Standards to be established as a part of the legal system. It will be necessary for this support to be maintained until workers with the required technical skills have been developed in the DTCA and DMTC. If this issue is not handled correctly, it could lead to inappropriate interference with the DTCA, which has strong decision-making power with respect to the nature of the Dhaka MRT, which may cause confusion.

6.1.5 Relationship with Other Future Railways

Technical Standards will be established as Standards specifically for Line 6 to be constructed in the immediate future. However, for matters relating to integration into a future MRT railway network, it was thought that some consideration should be given to applicability to subsequent railways, unification of Standards, etc. (e.g. common safety measures for fire prevention, etc., ensuring the possibility of through-train operation, streamlining operations through shared use of factories).

In addition, advance consideration has been given to underground installation, which will inevitably occur at connection points with other railways in future.

6.1.6 Consistency with Existing Laws and Regulations

Consistency with related existing laws and regulations, such as those relating to electricity, building Standards, fire prevention, environment, urban planning, etc., must be confirmed. On the other hand, since Dhaka MRT is a transport system which is fundamentally different from the existing Bangladesh Railway when it comes to electrification, use of CTC, etc., it is not necessary to seek technical and operational consistency with the existing Railway Act of Bangladesh.

6.1.7 Applicability of Japanese Technology

When formulating Technical Standards, as much consideration as possible will be given to facilitating the introduction of Japanese technology for items for which it is logical or necessary to do so. In particular, the applicability (scope and degree) of Japanese technology whose introduction has been agreed for the yen-loan-financed MRT Line 6 project to the Dhaka transport system will be taken into account. For example, consideration will be given to promoting the introduction of the contactless IC card format (in technological collaboration with JICA), lightweight rolling stock, etc.

6.2 Composition of Each Sector

6.2.1 System for Technical Standards

Railway transport safety and so forth is ensured when the following are integrated through overall management by railway operators: employees possess the required knowledge and skills, facilities and rolling stock possess the required features, and operations are handled in the required manner. For this reason, the national Technical Standards have been formulated based on the belief

that it is logical to indicate the required features and operating instructions for various facilities as part of a single, integrated system. In establishing Technical Standards for Dhaka MRT, it was decided to proceed by following the Japanese system for Technical Standards.

6.2.2 Railway Structures

6.2.2.1 Basic Principle

In designing railway structures, it is necessary to ensure that structures and parts are sufficiently safe with respect to the loads in effect during construction and use, and that trains can be run safely and comfortably. Moreover, consideration should be given to ease of construction, having sufficient durability in accordance with the design lifetime, ease of maintenance work, and environmental friendliness. Matters to be considered when designing railway structures were stipulated based on these criteria.

6.2.2.2 Design of Structures

1) Design Standards

The Technical Standards for this project explain that internationally recognized design Standards should be applied, and in particular, the Design Standards for Railway Structures and Commentary applied in design and construction of railway structures in Japan may be used.

2) Earthquake-resistant design

According to RHD's design Standards for bridges and culverts, seismic load is based on AASHTO, while the regional coefficients to be applied should be those stipulated in the Bangladesh National Building Code (BNBC). In addition, the detailed design of the Padma Multipurpose Bridge was based on AASHTO Bridge Design Specifications, 4th Edition (2007), and verification methods were designated according to the seismic scale.

The most suitable verification methods will need to be selected in the detailed design phase. At the present time, the Technical Standards indicate that the approach to seismic load is based on the BNBC.

3) Design load

The train load used in design will be determined based on the trains and rolling stock to be used in the relevant sections. However, since MRT Line 6 is exclusively for trains and the size of rolling stock is planned to be within 16 t of axle load, a load case of "M-16" was indicated in the Technical Standards.

Others

4) Design lifetime

5) Bearings

6) Environmental friendliness

a) Bangladesh Environmental Conservation Act

b) The Environmental Conservation Rules

- c) The Environmental Court Law
- 7) Cable ducts
- 8) Drainage facilities
- 9) Flooding countermeasures
- 10) Disaster prevention facilities
- 11) Protection of areas beneath bridges, etc.
- 12) Evacuation facilities

6.2.2.3 Maintenance of Structures

1) Inspection of newly constructed structures and trial operation

The Technical Standards explain inspection and trial operation, based on the understanding that these should be conducted to confirm that the structure allows safe operation of trains and that the initial inspection conducted for newly constructed or renovated/replaced structures will provide the initial values for managing future maintenance of deformation, etc.

The method for the initial inspection and so forth should be based on the Maintenance Standards for Railway Structures (hereafter referred to as “Maintenance Standards”).

- 2) Monitoring of main lines
- 3) Periodic inspection of structures
- 4) Records

6.2.3 Tracks

6.2.3.1 Basic Principle

The basic requirements for normal railway tracks are: they can guide rolling stock in the designated direction; they can tolerate the anticipated load of rolling stock; they do not have any deformations which may affect safe operation of trains; and they do not require complicated maintenance work, etc. Their scale varies according to the purpose of passenger transportation on the railway. Since Dhaka MRT Line 6 is inner-city transportation, passengers must be transported to their destination rapidly via safe and stable operation. It is necessary to indicate basic Standards for track structures that can satisfy these requirements.

6.2.3.2 Composition of Technical Standards

The main essential items comprising basic track structures are as follows:

- 1) Gauge
- 2) Track alignment
- 3) Track radius
- 4) Straight line between curves
- 5) Length of circular curves
- 6) Cant
- 7) Slack

- 8) Transition curves
- 9) Gradient
- 10) Vertical curves
- 11) Formation level width
- 12) Distance between track centers
- 13) Tracks
- 14) Turnouts
- 15) Guard rails
- 16) Rolling stock overruns prevention
- 17) Preventing entry onto tracks and protecting tracks
- 18) Evacuation facilities, etc.
- 19) Track signage
- 20) Crossings with other tracks
- 21) Crossings with roads
- 22) Road crossings

6.2.4 Buildings

6.2.4.1 Basic Principle

1) Basic items in proposed Standards

As basic items in the Standards, station facilities and passenger passageways must be able to withstand anticipated loads and not impair safe rolling stock operation and passenger usage. In addition, stations need to be constructed by taking into account the number of boarding/d disembarking passengers.

6.2.4.2 Composition of Technical Standards

1) Design Standards

Regarding railway station facilities, as mentioned above, items related to fire prevention, barrier-free facilities, etc. in the existing Bangladesh National Building Code should be complied with. However, for structures relating to newly constructed urban railway stations, the basic Technical Standards shall be followed rather than the existing Code for the purpose of building architecture.

2) Station facilities

Station facilities are: platforms, facilities for passenger circulation (passageways, concourses, stairs, passenger overpasses, elevators, escalators, etc.), customer service facilities (gates), waiting facilities (ticket offices, waiting rooms), business facilities (station facilities), toilets, lighting fixtures, and information facilities (guidance signs, location signs, information signs, regulation signs, etc.).

3) Platforms

4) Passenger passageways

5) Barrier-free facilities

6) Railway stations established inside buildings

Giving advance consideration to future urban development plans, Standards were specified that assume the establishment of railway stations inside commercial and residential development buildings constructed on privately owned land by railway companies and the like.

In principle, it is stipulated that railway and development building structures shall be separate and that railway structures shall comply with the present Standards while development building structures shall comply with the existing Bangladesh National Building Code Standards.

6.2.5 Stations

6.2.5.1 Basic Principle

Stations play an essential role in passenger transportation as railway connection points. Stations must be able to handle the passenger volume for the section, be able to function appropriately and be fully equipped with the facilities required to handle trains/rolling stock, and be suited to the train operating conditions.

Stations are required to have facilities necessary for handling passengers, facilities providing useful information for passengers, and so forth. Safe transportation services that anyone can easily use are desired.

Station facilities include: railroad tracks with an effective length for stopping trains based on the length of operating trains; bookstores; platforms; passenger passageways; machinery and equipment such as escalators and elevators; information displays and guiding signs; and other related electrical equipment. Recently in Japan, there have notably been many incidents of passengers falling from the platform onto the tracks, so consideration must be given to ensuring passenger safety by incorporating facilities that will prevent this, disabled-friendly facilities, etc.

Stations also include depots (rail yards), etc., which should have sufficient capacity to accommodate the number of rolling stock used in the section, and it is necessary to install sufficient inspection and repair facilities for inspection and repair work conducted in the depot.

6.2.5.2 Composition of Technical Standards

Station-related items are as follows:

- 1) Track layout at stations
- 2) Station facilities
- 3) Platforms
- 4) Passenger passageways, etc.
- 5) Depots, etc.
- 6) Main line turnouts

6.2.6 Electricity/Power Transformation

6.2.6.1 Basic Principle

In principle, with regard to Technical Standards that will be applied to MRT Line 6, Japanese railway electrical facility Technical Standards was followed, while respecting the basic plan in the Feasibility Study (F/S). Furthermore, assuming that recent IT and new technology will be introduced to MRT Line 6 in the future, consideration has been given to establishing technically flexible Standards that will not hinder their introduction. In parts where the introduction of new technologies, etc. is assumed, it was decided to specify performance Standards without specific descriptions. Also, with regard to materials used for railways, there has been remarkable progress in research and development in recent years, with more high-quality, high-performance materials continuing to appear. For this reason, only material features will be stipulated in the Standards, rather than specific descriptions.

6.2.6.2 Composition of Technical Standards

These Technical Standards have been prepared by referring to the Ministerial Ordinance from Japan's MLIT, and specific figures to be applied to MRT Line 6 were prepared by extracting figures from the Interpretation Standards.

Railways are required to ensure transportation with a high level of safety and stability at all times. Similarly, a high level of reliability is demanded of for electrical facilities as well.

Railway electrical facilities are comprised of circuit facilities, substation facilities, distribution facilities, signaling facilities, and communications facilities.

The main items for electrical Technical Standards are as follows:

- 1) Key details of facilities such as trolley wires
 - a) Feeding system
 - b) Messenger wire system
 - c) Lightning damage prevention measures
- 2) Key details of facilities such as substations
 - a) Measures to keep out outsiders
 - b) Fire prevention/extinguishing facilities
- 3) Key details of electrical equipment, switchboards, etc.
 - a) Facilities for equipment
 - b) Equipment
 - c) Electrical equipment
 - d) Grounding of electrical facilities

6.2.7 Signaling/Communications/OCC

6.2.7.1 Basic Principle

It is assumed that a cab signal system and Automatic Train Control system (ATC) will be introduced for MRT Line 6. Since the introduction of a signal system incorporating new technologies is possible for MRT Line 6, only the cab signal system will be stipulated. Japanese railway electrical facility Technical Standards will again be applied for signaling and communications facilities, and based on the assumption that recent IT and new technologies will be incorporated into MRT Line 6 in future, consideration has been given to establishing technically flexible Standards that will not hinder their introduction.

6.2.7.2 Key Details of Signal/Safety Equipment

1) Signal equipment

Since it is assumed that a cab signal system and Automatic Train Control system (ATC) will be introduced for MRT Line 6, the Technical Standards will stipulate the conditions for sending stop signals to cab signal devices.

It is stipulated that whatever type of signal system is used, it must indicate stop signals for the purpose of ensuring safety.

2) Safety communication equipment

The Technical Standards will stipulate that safety communication equipment for dedicated lines should be installed between electricity control locations and train control locations, between electricity control locations and substations, and between train control locations and stations.

3) Crossing safety equipment

The Technical Standards will stipulate that safety communication equipment must be able to warn crossing pedestrians of danger from trains approaching and to block passage via crossing streets in order to ensure the safety of crossing pedestrians, train operations, etc.

4) Control facilities

The Technical Standards will stipulate the installation of systems to record train operation status at the Operational Control Center (OCC) as well as the main items to record.

6.2.8 Rolling Stock

6.2.8.1 Basic Principle

These Technical Standards shall be the Technical Standards applied to the rolling stock (EMU) that will be used for MRT Line 6, and they shall take into consideration the specifications of lightweight rolling stock, whose use has been agreed upon.

The present Technical Standards shall be based on those parts of Japan's Ministerial Ordinance and Interpretation Standards for railway Technical Standards which cover rolling stock structure and safety for urban railways; the natural conditions in Dhaka and other social conditions, such as the power supply situation, shall also be taken into consideration.

6.2.8.2 Rolling Stock Structure

- 1) Rolling stock gauge
- 2) Weight of rolling stock, etc.
- 3) Stability
- 4) Rolling stock running equipment, etc.
- 5) Traction power generation devices
- 6) Braking devices
- 7) Structure of car bodies
- 8) Structure of driver's cabin
- 9) Structure of passenger cars
- 10) Structure of doors for boarding/disembarking passengers
- 11) Structure of gangway entrances and gangways
- 12) Structure of emergency exits
- 13) Coupling devices
- 14) Driver's cab facilities
- 15) Internal pressure vessels and other pressure supply sources and accessories
- 16) Rolling stock accessory devices
- 17) Rolling stock signage
- 18) Rolling stock fire countermeasures
- 19) Functioning of equipment during power failures
- 20) Rolling stock facilities for single-person operation of trains
- 21) Equipment to record train operation conditions

6.2.8.3 Rolling Stock Maintenance

In addition to the fundamental principle that rolling stock must not be used unless it is capable of safe operation, Japan's Ministerial Ordinance stipulates matters concerning inspections and trial operations of newly manufactured rolling stock, train inspections, periodic rolling stock inspections, and recording of inspections. Furthermore, inspection types and intervals are decided and announced based on the Ministerial Ordinance. The minimum requirements for Dhaka MRT rolling stock

Technical Standards will be stipulated based on the Ministerial Ordinance and Interpretation Standards, while the details will depend on operators' implementation Standards.

6.2.9 Automatic Fare Collection System

6.2.9.1 Basic Principle

In Japan, no specific Technical Standards for automatic fare collection (AFC) are stipulated by the Ministerial Ordinance, and the major railway operators follow the Congress of Japan Railway Cybernetics standard (CJRC standard) established by Congress of Japan Railway Cybernetics. Since the Dhaka AFC system needs to be compatible with buses, BRT, etc., minimum requirements from this standpoint will be included in the Technical Standards.

6.2.9.2 Introduction of AFC

The Technical Standards will stipulate that railway operators shall incorporate AFC in order to collect fares without fail. It will also be stipulated that contactless IC cards must be used as tickets in the AFC system and that tokens with built-in contactless IC chips may be used for single-journey tickets. In addition, it will be stipulated that tickets must be compatible with IC card tickets for AFC systems that are being used or are planned to be used by public transportation systems other than MRT Line 6. Other matters to be stipulated include the consideration of weather conditions such as temperature and humidity and passenger safety and convenience.

6.2.9.3 Standards applied to AFC system

The required Standards for introducing AFC will be stipulated in the Technical Standards, taking into account its track record in Japan and the circumstances in Dhaka. Specifically, it will be specified that the AFC shall comply with ISO/IEC 15408 card security verification and ISO/IEC 18092 or ISO/IEC14443.

6.2.10 Operation/Transportation Plan

6.2.10.1 Basic Idea of Operation Department

Among the items in the Technical Standards system, the operation department supervised matters relating to staff and handling of operations with a view to ensuring the safety and stability of railway operations.

6.2.10.2 Staff

In order for the system to function properly and safely, it was stipulated that there is a need to train and educate station staff, including those who perform maintenance of facilities, train protection equipment, and rolling stock, with regard to the required knowledge and skills.

In particular, in cases where staff are directly engaged in train operation (drivers, etc.), since physical or mental inaptitude for the task or lack of knowledge and skills could directly or indirectly cause accidents, it was stipulated that such staff must have the aptitude, knowledge, and skills required to

perform the work.

6.2.10.3 Train Operation

Basic items relating to train operation were stipulated:

- 1) Train composition
- 2) Train operation
- 3) Track closures
- 4) Rolling stock shunting
- 5) Rolling stock storage

When storing rolling stock, since there is a risk of unforeseen accidents occurring due to its movement, it was stipulated that movement of rolling stock shall be prevented while it is stored.

6) Ensuring train safety

Since it is planned to introduce ATC for Dhaka MRT Line 6, it was stipulated that ATC will be the normal operating method.

When there is no conductor and operations are to be performed by the driver only, the driver will perform the relevant operating tasks for the train, so it was deemed necessary to introduce an Automatic Train Operation (ATO) system, facilities to ensure the safety of passengers at embarkation/disembarkation points, and equipment that enables communication with stations and the control center in the event of an emergency.

7) Running speed

6.2.10.4 Railway Signals

It was decided that railway-related signaling shall be as follows:

- 1) Railway signals
- 2) Cab signals
- 3) Hand signals
- 4) Special signals
- 5) Signs
- 6) Indicators

6.2.11 Underground Facilities

6.2.11.1 Basic Principles

1) Possibility of underground tunnels

The basic plan for MRT Line 6 completed by the GC (General Consultants) contracted by the DMTC is based on an elevated railway. However, there is a strong possibility that extension plans for MRT Line 6 or plans for other future lines will include underground urban railway tunnels, with a view to maintaining the urban landscape or existing traffic routes, as in other major Asian cities.

Based on this, in preparing the Technical Standards, it was decided to include Standards predicated on the use of underground tunnels.

2) Adoption of Japanese Standards

From a technological (including safety) and economic standpoint, we recommended the adoption of the Japanese Standards for future underground lines be used in Dhaka. In particular, in cases where two lines financed by different donors connect at one underground station, it is essential to adopt the same fire protection Standards to ensure safe, prompt evacuation of passengers.

3) Basic items in proposed Standards

The basic items in the proposed Standards follow Japan's Ministerial Ordinance and Interpretation Standards. They will stipulate that tunnels shall be able to withstand anticipated loads, that they shall be free from any impediments to safe rolling stock operation due to deviation of structures caused by trains' load, impact, etc., and that ventilation facilities shall be installed in accordance with the required ventilation air volume while flood prevention facilities and drainage equipment shall be installed in accordance with the required drainage volume.

6.2.11.2 Composition of Technical Standards

1) Design Standards

In principle, the Design Standards for Railway Structures and Commentary (Cut and Cover Tunnel) and Design Standards for Railway Structures and Commentary (Shield Tunnel) will be applied.

2) Flooding prevention

3) Smoke exhausts facilities

4) Evacuation guidance facilities in stations and between stations

5) Fire extinguishing facilities

6) Fireproofing of buildings, etc.

7) Disaster prevention control centers

8) Alarm equipment

9) Notification equipment

10) Fire doors

11) Flood prevention facilities

12) Drainage equipment

13) Other facilities

14) Manuals, etc.

6.3 Comparison with Other Countries

We traveled to Thailand and India to conduct on-site surveys of their respective MRT (Mass Rapid Transit) and subway (Delhi Metro) systems, conducting interviews with their research departments and observing their railway facilities. Their Technical Standards are handled as described below.

1. Data for urban railway structure facilities in countries adjacent to Thailand and India is shown in Table 6.1.

2. Design Standards (codes) applied to designs and specifications for railway structures in countries

adjacent to India and Thailand are shown in Table 6.2.

Table 6.1 Key Data for Urban Railways in Neighbor Countries

	Bangkok Blue Line	India Hyderabad Metro	Singapore MRT	Vietnam MRT
Gauge	1,435mm	1,435mm	1,435mm	1,435mm
Design speed	80km/h	80km/h	—	130km/h
Curve radius (Minimum)	Mainline:300m Absolute 200m Depot: 100m	Mainline: 400m Absolute 120m Platform area: 1000m	Mainline: 500m Absolute 400m Depot: 190m	Mainline: 160m Depot: 100m
Length of pure circular arc between transitions (Minimum)	25m Preferred 50m Absolute 17m	25m	50m Absolute 20m	Length of rolling stock
Length of straight track between the ends of the curves (Minimum)	25m Preferred 50m Absolute 17m	25m Preferred 40m	50m Absolute 20m	Mainline: Length of rolling stock Side track: 5m
Gradients (Maximum)	Mainline: 3.0% Absolute 4.5% Station area: level	Mainline: 2.0% Absolute 4.0% Station area:0.1%	Mainline:2.5% Absolute3.0% Station area: level	Mainline: 3.5% Stabling area: 4.5% Station area: 0.5% (No coupling and decoupling) 1.0%
Distance between two track centers (Minimum)	4.4m	Ballasted track: 3.65m Ballast-less: 3.60m	No encroaching into each structure gauge	Rolling stock gauge +600mm (Rolling stock having a structure that prevents a passenger from extending any part of body out of the window) Rolling stock gauge + 400mm
Train loading	Vehicle length: 23.5m Distance of wheel axle to fix bogie: 2.30m Axle load: 175kN	The United Kingdom highways Agency Departmental Standard BD 37/01 (BS 5400)	The United Kingdom highways Agency Departmental Standard BD 37/01 (BS 5400)	Vehicle length : 20.0m Distance of wheel axle to fix bogie : 2.10m Axle load : 16t
Side platform width (Minimum)	To any objections: 4.25m To any continuous wall: 3.25m	Requirements of NFPA 130	—	At ends: 1.5m At center: 2.0m Preferred: 5.0m
Central platform width (Minimum)	(Each side of platform) To any objections: 4.25m To any continuous wall: 3.25m	Requirements of NFPA 130	—	At ends: 2.0m At center: 3.0m Preferred: 7.0m
Platform clear width from nosing	To any objections: 4.25m To any continuous wall: 3.25m	Requirements of NFPA 130	—	To any objections: 1.5m To any continuous wall: 1.0m
Platform nosing above rail level	1,100mm	1,100mm	—	1,100mm

*Source of reference

- **Bangkok Blue Line**

MRT BLUE LINE EXTENSION PROJECT contract documents
Between “Mass Rapid Transport Authority of Thailand” and “Italian-Thai Development Public Company Limited”
CONTRACT 1: UNDERGROUND CIVIL WORKS
VOLUME 5 OUTLINE DESIGN SPECIFICATION

- **India Hyderabad Metro**

Elevated Mass Rapid Transit System through Public Private Partnership
‘MANUAL OF SPECIFICATIONS AND STANDARDS’ issued by Government of Andhra Pradesh

- **Singapore MRT**

‘CIVIL DESIGN CRITERIA FOR ROAD AND RAIL TRANSIT SYSTEMS’ issued by Land Transport Authority

- **Vietnam MRT**

TCVN8585: 2010/BGTVT (national Standards of Vietnam issued by the Vietnam Standard and Quality Institute)
‘Urban railway Standards for Mass Rapid Transit (MRT) - General technical requirements’

Table 6.2 Design Standards Applied to Design of Civil Structures in Neighbor Countries

Standard publications or Standard Codes of practice (Design and loading requirements for the civil structures)
Codes, Standards and specifications applicable for design of the components of the Rail System

Thai Bangkok Blue Line <i>Source: Specification in contract document</i>	India Hyderabad Metro <i>Source: MANUAL OF SPECIFICATIONS AND STANDARDS</i>	Singapore MRT <i>Source: CIVIL DESIGN CRITERIA FOR ROAD AND RAIL TRANSIT SYSTEMS</i>	Vietnam MRT <i>Source: Design Standards list of Phase I stage in Hanoi Line-1</i>
AASHTO American Association of State Highway and Transportation Officials	AASHTO American Association of State Highway and Transportation Officials	AASHTO American Association of State Highway and Transportation Officials	AASHTO American Association of State Highway and Transportation Officials
AREA American Railway Engineering Association	AREA American Railway Engineering Association		
ASTM American Society of Testing and Materials	ASTM American Society of Testing and Materials		ASTM American Society for Testing and Materials
BS British Standard	BS British Standard	BS British Standard BD	
EN Euro Norm	EN European Norm		EN Euro Norm
ASCE American Society of Civil Engineers	ASCE American Society of Civil Engineers		
CEB-FIP Comite Euro-International du Beton (CEB) and Federation International de la Precontrainte (FIP)	CEB-FIP Comite Euro-International du Beton (CEB) and Federation International de la Precontrainte (FIP)		
UIC The Union International des Chemins de Fer	UIC The Union International des Chemins de Fer	UIC The Union International des Chemins de Fer	
JIS Japanese Industrial Standards			JIS Japanese Industrial Standards
IBC International Building Code	IBC International Building Code		
	ISO International Standards Organization		ISO International Standards Organization
ACI American Concrete Institute	IRS Indian Railway Standards	SS Singapore Standard	Japanese Standards Design Standards for Railway Structures Vietnamese Standards 22TCN, 14TCN, TCVN, TCXD, TCXDVN, etc.
AISC American Institute of Steel Construction	IRC Indian Roads Congress		
ASBI American Segmental Bridge Institute	IS Indian Standard		
EIT Engineering Institute of Thailand	IEC International Electro technical Commission		
NAVFAC US Naval Facilities Engineering Command	NFPA National Fire Protection Association 'Standards for Fixed Guide-way Transit and Passenger Rail Systems'		
PCI Pre-stressed Concrete Institute	Indian Standard Hand Book on Steel Sections		
TIS Thai Industrial Standards	Indian Railways Manual on Design and Construction of pile foundations		
	The Persons with Disabilities Act		
	NBC National Building Code (of India)		
	ADA Americans with Disabilities Act		
	ADAAG ADA Accessibility Guidelines for Buildings and Facilities		
	Guidelines and space standard for Barrier free Built Environment for Disabled and Elderly Persons		
	BIS Bureau of Indian Standards		
	ANSI American National Standards Institute		
	AAMA American Architectural Manufactures Association		

Chapter7 Formulation of Regulations Relating to Train Handling Standards

7.1 Approach to Formulation

Japanese driver certification is a national license. The reason is that there are many licensees in Japan and driver certification is allowed to convert into other licensee. However, in Dhaka MRT where only one licensee exists at present at least and it is not thought drivers convert into the other licensee for the time being, it is not necessary to make the driver's certification the national license. Licensee should educate drivers and authorize certifications with responsibility. In France or Thailand, driver's certification is not made the national license, but it is being operated without problems actually.

Therefore, after having confirmed the above-mentioned policy in DTCA, it was decided that driver's certification was prescribed in Metrorail General Rules, 2015 (Schedule 9: Contents of Safety Management System) that was described in Chapter 4.

The current proposed Metrorail General Rules, 2015 has Safety Management System proposed by operators and stipulate that operators must stipulate items that should be followed in order to ensure safe transportation. One regulation covers items relating to certifications of drivers and other persons engaged in essential train operation-related tasks.

Train operation-related tasks notably include the need for drivers to operate trains carrying many passengers and to take rapid decisions on their own and respond promptly when abnormal situations arise. As a result, the proposed Metrorail General Rules, 2015 shall ensure that railway operators improve drivers' credentials and provide safe transportation by stipulating specific requirements that must be met for items relating to drivers' certifications.

On stipulating specific requirements, at the present that the sphere of business of driver does not become clear, to apply to the duties of the driver in future even if the sphere of business of the driver became anything, this technical standard is made minimum concise contents.

7.2 Positioning of Qualifications

For Dhaka's MRT, since it is planned to introduce an advanced safety system and there will be a single operator, licensee will use its own Standards for certification rather than the Government specifying train handling Standards. However, so that train operating safety will not be compromised, it prescribes driver's certification in Metrorail Rules, as a required item to describe in safety management system to submit to DTCA and a setup will be used whereby licensee implements the Standards under the control of the DTCA.

Chapter8 Making of application and approval procedure Manual based on the Metrorail rules

8.1 Purpose of making

For a construction start of MRT6 line, DMTC needs to carry out the procedures of Licensing, Safety Management System and Construction Plan based on Metrorail Act, 2015 and Metrorail General Rules, 2015. Metrorail General Rules, 2015 is going to be approved soon, but Study Team directly cannot carry out review and approval support that DTCA performs after various application and submission because this investigation is finished in August, 2015. Therefore it will be supported by making a manual that become the indicator in case of procedure.

8.2 Discussion with organizations concerned

In making, Study Team made much account of that procedures are finished smoothly, so Study Team repeated discussion with GC and IDC which supported DMTC of application and submission side as well as discussion with DTCA of review and approval side. In addition, toward application of licensing necessary immediately, Study Team coordinated role allotment of GC and IDC.

8.3 Summary of Manual (Attached document 6)

(1) Flow chart of the procedure

Various procedures such as Licensing, Safety Management System and Construction Plan based on Metrorail Act, 2015 and Metrorail General Rules, 2015 are explained visually by flow chart and make it easy to be understood.

(2) Procedure of Licensing

The purpose, outline of the procedure, Selection Committee and documents necessary for application are explained in regard to Licensing based on Metrorail Act, 2015 and Metrorail General Rules, 2015. Furthermore, the check list for DMTC and DTCA both sides to confirm that the procedure and the contents are satisfied is attached.

(3) Procedure of Safety Management System

The purpose, outline of the procedure, documents necessary for application and the contents are explained in regard to Safety Management System based on Metrorail Act, 2015 and Metrorail General Rules, 2015. Furthermore, the check list for DMTC and DTCA both sides to confirm that the procedure and the contents are satisfied is attached.

(4) Procedure of Construction Plan

Outline of the procedure, documents necessary for application and Completion Inspection of construction works are explained in regard to Construction Plan based on Metrorail Act, 2015 and Metrorail General Rules, 2015.

Furthermore, the check list for DMTC and DTCA both sides to confirm that the procedure and the contents are satisfied is attached.

(Only as for the necessary part of a rail yard that must level the land immediately)

8.4 Holding of the presentation meeting in respect of Manual (Attached document 7)

The presentation meeting in respect of Manual was held in DTCA meeting room on July 27, 2015, and Study Team member explained. The person concerned of DTCA and DMTC attended at the presentation meeting, and the person in charge of GC and IDC attended at it, too.

Chapter9 Formulating a Road Map and Work Plan for Developing Laws and Regulations Required for Dhaka MRT Project

The objectives of this study are supporting the approval of Metrorail Act, supporting the formulation of Technical Standards for Metrorail, preparing a Road Map for development of laws and rules required for the Metrorail project and proposing development activities for rules required for the development of subsequent phases.

The content of the Metrorail Act has been simplified from the original proposal, and basic items such as authorization of project or construction applications, setting of fares, and equipment function inspections have been removed from the Act, and will be governed by separately stipulated Metrorail Rules. As a result, provisions for licensing , construction authorization, fare setting, etc., that were initially to be stipulated in the Metrorail Act scheduled to be formulated in subsequent phases will be considered part of the Metrorail Rules (procedures before beginning operation). It is therefore necessary to legislate these together with the Metrorail Act. At present, discussions in the Bangladesh government are now underway for approval of final draft.

Legislation relating to obtaining certificate of train driver is also decided to prepare in this study.

Moreover, the Technical Standards for Metrorail in Bangladesh had approved by the DTCA board in May 2015 as directive.

In addition, with regard to project auditing rules, accident reporting rules, project reporting rules, and project accounting rules, it would be required to be developed as part of the Metrorail Rules (procedures after beginning operation) at least two to three years before beginning operation.

The relationship between the MRT project and relevant laws and rules is shown in the Road Map in Fig. 7.1 and the Work Plan for the relevant laws and rules in conjunction with the current project schedule is shown in Table 7.1

The abbreviations in Fig. 7.1 and Table 7.1 are as follows:

DTCA: Dhaka Transport Coordination Authority

DMTC: Dhaka Mass Transit Company

IDC: Institutional Development Consultant

GC: General Consultant

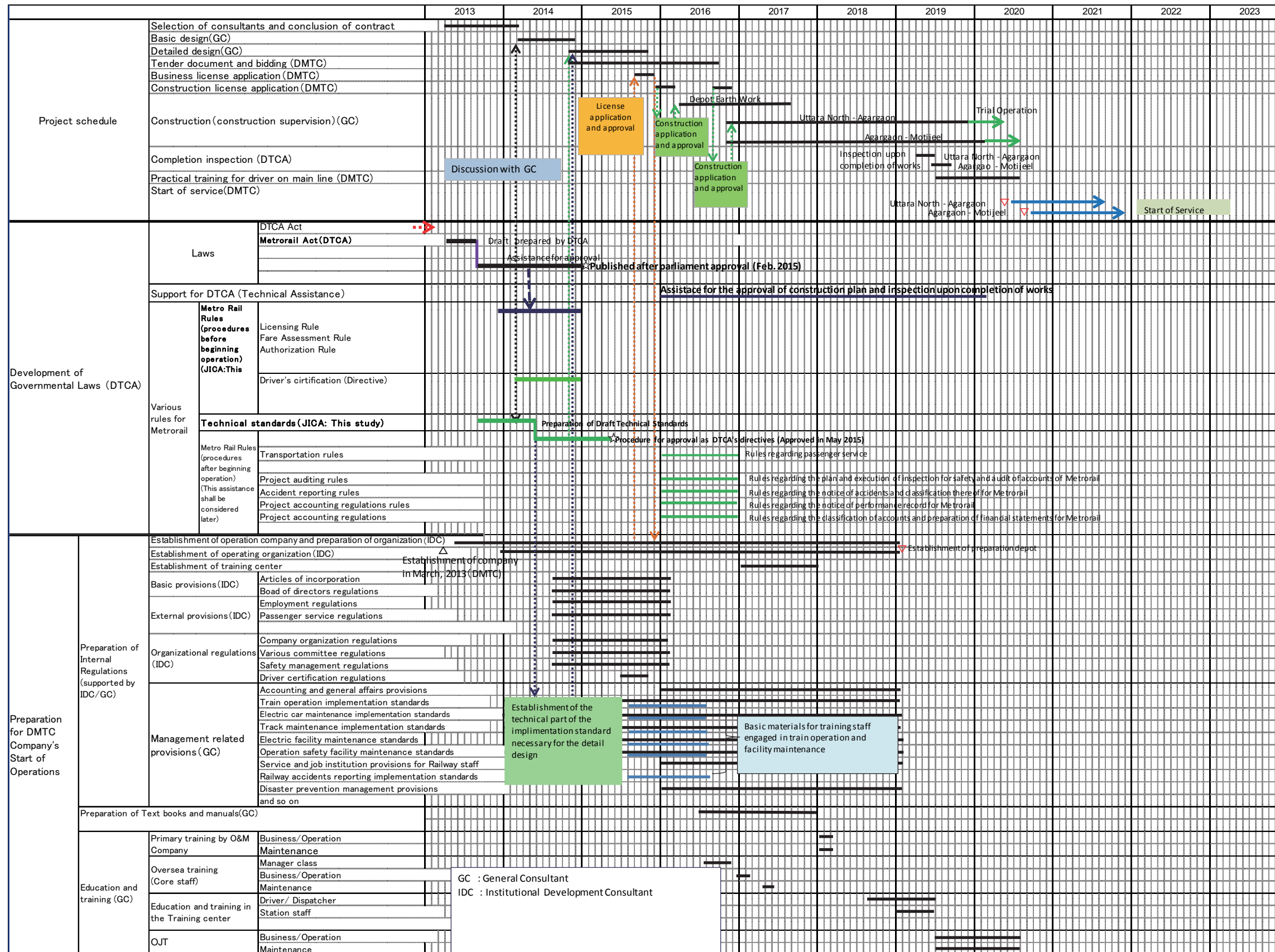


Figure 9.1 Road Map

Table 9.1 Work Plan for Development of Laws Required for Metrorail Project (Proposed)

Laws and Regulations			Party Responsible for Formulation	Formulation Period	Support	Remarks	
Development of Governmental Laws and Rules	Law	Metrorail Act	DTCA	May 2015 (Published)	JICA(This study)		
	Rules	Metrorail Rules (procedures before beginning operation)	DTCA	August 2015	JICA(This study)		
	Directives	Technical Standards	DTCA	May 2015 (Approved)	JICA(This study)	Already reflected to the design of MRT Line6	
		Train driver's certificate	DTCA	2015	JICA(This study)		
	Rules	Metrorail Rules (procedures after beginning operation)	Transportation rules	DTCA	2016	JICA (This assistance shall be considered later)	Rules regarding the passenger service
			Business auditing rules				Rules regarding the plan and execution of inspection for safety and audit of accounts of Metrorail
			Accident reporting rules				Rules regarding the report of accidents and classification thereof for Metrorail
			Business reporting rules				Rules regarding the report of performance record for Metrorail
			Business accounting rules				Rules regarding the classification of accounts and preparation of financial statements for Metrorail
	Preparation for DMTC Company's Start of Operations	Basic regulations	Articles of incorporation	DMTC	2015	IDC	
Board of directors regulations			2016				
External regulations		Employment regulations	DMTC	2016	IDC	Internal regulations regarding the employment condition of staff	
		Passenger service regulations		2016		Internal regulations regarding the passenger service	
Organizational regulations		Company organization regulations	DMTC	2016	IDC	Internal regulations regarding the company organization and assignment of work	
		Various committee regulations		2016		Internal regulations regarding the setting up committee	
		Safety management regulations		2016		Internal regulations regarding the safety management	
		Driver certification regulations		2016		Internal regulations regarding the certification of the train driver	
Management-related regulations		Accounting and general affairs provisions	DMTC	2016-17	GC		
		Various system implementation Standards		2015		Internal regulations regarding the structure and maintenance of facilities and rolling stock and regarding the train operation	
		Disaster prevention management provisions		2019		Internal regulations regarding the disaster prevention	

Chapter10 Results of This Study and Future Assistance

10.1 Overall status

As the situation in Bangladesh turned unstable from December 2013 to January 2014 and from January 2015 to February due to the confrontation between the ruling and opposition parties, the study team was forced to postpone or cancel some of the planned work in Bangladesh and the duration of this study was extended from the initial schedule.

At present, Metrorail Rules has not been approved yet but is expected to be approved soon since it is in the final stage. On the other hand, the Metrorail Act passed the Parliament on January 26, 2015 and was approved by the President and published by the official gazette on February 2. Technical Standards for the Metrorail has also been approved by the DTCA as the directive on May 28, 2015 as a directive. Therefore it can be said that the most of the objectives of this study have been achieved.

10.2 Work Progress Status

10.2.1 Assistance for Metrorail Act approval

The Metrorail Act was drafted under prior study by JICA, but the approval procedure was stalled. After the launch of this study, the draft, which was re-revised based on comments from JICA, the study team, etc. and inter-ministerial coordination, was presented to the intra-Governmental approval process and was reviewed by MOL after Cabinet approval on April 29, 2014. After revisions were made by the MOL, Cabinet approval was given again on November 10, 2014 and the draft bill was sent for a Parliamentary approval on November 30. After discussion at the committee in the Cabinet, the draft bill was enacted by the Parliament on January 26, 2015 and was approved by the President and published by the official gazette on February 2, 2015.

10.2.2 Status of institution of Metrorail Rules framed under the Metrorail Act

Since the early establishment of the Metrorail Rules stipulating procedures to be taken before starting operations, such as business license approval, fare fixation, approval of construction plan, etc., were confirmed to be needed, the study team prepared the draft Metrorail Rules and put to the approval process. It is expected to be approved soon since it is in the final stage.

10.2.3 Assistance for formulation of Technical Standards

The Technical Standards is regarded as “Directive” in the Metrorail Act. Although it is directive, the Technical Standards has the legal force by the provision of Metrorail Act. These Standards had approved by DTCA board on May 28, 2015.

10.2.4 Progress on development of the directive for train driver certification

The draft of directive for train driver certification prepared by the study team was submitted to the DTCA. This directive needs to be approved by DTCA board.

10.2.5 Supporting business license screening

As stipulated in the Metrorail Act, DMTC needs to obtain a license to conduct Metrorail business. Specific procedures for issuing license are to be stipulated in the Metrorail Rules under the Metrorail Act. DMTC will submit the application for obtaining business license as soon as the Metrorail Rules are established and then, DTCA will start screening for issuance. The study team has prepared the manual for these procedures and explained to DTCA, DMTC and other relevant organizations in the presentation meeting held on July 27, 2015.

10.2.6 Status of assistance for procedures for approval of construction plan and of the safety management system

As stipulated in the Metrorail Rules, procedures for approval of construction plan and of the safety management system are required to commence construction work. As the first stage of construction, the earth work in depot is planned to start at the beginning of 2016 in MRT Line6 project. Therefore the study team has prepared manuals for the approval of construction plan of the depot earth work and of safety management system, and explained them to DTCA, DMTC and other relevant organizations in the same meeting mentioned above.

10.3 Future technical assistance

10.3.1 Need for future assistance for DTCA

Under this study, we assisted DTCA till the formulation of Metrorail Rules that will be needed before starting operations and the preparation of manuals for the procedure for approvals of construction plan of depot earth work and of the safety management system.

Afterwards, DTCA will have to formulate Metrorail Rules that will be needed after starting operations, obtain approval for main civil construction work and installation of E&M system, and conduct final inspections of civil work, E&M system and rolling stock. After starting operations, DTCA staff will have to audit as an inspector.

It seems to be difficult for DTCA which have no experience in Metrorail to perform these tasks. Thus, it is assumed that providing continuous technical assistance to DTCA and capacity-building for DTCA staff is indispensable.

10.3.2 Assistance schedule

Details of technical assistance required before the commencement of operation of MRT Line 6 after this study and their timings are shown in Table 8.1.

Table 10.1 Details of Technical Assistance and Timing (plan)

Assistance	Items	Timing
Formulation of Metrorail Rules (procedures after commencement of operations)	Rules required after the commencement of operation such as Transportation rules, Project auditing rules, Accident reporting rules	2016
Approval of construction plan	Approval for construction plan of civil works, installation of E&M system Approval of safety management system	2016
Inspections upon completion of construction works	Inspection upon completion of civil works, installation of E&M system and rolling stock	2018-2020

Relations between the schedule of construction, the timing of approval of construction plan and inspections upon completion of works, and the schedule of assistance are shown in Figure 9.1.

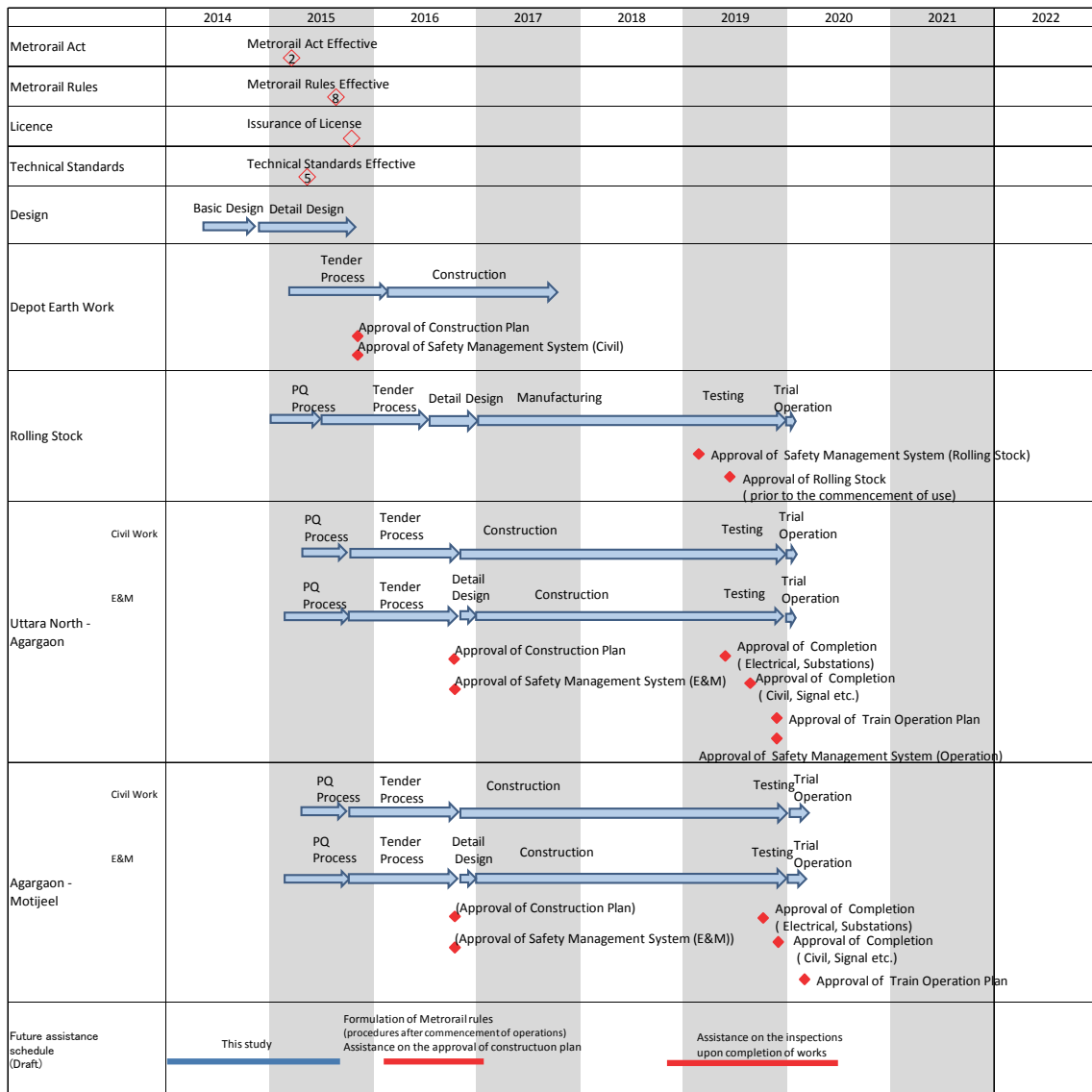
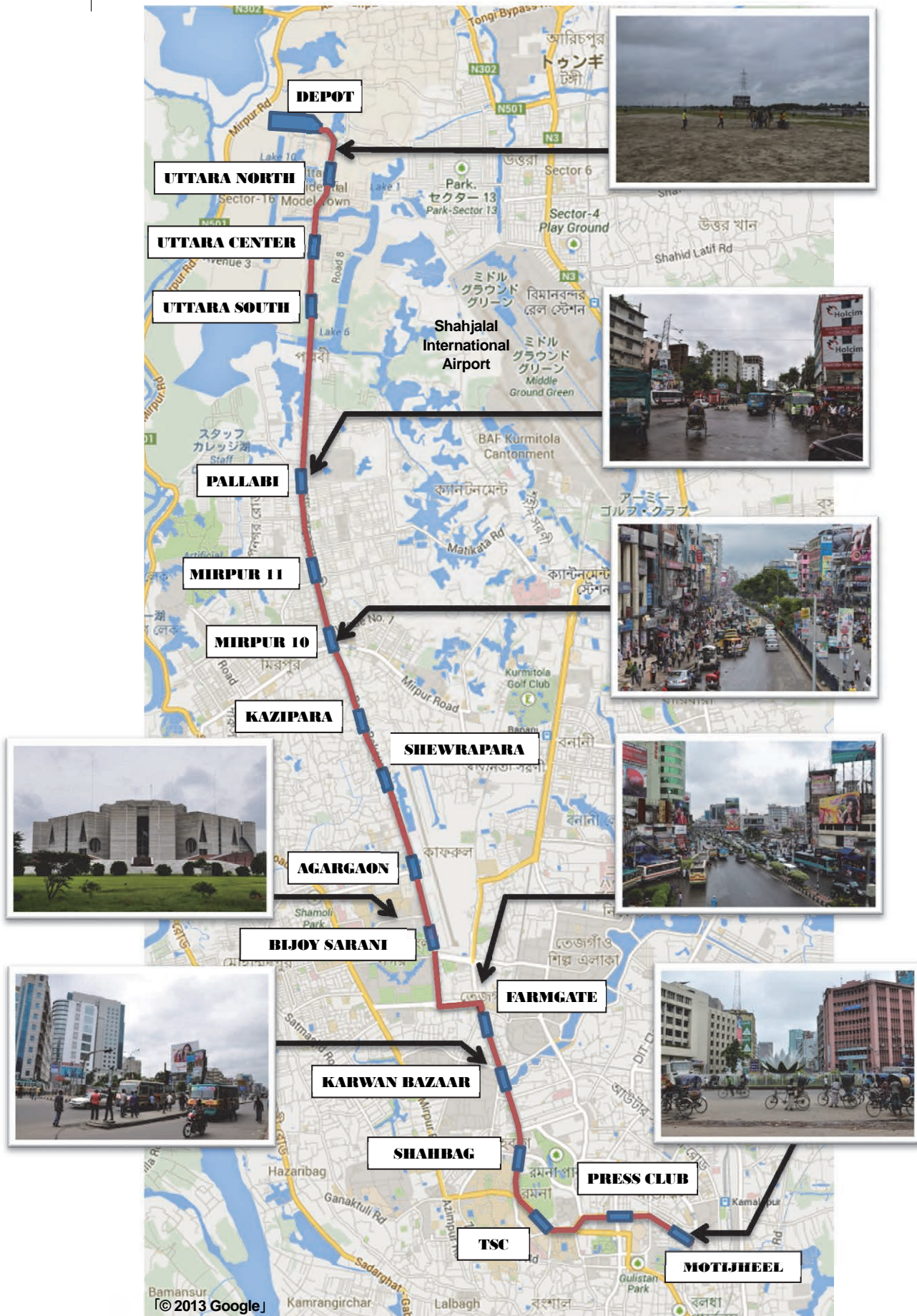


Figure 10.1 Timing of Approval of Construction Plan, Inspections upon completion and Assistance Schedule (plan)

Main Text

Present State of Areas along Proposed Dhaka MRT Line 6



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Remark: Figures and Tables without writing source are compiled by Study Team.

Abbreviation

AASHTO	American Association of States Highway and Transportation Officials
ADB	Asian Development Bank
AFC	Automatic Fare Collection
AFD	Agence Francaise de Developpement
ATC	Automatic Train Control system
BBA	Bangladesh Bridge Authority
BBS	Bangladesh Bureau of Statistics
BIWTA	Bangladesh Inland Water Transport Authority
BNBC	Bangladesh National Building Code
BOO	Build-Own-Operate
BOT	Build-Own-Transfer
BR	Bangladesh Railway
BRT	Bus Rapid Transport
BRTA	Bangladesh Road Transport Authority
BS	British Standard
CASE Project	Clean Air and Sustainable Environment Project
CPD	Centre for Policy Dialogue
CTC	Centralized Traffic Control
DAP	Detailed Area Plan
DCC	Dhaka City Coordination
DHUTS	Dhaka Urban Transport Network Development Study
DMA	Dhaka Metropolitan Area
DMDP	Dhaka Metropolitan Development Plan
DMRC	Delhi Metrorail Corporation Ltd
DMTC	Dhaka Mass Rapid Transit Company
DTCA	Dhaka Transport Coordination Authority
DTCB	Dhaka Transport Coordination Board
ED	Executive Director
ELC	Electric Inspector Clearance
EMU	Electric Multiple-Unit
FDI	Foreign Direct Investment
FS	Feasibility Study
GC	General Consulting Services
GDSUTP	Greater Dhaka Sustainable Urban Transport Project
GEF	Global Environment Facility
GIBR	General Inspector of Bangladesh Railway
IBA	Institutional Building Assistance for Dhaka Urban Transport Network Development
IC	Integrated Circuit
ICT	Information and Communication Technology
IDC	Institutional Development Consultant
IRC	Indian Railway Code
LGED	Local Government Engineering Department
LPAD	Legislative and Parliamentary Affairs Division
M/D	Minutes of Discussion
MEA	Metropolitan Electricity Authority
MOC	Ministry of Communication
MOEF	Ministry of Environment and Forest
MOP	Ministry of Power
MOR	Ministry of Railways

MoRTB	Ministry of Road Transport and Bridges (same as past MOC)
MRT	Mass Rapid Transit
MRTA	Mass Rapid Transit Authority of Thailand
NFPA	National Fire Protection Association
OCC	Operation Control Center
OTP	Office of Transport Planning
PPP	Public Private Partnership
PTC	Public Transport Council
RAJUK	Rajdhani Unnyan Kartipakkah
RDSO	Research Design and Standards Organization
RHD	Roads and Highways Department
STP	Strategic Transport Plan
STRASYA	Standard Urban Railway System for Asia
WB	World Bank

Chapter1 Outline of Work

1.1 Background of Work

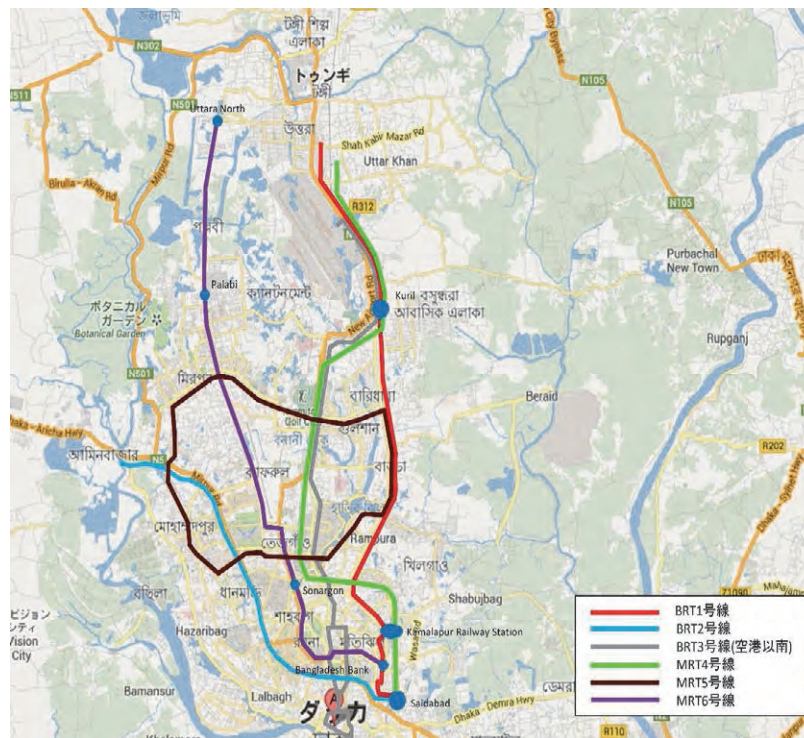
Dhaka, capital city of Bangladesh, and the surrounding areas (Dhaka Metropolitan Area: DMA), have a population of 9.15 million people. In the DMA, where there is no Mass Rapid Transit (MRT) system such as urban trains, urban transport depends heavily on road transport, and traffic congestion due to the intermingling of different modes of transportation such as automobiles, buses, and rickshaws has become a severe problem. Moreover, the deterioration of the transportation environment due to the air and noise pollution from traffic is growing worse and worse.

Given that the number of automobiles is also expected to increase further with the growth of the economy and the urban population in future, developing an urban transport system aimed at improving traffic conditions and the urban environment in the DMA has become a pressing issue. In light of these circumstances, in 2005 the Government of Bangladesh, with the Collaboration of the World Bank, formulated the Dhaka Strategic Transport Plan (STP) for the region.

The STP proposed that three lines in Bus Rapid Transit and three lines in Mass Rapid Transit were required.



Figure 1.1 A Traffic Jam in Dhaka



Source: prepared by the authors based on STP, DHUTS, etc.

Figure 1.2 Dhaka Urban Transport Network Plan

The Japan International Cooperation Agency (JICA) then conducted the Dhaka Urban Transport Network Development Study (DHUTS; 2009-2011) with the aim of constructing an urban transport system centered on MRT. Based on the results, it launched the Dhaka Mass Rapid Transit Development Project I (2012; loan-assisted; hereinafter referred to as MRT Line 6).

Meanwhile, the Government of Bangladesh had just begun institutional building relating to the MRT project. JICA dispatched Institutional Building Assistance for Dhaka Urban Transport Network Development (Dhaka IBA; 2011-2012; loan assistance specialists) as advisors to the government, who analyzed and assessed the basic organization system and proposed legislative framework. Specifically, JICA proposed that the Dhaka Transport Coordination Authority (DTCA) be responsible for planning and coordination relating to overall urban transport within the DMA and serve as a regulatory and supervisory institution once the system begins operation. It also proposed the formulation of the DTCA Act (already approved by the government) stipulating that the newly created Dhaka Mass Rapid Transit Company (DMTC) will handle project implementation and management/maintenance after the start of operations and the Metrorail Act, which will serve as the basis for company registration required for creating DMTC and urban railway business. However, legislation relating to railway business Technical Standards, General Rules (Standards), etc., which is required to implement the MRT Line 6 project, has not yet been developed.

At the present time, the General consultant (GC) for the MRT Line 6 project has been selected by the DMTC and basic design, detailed design, and preparations for bidding have been underway since February 2014. In order to ensure the efficacy of the MRT Line 6 project's outcomes, it is necessary to first develop Technical Standards, which is a basic requirement for the various types of design work, and structural rules (Standards) in the General Rules (Standards) (hereinafter collectively referred to as Technical Standards), and ensure that suitable project plans are formulated. In addition, this is the first MRT Project for the Government of Bangladesh, and there is no domestic expert or engineers who are well versed to the relevant expertise and knowledge. It is necessary; therefore, that railway operators of the countries with sufficient experience in MRT Projects should support the formulation of Technical Standards to be applied to the Dhaka MRT.

This work will be implemented to achieve the following as design Standards for Dhaka MRT projects, including the aforementioned MRT Line 6 project: developing the minimum required Technical Standards and formulating suitable designs; preparing legislative/regulatory proposals relating to Dhaka MRT, including MRT Line 6 and future lines, as well as producing a Road Map and Work Plan aimed at establishing an approval and licensing system under the various laws and regulations; and facilitating Cabinet approval of the Metrorail Act, which will serve as the basic law for MRT in Bangladesh.



Source: DHUTS Report
 Figure 1.3 MRT Line 6 Route Map (First Plan)

1.2 Objectives of Work

This work will be implemented to achieve the following objectives with respect to MRT projects in Dhaka, Bangladesh, including the aforementioned MRT Line 6 project.

Table 1.1 Objectives of Work

Objective 1	Developing the minimum required Technical Standards for formulating technical plans, etc.
Objective 2	Revising the legislative/regulatory system relating to Dhaka MRT, including MRT Line 6 and future lines
Objective 3	Preparing the relevant laws/regulations and producing a Road Map and Work Plan aimed at establishing an approval and licensing system
Objective 4	Facilitating Cabinet approval of the Metrorail Act , which will serve as the basic law for MRT in Bangladesh

For this work, based on the Minutes of Discussion (M/D) signed by both JICA and DTCA on June 26, 2013, in order to achieve the above Objectives of Work for Dhaka Mass Rapid Transit Development Project I, the study described in the Work Implementation Method will be conducted and the Deliverables (reports, etc.) will be prepared and submitted. In conjunction, the authors will monitor the progress of this work as a whole and the progress status of the overall MRT Line 6 project and verify consistency with the work scope, schedule, etc. of GC and IDC for MRT Line 6.

Table 1.2 Work Implementation Method

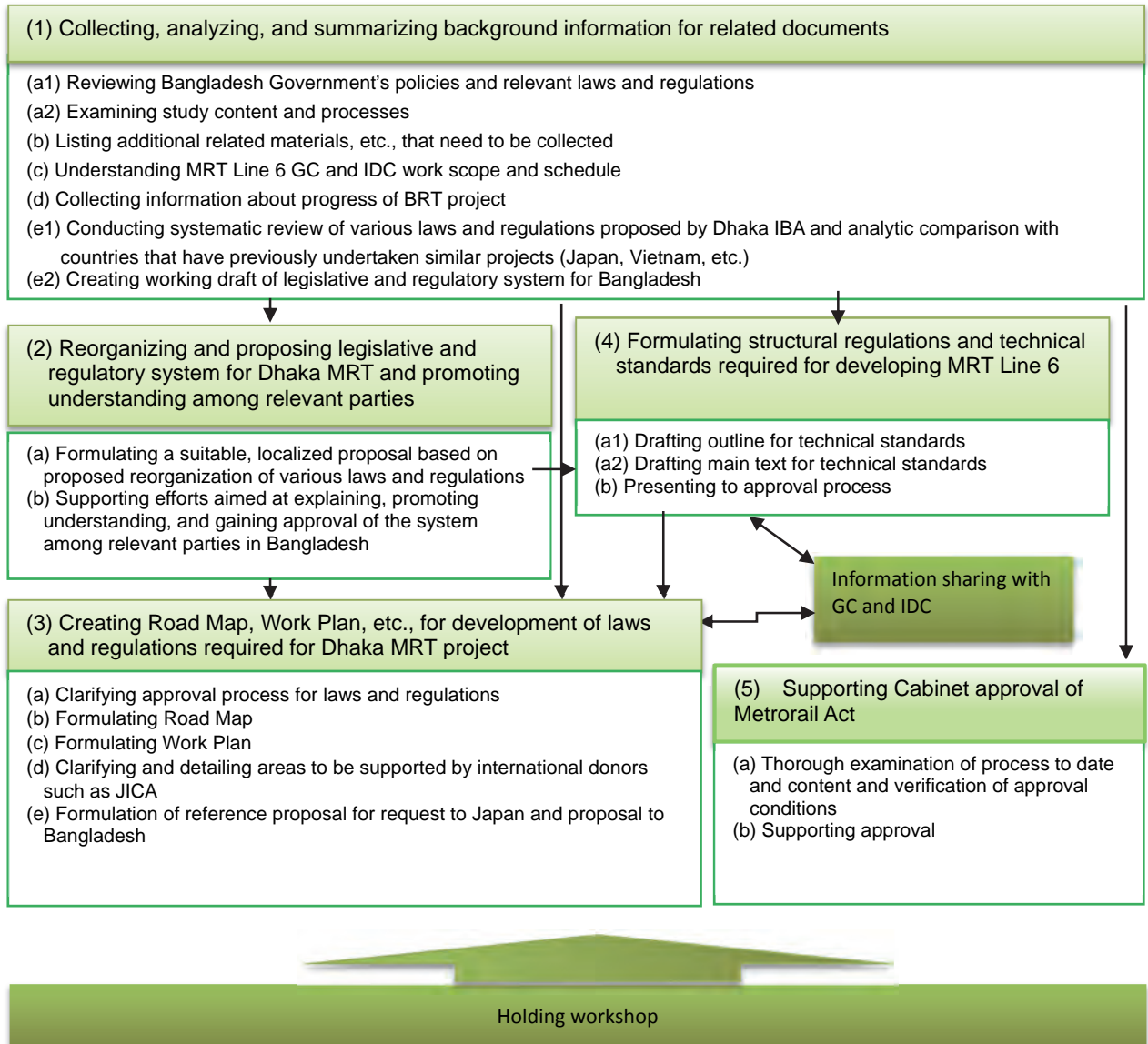
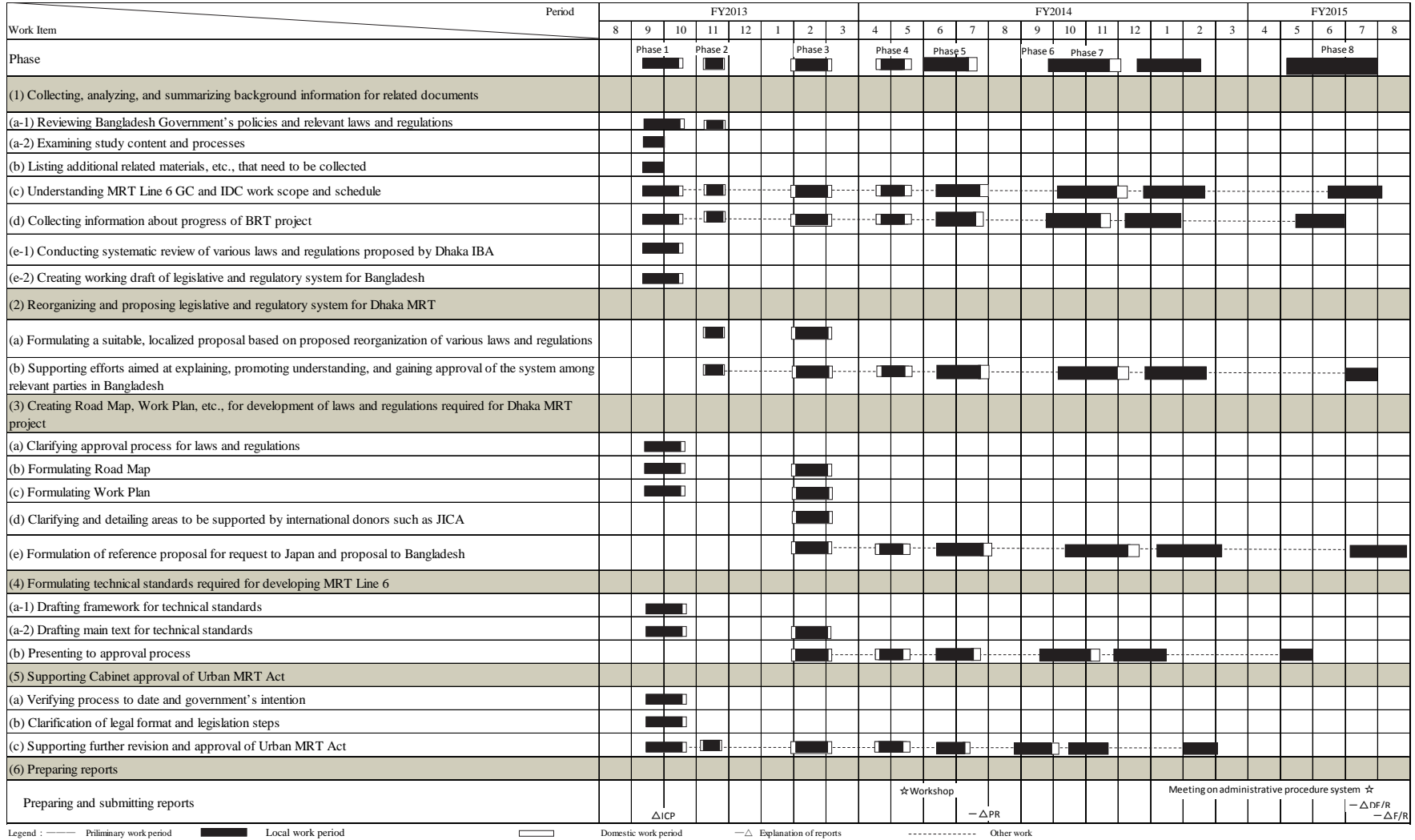


Figure 1.4 Work Plan and Implementation Process



Phase	General	Preparation of Draft Technical Standards and Support for Approval	Preparation of Draft Metrorail Legislative and Regulatory System and Support for Approval
Phase 1 September- October 2013	<ul style="list-style-type: none"> ▪ Submitting Inception Report ▪ Analyzing environment surrounding Dhaka urban transport (status of approval of Metrorail Act, current status of DTCA and DMTC, etc.) ▪ Collecting information/organizing existing information (preliminary study by JICA, confirmation of work scope and schedules, etc. of GC and IDC for MRT Line 6) ▪ Confirmation of process and procedures to approve laws and regulations in Bangladesh ▪ Organizing overall picture of future work for this project ▪ Selecting and hiring local consultants ▪ Preparing draft framework relating to Technical Standards and explaining it to the Bangladesh side ▪ Formulating Road Map and Work Plan for developing laws and regulations ▪ Summarizing current status of Metrorail Act and future principles relating to support work policy and formulating work policy 	<ul style="list-style-type: none"> ▪ Preparing draft framework relating to Technical Standards 	<ul style="list-style-type: none"> ▪ Preparing revised draft Metrorail Act ▪ Coordinating with Bangladesh side
Phase 2 November- December 2013	<ul style="list-style-type: none"> ▪ Formulating, submitting, and explaining local work implementation policy for this phase 	<ul style="list-style-type: none"> ▪ Preparing first draft of Technical Standards 	<ul style="list-style-type: none"> ▪ Supporting approval of Metrorail Act ▪ Examining proposed reorganization of MRT legislative and regulatory system and producing first draft

Phase3 February 2014	<ul style="list-style-type: none"> ▪ Formulating, submitting, and explaining local work implementation policy for this phase ▪ Summarizing and submitting local work report 	<ul style="list-style-type: none"> ▪ Explaining and delivering first draft of Technical Standards to the Bangladesh side 	<ul style="list-style-type: none"> ▪ Explaining first draft of MRT legislative and regulatory system reorganization to Bangladesh side
Phase 4 April- May 2014	<ul style="list-style-type: none"> ▪ Formulating, submitting, and explaining local work implementation policy for this phase ▪ Presenting workshop related to Urban Transport Laws and Regulation to deepen the understanding of the Bangladesh key stakeholders concerned with MRT project. ▪ Summarizing and submitting local work report (including draft Technical Standards presented for approval by the Bangladesh Government in this phase, workshop records, documents prepared by the Bangladesh Government showing progress of approval process, etc.) 	<ul style="list-style-type: none"> ▪ Adapting in response to comments from Bangladesh side ▪ Producing final Technical Standards draft and presentation for approval 	<ul style="list-style-type: none"> ▪ Finalizing proposed reorganization of MRT legislative and regulatory system ▪ Explaining to and obtaining understanding and agreement from the Bangladesh side ▪ Implementing support activities required for approval
Phase 5 June –July 2014	<ul style="list-style-type: none"> ▪ Formulating, submitting, and explaining local work implementation policy for this phase ▪ Making required revisions in the progress of yen-loan-financed projects 	<ul style="list-style-type: none"> ▪ Adapting in response to comments on revised draft Technical Standards from Bangladesh side, holding discussions with related organizations, finalizing draft, beginning preparation of Bengali version, and finalizing approval process schedule ▪ Implementing support activities required for approval 	<ul style="list-style-type: none"> ▪ Formulating draft rules under Metrorail Act and explaining to and obtaining understanding and agreement from the Bangladesh side ▪ Implementing support activities required for approval

<p>Phase 6 August- September 2014</p>	<ul style="list-style-type: none"> ▪ Formulating, submitting, and explaining local work implementation in the progress of yen-loan-financed projects 	<ul style="list-style-type: none"> ▪ Presenting final draft Technical Standards for Bangladesh approval process and implementing support activities required for approval 	<ul style="list-style-type: none"> ▪ Explaining and submitting to Bangladesh side the first draft of directive relating to certificate of train driver and preparation of final draft adapting the comments. ▪ Presenting draft rules under Metrorail Act for Bangladesh approval process and implementing required support activities
<p>Phase 7 October- December 2014</p>	<ul style="list-style-type: none"> ▪ Formulating, submitting, and explaining local work implementation policy for this phase ▪ Making required revisions in the progress of yen-loan-financed projects 	<ul style="list-style-type: none"> ▪ Following up on progress of Bangladesh approval process for final draft Technical Standards implementing support activities required for approval ▪ Preliminary coordination of approval of construction work and safety management system relating to depot earth work 	<ul style="list-style-type: none"> ▪ Presenting final draft of directive relating to certificate of train driver for Bangladesh approval process and implementing support activities required for approval ▪ Following up on progress of Bangladesh approval process for draft rules under Metrorail Act and implementing support activities required for approval
<p>Phase 8 May - August 2015</p>	<ul style="list-style-type: none"> ▪ Formulating, submitting, and explaining local work implementation policy for this phase ▪ Making required revisions as yen loan-financed projects progress ▪ Preparation of a manual for screening and issuing of business licenses and holding a presentation meeting with Bangladesh side ▪ Preparation of final report and submitting it to JICA 	<ul style="list-style-type: none"> ▪ Following up on progress of Bangladesh approval process for Technical Standards and implementing support activities required for approval ▪ Preparation of a manual for approval procedure of construction work and safety management system relating to depot earth work and holding a presentation meeting with Bangladesh side 	<ul style="list-style-type: none"> ▪ Following up on progress of Bangladesh approval process for directive relating to certificate of train driver and draft rules under Metrorail Act and implementing support activities required for approval

Chapter2 Background Review

2.1 Review of High-Level Plans (Vision 2021, STP, etc.)

2.1.1 Vision 2021 (Bangladesh Vision 2021)

2.1.1.1 Formulation Process and Ultimate Goals

Vision 2021 was published by the Centre of Policy Dialogue (CPD) in August 2007. This vision reconsidered what the nation has to achieve in the next 15 years, leading up to the 50th anniversary of independence. It specified the following eight ultimate goals, reflecting citizens' hopes for the future of Bangladesh:

- To become a participatory democracy
- To achieve an efficient, accountable, transparent, and decentralized system of governance
- To become a poverty-free middle-class nation
- To have a nation of healthy citizens
- To develop skilled and creative human resources
- To become a globally integrated regional economic and commercial hub
- To be environmentally sustainable
- To be a more inclusive and equitable society

2.1.1.2 Key Social Infrastructure Development-Related Statements

(1) Becoming a Poverty-Free Middle-Class Nation

Bangladesh will join the ranks of middle-income countries by 2021. Based on a GDP growth rate of at least 8 percent over the next 15 years, this will mean reaching an average per-capita income level of around US \$1,000. To design a strategy centering on the society's disadvantaged, creative policies and innovative institutions will be required rather than temporary benefits.

(2) An Appropriate Balance Between Public and Private Investment and FDI

The relative roles of the state and the market will be clarified, and the appropriate balance between public and private investment and foreign direct investment (FDI) will be sought. To this end, it will be necessary to provide fiscal resources to support a balanced strategy through further tightening in the public sector, the introduction of foreign capital, and the sophisticated use of funds.

(3) Being Environmentally Sustainable

Over the next 15 years, economic growth, increased population size, and the continued advance of urbanization will present environmental challenges. The Government must adopt tough measures in order to reduce air pollution that appears in many urban centers and mega-cities by 2021. The main source of this pollution is automobiles, and it is possible to reduce the number of automobiles on the road through the introduction of integrated traffic management in major cities and more effective public transport systems in urban areas. As a long-term measure, elevated railway systems should be built by the Government and private businesses in the most congested cities, or at least in Dhaka, by 2021.

2.1.1.3 MRT Project-Related Review

Over the next 15 years, environmental problems will become severe due to increased population size and the continued advancement of urbanization as the economy grows. In order to solve these problems, it will be necessary to introduce integrated traffic management and efficient urban transport systems in major cities, and construction of an MRT elevated railroad by the Government and private businesses in Dhaka was proposed. The MRT project must be undertaken to overcome the city's extreme traffic congestion, and strong policies to this end are

essential. There is a desire to introduce the bold, integrated traffic management policies proposed in the Vision.

With regard to new, modernized investment, Bangladesh should emphasize the relative roles of the state and the market and pursue a strategy aimed at an appropriate balance between public and private investment and FDI. In terms of the main project contractors, the proposed Metrorail Act plans for not just Government-affiliated contractors but also public-private partnership (PPP) contractors to be involved. As a result, it is necessary to clarify the division of roles between Government and private companies and develop an institutional environment for allocating development profits based on investment.

In addition, with Bangladesh in the process of transitioning to a poverty-free middle-class nation, poverty-related policies are needed for the MRT project. Accordingly, when it comes to fare policies, considering the actual living Standards of citizens, rather than just railway operation management principles, is called for. There is a host of issues that need to be resolved in order to determine how revenues and expenditures related to the MRT's construction and administration will be calculated.

2.1.2 Dhaka STP (Strategic Transport Plan)

2.1.2.1 Formulation Process and Basic Goals

This study was conducted over 1.5 years, starting in April 2004, with the aim of showing how to proceed with the development of transport infrastructure facilities over a 20-year period.

The population of the region covered by the STP study was 17 million people, and it was estimated that it would at least double in size over the 20 years during which the project is implemented. Meanwhile, the development of new districts featuring good facilities and comfortable living environments is giving rise to considerable population movement within the Dhaka urban area.

The Dhaka STP describes key activities for selecting a long-term strategic plan for the greater Dhaka area in light of basic policies relating to urban structure, development of road and public transport systems, financing, etc. The following basic plans were formulated in the study:

- Transport strategy to meet future demand and desired land use and development promotion strategy
- Work plan covering the next 20 years, divided into five-year phases

2.1.2.2 Current Urban Transport Conditions in Dhaka

Currently, in the Dhaka transport sector, various types of vehicle, including some with engines and some without engines, use the same road space, giving rise to extremely chaotic traffic conditions. The deteriorating transport environment is causing delays and air pollution to worsen.

(1) Sidewalks

According to one estimate, approximately 40 percent of sidewalks are illegally occupied. As a result, pedestrians have to walk in the road instead of on the sidewalk, which has a negative effect on road capacity and exacerbates congestion.

(2) Rickshaws

Rickshaws are an extremely important mode of transportation in Dhaka. STP door-to-door household survey data for 2004 showed that they were the main mode of transportation for 34 percent of all trips for people in Dhaka.

(3) Taxis

Taxis are a relatively recent development in Dhaka, having begun operation in 1998. At the time of writing, the city had about 12,000 taxis.

(4) CNGs

CNGs are a taxi-style form of transport. Since two-stroke vehicles cause severe air pollution, in January 2002, 40,000 two-stroke vehicles were withdrawn. The Government subsequently approved the introduction of 12,000 four-stroke CNG-fueled vehicles. Since then, the number of CNG vehicles has gradually increased.

(5) Automobiles

Over the past 10 years, the number of automobiles has steadily increased. According to estimates by the Bangladesh Road Transport Authority (BRTA) and the Bangladesh Bureau of Statistics (BBS), the number of registered automobiles is 128,000, but the actual number on the road is around 310,600.

(6) Buses

Bus transportation continues to represent a significant portion of the multi-modal transport system in Dhaka. According to an STP survey, among all passengers passing three screen lines, 77 percent were bus users. Bus and mini-bus routes follow a limited number of major roads tending to run north-south as a general rule. Mini truck bus routes are more dispersed, and are generally east-west routes along narrow streets.

(7) Trains

Train-related facilities and services in Dhaka are provided, managed, and maintained by Bangladesh Railway (BR), an organization reporting to the Ministry of Railways. The railway mainly serves as inter-city transport, but within the Dhaka area, it runs south-north from Narayanganj, the southernmost terminal, to Tongi, from which the route continues north and also branches west and east.

(8) Management of road traffic

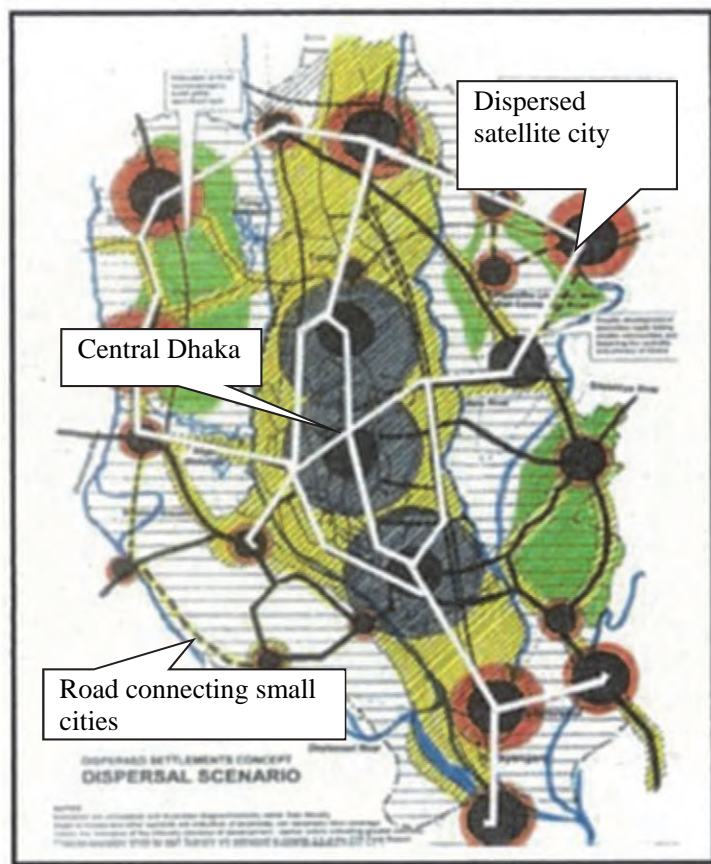
A considerable amount of Dhaka's road capacity is being squandered due to inappropriate usage, with experts pointing out that about 50 percent of the capacity is unusable. There are extremely significant potential benefits to be obtained from more efficient usage of Dhaka's existing transport services and infrastructure.

2.1.2.3 Land Usage Scenarios

In order to meet the demands of the population, which will grow rapidly in the next few decades, more efforts are needed. The central issue is establishing a comprehensive framework in order to develop a multi-modal transport system that will efficiently manage current and future land usage. The currently employed land usage plan, based on the Dhaka Metropolitan Development Plan (DMDP), was published in 1997. The Dhaka Structure Plan was formulated in order to indicate a long-term plan (20 years) for development of the greater Dhaka area. It forecasted that the population would be 15 million in 2015. The STP adopts the forecasts and concepts in the Structure Plan as given conditions for planning. Land usage scenarios were specified according to the updated Structure Plan content.

- Strong central spine scenario, in view of the strong central north-south spine that is a distinctive feature of Dhaka
- Growth pole scenario employed to decide on planning and investment policy at the state level

A Growth Pole/Satellite Cities Scenario that takes into account the idea of both these scenarios was put forward by an Advisory Committee, and it was decided to adopt this scenario.



Source: DMDP

Figure 2.1 Growth Pole/Satellite Cities Scenario Concept

2.1.2.4 Strategy Specification and Evaluation of Strategies

Over the 20-year period until 2024, the population of the STP study area will become 36 million. It was estimated that the total number of trips taken by these people every day would be at least 70 million over the course of one year. Based on initial evaluation of transport demand model calculation results, ten alternate transport strategy proposals were specified.

Table 2.1 Ten Alternate Transport Strategy Proposals

Proposal	Road Investment Level	BRT	Metro	Cost (\$)
Base Case	Roads (existing plan)	No	No	149m
1a	Roads+	Yes	No	3.0bn

1b	Roads+	Yes	Yes	5.5bn
1c	Roads+	No	Yes	6.7bn
2a	Roads++	Yes	No	3.3bn
2b	Roads++	Yes	Yes	5.8bn
2c	Roads++	No	Yes	6.9bn
3a	Roads+++	Yes	No	4.2bn
3b	Roads+++	Yes	Yes	6.7bn
3c	Roads+++	No	Yes	7.9bn
3d	Roads+++	No	No	3.2bn

Roads+ 42 projects with varying levels of importance over 20 years
Roads++ Addition of street projects and enhanced development of outlying areas
Roads+++ Addition of elevated rapid transit system due to high level of automobile traffic

Source: Dhaka Strategic Transport Plan

(1) Quantitative and Qualitative Evaluation

Using a UTP model, the ten strategies and base case were tested by computer simulation. Quantitative evaluation was performed simply by evaluating the UPT model calculation results (number of trips per person, people/km, people/hr, number of rolling stock trips, rolling stock/km, rolling stock/hr, running speed). In addition, qualitative evaluation was performed for eight key objectives (1: efficiency, 2: mobility and accessibility, 3: safety, 4: usability, 5: performance level, 6: economic development, 7: social development, 8: environment).

(2) Narrowing Down of Strategies and Reasons

(a) Step 1: Elimination of Strategy 3d

Strategies which do not place the emphasis on public transport are not suitable.

(b) Step 2: Elimination of Strategy 2c (\$4.8 billion), 3b (\$5.3 billion), and 3c (\$5.3 billion)

Taking into account Government reserve funds and donor reserve funds, the team assumed an amount of approximately \$100 million per year. Based on this, \$2 billion would be usable over the 20 years of the plan. If one considers additional funding based on strong Government and private sector involvement, the total would increase to, for example, \$4 billion, should the amount increase by 100 percent per year. However, it will be difficult to employ a strategy that requires at least 25 percent more than this figure (i.e., a total of \$5 billion or more).

(c) Step 3: Elimination of Strategy 1b and 1c

1a, 1b, and 1c do not include construction of bypasses on the east and west sides, which are key connecting routes in development for the Growth Pole Scenario. Additional investment for this purpose would cost \$282 million.

(d) Step 4: Elimination of Strategy 2a

Among the remaining three strategies, two (2a and 3a) are based on Bus Rapid Transport (BRT) technology only. These strategies do not include an MRT system. In the long term, BRT is not a definitive solution for a city whose population is likely to exceed 36 million. Therefore, a combination of BRT and MRT is desired.

(3) Strategy That Should Be Selected

The number-one priority is to make maximum use of existing assets based on a bold traffic management plan. This plan must be supplemented by a suitable Mass Rapid Transit (MRT) system.

Strategy 2b is the alternative with the optimal balance between public transit and personal transport in order to meet Dhaka's future demand, and it is recommended as the strategy that should be selected. In order to obtain the financial resources needed to successfully implement strategy 2b, the Government should adopt the following measures:

- Increase the budget allocated to Dhaka's transport sector by at least 50 percent.
- When applying to donors for funding in the transport sector, increase the target values by at least 50 percent.
- Proactively pursue the use of private sector funding for construction and administration of elevated highways and the MRT system in particular.
- Introduce special taxes in the form of Government levies to be allocated to transport sector investment.

The Advisory Committee agreed that a combination of BRT and MRT is vital for developing an efficient, flexible system in Dhaka, and put forward a strategy that combined 2b (BRT and MRT) with a cross between Roads++ and Roads+++.

With this preferred strategy, the Mass Rapid Transit system will be comprised of six rapid transit lines: three BRT lines (Line 1, Line 2, Line 3) and three MRT lines (Line 4, Line 5, Line 6). Considering the implementation time needed for design, fundraising, selection of an administrative company, and construction work, it is important to precede with development of the BRT lines during the early stages of work on the MRT system.

2.1.2.5 Institutional Issues

At the present time, land use planning functions are separated from transport planning functions. The Capital Development Authority (Rajdhani Unnyan Kartipakkah, or RAJUK) formulated the Structure Plan and is responsible for implementing it; on the other hand, transport-related functions are divided among the BRTA, Dhaka Transport Coordination Board (DTCB), Dhaka City Coordination (DCC), and police force.

Policies relating to the establishment of an integrated institution and governance issues were presented and discussed in the STP Urban Transport Policy, while the organizational structure and powers were presented and discussed in the STP Institutional Strengthening and Capacity Building Report. During the transition period until the integrated institution is formed, DTCB will handle its functions, enhanced by collaboration with other institutions, including RAJUK.

2.1.2.6 Implementation Plan

The implementation plan, which begins in 2005 and ends in 2024, is divided into four five-year plans. The key aspects of the various phases are as follows:

(1) Phase 1: First Five Years (2005-2009)

- Concentrating efforts on optimal use of existing resources and improvement of current transport services
- Implementing transport management measures for major routes, including first BRT line
- Formulating guidelines for development of Mass Rapid Transit system, including BRT and MRT system

(2) Phase 2: Second Five Years (2010-2014)

- Completing three major elevated highways, based on PPP and financing plan
- Continuing development of BRT line network and opening of 16 km of Line 3
- Final design of initial MRT line (Line 5) and financing plan
- Full rationalization of regular bus services to supplement Mass Rapid Transit system

(3) Phase 3A: Third Five Years (2015-2019)

- Final design of second and third MRT lines (Line 4, Line 6) and financing plan
- Completing construction of MRT Line 5

(4) Phase 3B: Final Five Years (2020-2024)

- Completing construction of MRT Line 4 and Line 6

2.1.2.7 Construction Costs

BRT construction costs are estimated to be \$5 million per kilometer. MRT construction costs are estimated to be \$50 million per kilometer for elevated structures and \$75 million per kilometer for underground lines. It should be noted that none of these estimates include land and asset acquisition.

Therefore, to summarize, the estimated costs for the preferred strategy are as shown below.

Table 2.2 Strategy Costs

Phase	From	To	Road Cost (US\$m)	MRT Cost (US\$m)
1	2005	2009	226	188
2	2010	2014	900	1,200
3A	2015	2019	338	2,550
3B	2020	2024	117	0
Totals			1,581	3,938
			Total	5,519

M: million

Source: Dhaka Strategic Transport Plan

2.1.2.8 Review Relating to MRT Project

In terms of the project implementation status, BRT Line 3 was scheduled to begin operation in 2014 (when STP Phase 2 ends); however, there have been delays and it is still at the execution design stage.

Basic design work is underway for MRT Line 6 instead of the planned Line 5. However, at present, it is assumed that Line 6 will open in 2022, so opening the other two planned MRT lines by the final STP phase (ending in 2024) is not realistic.

With regard to road traffic management, despite the fact that initial implementation of traffic management measures, optimization of use of existing resources, and improvement of current transport services management for key routes was planned for Phase 1 (ending in 2009), this work is progressing very slowly.

In terms of institutional issues relating to the implementation system, the establishment of an integrated organization was proposed, as a result of which the DTCA, which will fulfill an enhanced coordinating role instead of the DTCB, was established. However, the development of this organization is lagging behind, which is impeding the STP plan. The DTCA will undertake the coordination of many issues such as the acquisition of advanced technology in the case of the MRT project and links with other modes of transport, development of station-front plazas, collaboration in track-side development, etc. in the case of urban infrastructure development. In order to achieve this, it is necessary that a sufficient number of personnel be rapidly assigned to the DTCA and that the necessary skills development programs be implemented.

An initial review of the STP was to be conducted after five years, and at that point, a progress report was to be made, the construction plan was to be reviewed, and a more appropriate plan was to be proposed. In 2014, the STP review project was begun with the support of JICA.

2.1.3 The Dhaka Transport Coordination Authority Act (DTCA Act)

2.1.3.1 Process

On February 15, 2011, a meeting chaired by the Minister of Finance was held with

regard to constructing MRT Line 6. At this meeting, it was agreed that enhanced coordination was required in order to develop coordinated, efficient urban transport. The Dhaka Transportation Coordination Authority (DTCA) was established to coordinate and supervise the MRT system, with responsibility for conducting specialized research in the transport field, creating programs, and ensuring the implementation of transportation policies. In addition, a policy for changing the DTCA's Board of Governors to a Governing Council was decided upon.

The revised 2011 Dhaka Transport Coordination Board Act bill was approved at a Cabinet meeting in May 2009, and passed with immediate effect as the 2011 Dhaka Transport Coordination Authority Act.

2.1.3.2 Objective and Purpose

- (1) To formulate strategic plans and arrange collaboration and coordination between organizations in order to eliminate traffic congestion in Dhaka
- (2) To provide advice and proposals for implementing policies and plans relating to public transport
- (3) To coordinate Dhaka's transport and related infrastructure development with strategic policies for the city's overall development
- (4) To provide advice to individuals, organizations, public utility companies using land and all transport department-related stakeholders and take any measures required for the purpose of ensuring a safe, coordinated transportation system.

The Government may enact decrees for the purpose of achieving the above objectives and disseminate them via public bulletins.

2.1.3.3 Powers and Functions

- (1) Formulating and approving a transportation plan, an implementation plan, and a master plan for alleviating Dhaka's traffic congestion
- (2) Improving public and private transport system services through the issuing of clear instructions
- (3) Approving final plans for projects to be implemented by other organizations and institutions
- (4) Supervising research studies on Dhaka's transport system (automobiles, roads, sidewalks, track-side areas) published based on the master plan, detailed area plan (DAP), STP, or the DTCA Act and formulating parking measures
- (5) Formulating and coordinating the implementation of policies aimed at safe pedestrian movement
- (6) Planning and overseeing policies relating to transportation entry/exit and circulation of traffic for multi-story buildings constructed by private individuals or companies
- (7) Prohibiting construction of and eliminating structures that are an impediment to an appropriate transport system
- (8) Formulating policies governing all types of private automobiles and Government-related and private transportation and concluding necessary agreements with transport-related institutions
- (9) Providing necessary advice to relevant institutions for the purpose of formulating and implementing plans to improve automobile traffic
- (10) Formulating transport safety policies in order to guarantee passenger safety
- (11) Formulating environmental policies for all types and forms of rolling stock and providing any necessary guidelines and advice for their implementation
- (12) Obtaining consultation on matters pertaining to transport-related taxation and fiscal management
- (13) Formulating and authorizing rolling stock and transport technology plans

- (14) Authorizing plans for rolling stock storage and rolling stock movement plans and designs
- (15) Formulating plans for rail yards, terminals, and so forth, as well as obtaining consultation and overseeing their implementation
- (16) Registering rolling stock types and forms
- (17) Formulating, implementing, and overseeing policies in order to develop skilled human resources for the transport sector
- (18) Providing support and consultation in order to prevent environmental pollution caused by inappropriate rolling stock
- (19) Formulating policies and projects for Mass Rapid Transit and, where needed, providing consulting and supervision in order to implement them
- (20) Formulating plans and implementation policies and determining the number of lines for various transport routes
- (21) Formulating a coordinated plan to integrate road and water transport systems and providing advice to relevant institutions in order to implement it
- (22) Formulating, implementing, and authorizing plans relating to the operation of rapid buses and MRT, MRT system fares, and related activities, with the purpose of providing prompt, improved transport services, as well as approving operation of buses, MRT (trains, monorails, loop lines, commuter lines) and highways (dedicated elevated roads)
- (23) Communication activities and information-sharing relating to public transport
- (24) Concluding agreements based on key licenses from the Government in order to achieve the objectives of the DTCA Act
- (25) Conducting appropriate activities related to the above matters
- (26) Fulfilling other responsibilities stipulated by the Government

2.1.3.4 Review Relating to Development of MRT Legal System

Based on the DTCA Act, the DTCA is granted broad coordinating and approval powers with respect to overall urban transport affairs in Dhaka, from planning to implementation. With regard to MRT projects, it is necessary to establish a legal system framework that enables the DTCA to fulfill the powers and responsibilities stipulated by the DTCA Act as the ultimate decision-making body. Therefore, when formulating the Metrorail Act and regulations affected by it, it is necessary to ensure that the DTCA is able to make effective, timely decisions with regard to the consistency of urban policy and urban transport policy as well as MRT-specific safety, convenience, economic performance, efficiency, and social impact (environmental preservation).

The MRT Technical Standards will be the required examination Standards with regard to transport facilities, rolling stock, rail yards, terminals, transport technology plans, etc., covered by the DTCA Act and technical approval and licensing activities accompanying the design, construction, and operation of MRT system facilities. Technical decisions for approval and licensing of a technologically advanced MRT system need to be based on extremely sound reasoning. Along with the DTCA's intentions, it is essential to specify easily understood examination processes and premises to encourage appropriate, effective decisions that will contribute to the advancement of projects.

2.1.4 DMTC (Dhaka Mass Rapid Transit Company) Articles of Incorporation

The DMTC is a public company limited by shares based on the 1994 Companies Act. The company was established for the purposes indicated below. Key explanations excerpted from the articles of incorporation are shown. Note that since the explanations include parts where the meaning is difficult to understand, the excerpts have been formulated to shed light on the context. Also, there is considerable overlap among the explanations. However, we have emphasized the original text and avoided paraphrase, deletion, and synthesis as much as possible.

2.1.4.1 Key Purposes of Company

- To construct, operate, and maintain an MRT (mass rapid transit) system in Dhaka and the surrounding area
- To conduct passenger transport activities in the urban area as a railway company
- To construct facilities above and below ground on land, roads, etc. of all kinds
- To modify road, river, and canal routes
- To set up drainage channels
- To repair, revamp, and divide buildings
- To set up boundary markers, fences, gates, etc.
- To own, operate, and maintain ferries
- To set up and maintain bridges and roads
- To set up and maintain restaurants, coffee shops, and cafeterias
- To act as a consultant for Government corporations, individuals, associations, etc.
- To acquire necessary land and property
- To lend and invest the company's stocks and equipment
- To develop property and commercial facilities
- To implement laws, plans, etc.
- To conduct feasibility studies, detailed surveys, and technical/economic surveys and provide basic technical services
- To supply technical and administrative services
- To implement activities relating to the construction, maintenance, and operation of a mass transit system
- To construct a new system, roads, tracks, and rail lines above/below bridges and underground
- To improve, enhance, convert, and introduce double tracks for all or part of the existing system
- To lay down and upgrade urban transport facilities including permanent tracks, points, and crossings
- To construct and rebuild plants and maintain and modernize yards
- To procure and set up rolling stock, mass transit rolling stock, signals, coupling and communication facilities, bridge girders, structures, rail welding, pre-stressed concrete sleepers, various track components, other mass transit necessities, people movers, etc.
- To procure and set up new signals, communications, trains, and traffic control and management systems
- To develop electrification of systems not limited to train traction, general electricity supply systems, public utility systems, etc.
- To set up, commission, and operate mass transit and urban transit facilities, other urban transit facilities, and people movers
- To maintain tracks and all fixed equipment, rolling stock, signals, couplings, communications, train control systems, electrical equipment, etc.
- To take over from other institutions designated by the DTCA/DTCB and Government and operate and maintain the mass transit system via loans and licensing
- To supply and integrate various mass transit and other urban transport facilities, including feeder transport and other facilities (parking lots, roundabouts), etc.
- To conduct market surveys and communication activities
- To announce decisions, changes, and revisions relating to fares required for commercial operation
- To conduct technical consulting relating to design, construction, maintenance, etc.

- To dispatch company engineers, experts, and other personnel within Bangladesh and to other countries under suitable conditions
- To provide technical advice and engineering services
- To provide technical expertise and administrative services
- To adapt to BOO (build-own-operate) and BOT (build-own-transfer) policies
- To conduct buying and selling activities

2.1.4.2 Temporary and Incidental Objectives in Order to Achieve Main Objectives

- To acquire, produce, and construct buildings, offices, warehouses, plants, locomotives, urban transit systems, and other transport methods
- To obtain subsidies from the Government of Bangladesh
- To conclude agreements with the Government
- To conclude treaties with the Government, railway authorities, RAJUK, other public institutions, and the private sector
- To produce, supply, and lease rolling stock, plants, mechanical equipment, etc. required for maintaining urban transit system and rolling stock
- Payments and related condition-setting required for operations and maintenance
- To set up facilities for moving passengers from interchange facilities, contracted railways, or other means of transport and allocating revenue collected from passengers
- To purchase or acquire land, buildings, mining rights, forested sites, etc. under land appropriation laws or other special legislation and, where necessary for the company's activities, transfer profits from the application and development of related rights and privileges to the accounts
- To acquire tenders, purchases, contracts, and usage rights
- To conduct construction, manufacturing, installation/upgrading, buying, selling, exchange, and importing/exporting
- To produce electricity and gas required for the company's activities
- To transfer profits from commercial application of land acquired by the company to the accounts
- To acquire, establish, construct, supply, and maintain plants, etc. in Bangladesh
- To hire and remunerate experts for the purpose of producing project reports
- To conclude contracts and agreements with individuals in Bangladesh and other countries
- To advertise and provide information about the company's business activities
- To apply for, purchase, or acquire, protect, extend, and renew patent rights, trademark rights, designs, licenses, exclusive use rights, etc. in all regions of the world
- To collaborate in and conclude agreements on distributing and pooling profits
- To purchase or lease licenses and acquire property and movable assets
- To acquire shares in other companies and handle their disposal
- To produce, issue, provide compensation for, and negotiate reductions for promissory notes
- To open bank accounts
- To borrow and accept money in taka or foreign currency for loans with deposits or interest
- To issue company guarantees with respect to company assets, take out mortgages, etc.
- To invest in trusts
- To collaborate in establishing and supporting companies
- To establish subsidiaries

- To pay operational and incidental expenses
- To buy and sell powder and other explosives
- To secure depreciation funds, sinking funds, insurance funds, and other special funds
- To acquire information from everyone about technology, expertise, and process engineering
- To appoint legal representatives, managers, and secretarial staff
- To conduct and pay for training in Bangladesh or other countries
- To take any necessary security measures
- To maintain the transportation business
- To conduct all items associated with or incidental to achieving the above objectives

2.1.4.3 Declaration

- The responsibilities and duties of the company's members are limited.
- The company's authorized capital amount is 8 billion taka, divided into 800,000 100-taka common shares.
- The following individuals, whose names and addresses are shown below, are involved in the public limited company in accordance with the company's articles of incorporation and have agreed to acquire the number of company shares indicated opposite each individual's name.

Table 2.3 Share Subscribers

Name, Address, and Nationality of Share Subscriber	No. of Shares Held	Subscriber Signature
The Government of Bangladesh, represented by the Secretary of the MOC		
Mr._____ Secretary, Communication Division, MOC		
Mr._____ Additional Secretary, Communication Division, MOC		
Mr._____ Joint Secretary, Communication Division, MOC		
Mr._____ Joint Secretary, Communication Division, MOC		
Mr._____ Director		
Mr._____ Director		
Total		Shares

Date: XXXX, 2011

Witness: _____ (signature)

Source : DMTC (Dhaka Mass Rapid Transit Company) Articles of Incorporation

2.1.4.4 MRT Project-Related Review

The articles of incorporation were stipulated based on the realities of railway companies in other countries. Overall, what may be taken away is the fact that the DMTC is a comprehensive urban transport-related company that handles development and management not just of a single MRT line (e.g. Line 6) but of multiple lines, other types of transportation

(monorails, etc.), and urban facilities.

(1) Activities as a Public Transit Operator

The DMTC's main role is the construction of urban transport facilities and mass transit of passengers, and to this end, it will construct, manufacture, install, renovate, commission, and operate facilities and equipment. As a transport-related company, it will perform land and property acquisition, buying and selling, and commercial use of land, and establish subsidiaries for these purposes.

In addition, besides supplying and integrating urban transport facilities, including feeder transport and other facilities (parking lots, roundabouts, etc.), it will conclude contracts and treaties with the Government, RAJUK, other public institutions, and the private sector and be involved in the coordination of urban facilities.

With regard to the form of the railway business, in addition to BOO (build-own-operate) and BOT (build-own-transfer) approaches, it will operate and maintain the mass transit system by taking over, borrowing, and licensing from other organizations.

(2) Consulting Activities

The DMTC will perform technical consulting with regard to design, construction, maintenance, etc. Acting as a consultant, it will provide technical expertise and administrative services to Government corporations, individuals, associations, etc.

(3) MRT Facility Development Activities

The DMTC may construct facilities above or below land, roads, etc. of any kind in order to achieve its public purpose. With regard to MRT facilities, it will construct, procure, install, upgrade, maintain, and modernize:

- Tracks, bridge girders, structures, people movers, plants, rail yards, and all other fixed equipment
- Rolling stock, signaling/train control/coupling facilities, communication facilities, electrification/electrical supply systems, etc.

In addition, it will manufacture, supply, and lease mechanical equipment, etc.

2.1.5 The Bangladesh Railways Act

The purpose and principles of the Railways Act were described in a British India publication in 1887, and the Railways Act was first formulated in 1890 based on British railway laws. In 1949, when Pakistan separated from India, the terms "India" and "Indian" in the Act were deleted. Then, in 1973, when Bangladesh achieved independence from Pakistan, the term "Pakistan" was replaced by "Bangladesh" and "Rupees" by "Taka," based on the Act of 1973. Headings and representative provisions extracted from this Act are shown below.

2.1.5.1 Extracts of Relevant Explanations

(1) Chapter 1: Preliminary and Definitions of Terms

(2) Chapter 2: Inspection of Railways

(a) Appointment and Duties of Inspectors

- The Government shall appoint inspectors and they shall be deemed public servants under the control of the Government.

(b) Powers of Inspectors

- To inspect railways to determine whether they are fit to be opened.
- To make periodic or other inspections of facilities or rolling stock as requested by the Government.
- To investigate the cause of accidents.
- To enter and inspect facilities or rolling stock.
- To require in writing that a railway company employee appear in person or submit a reply or report.
- To require the submission of a copy of railway company books or documents.

- (3) Chapter 3: Powers and Duties of Operators with Respect to Construction and Maintenance
 - Entering adjoining land for the purpose of repairing facilities or preventing accidents
 - Paying compensation for any damage caused
- (4) Chapter 4: Involvement of the Government in the Opening of Railways
 - Procedures for approving the opening of railways
 - Procedures for opening after repairs to facilities
 - The power to close and resume operation
 - The power to formulate regulations with respect to the opening of railways
 - Transfer of powers to inspectors
- (5) Chapter 5: Provisions Regarding the Administration of Facilities
 - Except as stipulated in this Act, no suit of any kind shall be made with regard to the actions of railway companies.
 - Any complaint filed regarding a breach by a railway company shall be determined by the Government.
 - The Government shall set maximum and minimum rates.
- (6) Chapter 6: Provisions Relating to Railway Operation
 - Running speed and propulsion method of rolling stock
 - Specifying conditions for transporting passengers suffering from infectious diseases and disinfecting carriages
- (7) Chapter 6A: Restrictions Relating to Employment Conditions for Railway Employees
- (8) Chapter 7: Responsibilities and Duties of Railway Companies
 - Responsibilities as a transporter of animals and goods
 - Duties of railway companies relating to train accidents while transporting passengers
- (9) Chapter 8: Accidents
 - Duty to submit accident reports
 - Power to formulate regulations relating to notification and investigation of accidents
 - Compulsory medical examinations for persons injured in railway accidents
- (10) Chapter 9: Offences and Penalties
 - (a) Breaches of duty by railway personnel
 - Drunkenness
 - False reports
 - (b) Other breaches
 - Boarding a carriage in motion or other improper boarding
 - Traveling without a valid pass or ticket
 - Bringing unlawful dangerous or inappropriate goods on board
- (11) Chapter 10: Supplemental Provisions

2.1.5.2 Review of MRT Legal System Development

The MRT Act stipulates basic matters relating to railway operation and is similar to Japan's Railway Business Act. The Act assumes that there are multiple railway operators, but all are directly established by the state and under its supervision, so the Act includes almost no provisions relating to railway company approval and licensing. Therefore, in terms of the system, there is no clear division between regulators and railway operators, with the current Bangladesh Railway being an organization under the jurisdiction of the Ministry of Railway. Specific matters relating to railway facility development are stipulated based on railway operators' internal regulations (manuals).

A distinctive feature of the system is that railways developed by operators are inspected by Government-appointed inspectors, and the Government authorizes the opening of

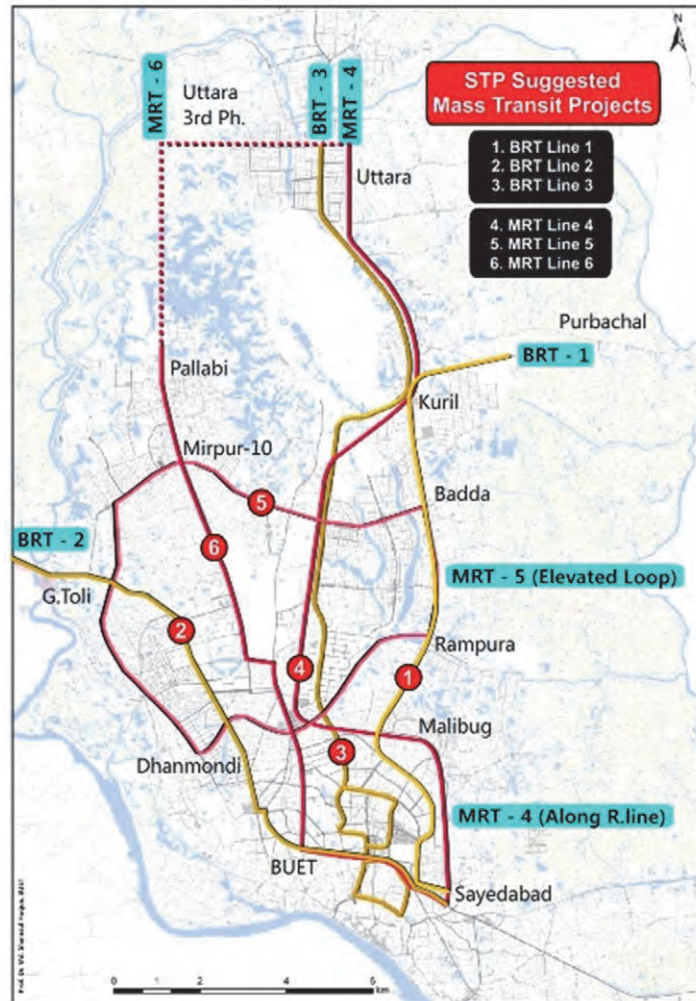
these railways as public transportation based on the inspector's report. This differs considerably from the Japanese system, which is based on an organizational responsibility structure that clearly separates the responsibilities of regulators and operators. This follows the example of the British system of verification by a third-party (external person or company). There are many parts of the Metrorail Act, which is currently in the final stages of passage into law, that appear to have been stipulated in a perfunctory manner based on the Bangladesh Railways Act.

2.2 Progress Report on BRT Plan

2.2.1 Position of BRT in STP

In the Dhaka Metropolitan Area (DMA), there is an overconcentration of transportation and distribution is excessively concentrated on the roads, and while there has been sufficient traffic infrastructure development, the various types of traffic regulation that control the various modes of transportation (automobiles, buses, rickshaws, etc.) have not kept pace with this development, so traffic congestion is becoming a chronic problem. In addition to this, the worsening of traffic pollution including automobile exhaust and noise is also a problem. Given the projected future population expansion, the development of mass transit (bus- and train-related transportation) is a pressing issue.

As an urban transportation policy, the Dhaka Strategic Transport Plan (STP) formulated in 2005 proposed an urban transit network comprised of a three Bus Rapid Transport (BRT) lines system and three mass rapid transport (MRT) lines (see Fig. 2.2.1). It would accommodate the transit needs of the DMA while also helping to alleviate climate change by suppressing air pollution in the DMA through switching to a public transportation system.



Source: DTCA Home page
 Figure 2.2 MRT and BRT Alignment

2.2.2 What is BRT?

The name BRT (Bus Rapid Transit) is derived from Rail Rapid Transit, a term signifying urban high-speed railways. Urban high-speed railways are a high-capacity rapid transit system that uses large numbers of rolling stock operated at frequent intervals and take precedence in transportation, while BRT is a bus-based rapid transit system. BRT is a transit system that runs faster than conventional buses on normal streets by setting up dedicated bus streets and permanent dedicated bus lanes and aims to ensure punctual operation. Since the buses run on dedicated streets, it is possible to operate large-body vehicles, and transportation capacity can be expanded by a certain amount through introducing extra-large buses or articulated (bendy) buses that link two or more vehicles.

BRT was first introduced in the city of Curitiba, Brazil, in the 1970s. Since it has the advantage of reducing introduction and maintenance costs compared to railways, it is now employed as a key transit system in urban areas around the world.

The general features of BRT systems are shown below.

- 1) Improvement of operating environment (ensuring reliability and rapidity)
 - Dedicated lanes

- Priority lanes
 - Signal control: PTPS (Public Transport Priority System, etc.)
- 2) Increased sophistication of rolling stock and facilities (ensuring convenience and comfort)
- Articulated buses: large capacity
 - Higher grade bus stops (stations): comfort, smooth boarding/disembarking
 - Off-board fare collection (IC card, etc.): smooth boarding/disembarking

2.2.3 Outline of Dhaka BRT Project

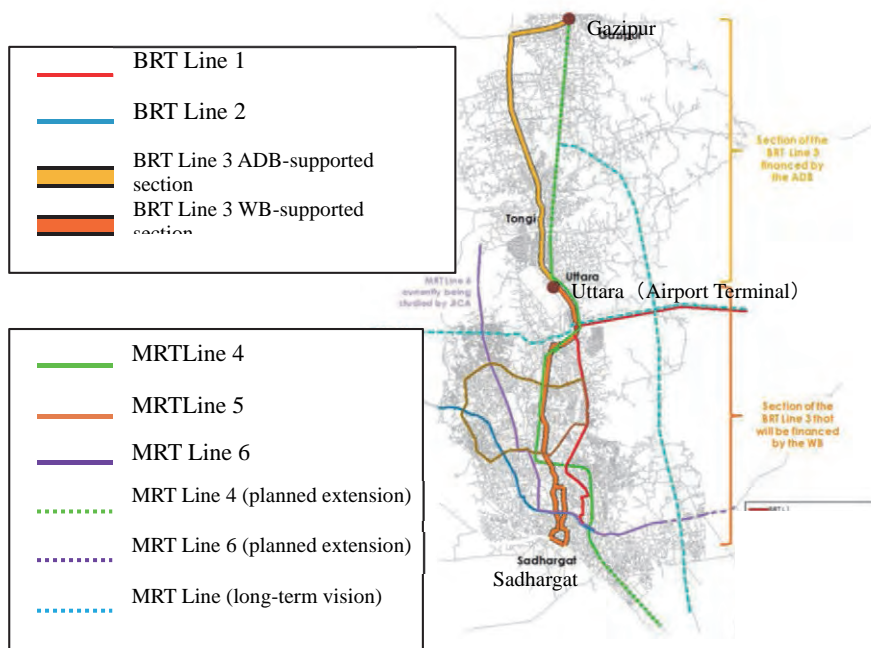
Of the three planned BRT lines, work is currently progressing only on Line 3.

The World Bank (WB) supported the formulation of the aforementioned STP, and in 2009, as part of the Clean Air and Sustainable Environment (CASE) Project, it supported development of an approximately 22.5 km section of the line between the Uttara and Sadhargat areas proposed in the STP.

As well, development of an approximately 20km section from Uttara north to the Gazipur area, which connects with the aforementioned section, has been underway since 2010 as the Greater Dhaka Sustainable Urban Transport Project (GDSUTP), with the support of the Asian Development Bank (ADB). Refer to Fig. 2.2.2.

The two routes connect at Airport Terminal near Hazrat Shahjalal Airport in the Uttara area, with the total length of BRT Line 3 being 42.5 km. Operation is scheduled to begin in 2017.

In addition, with a view to commercial development and serving as a hub for the BRT line, Hazrat Shahjalal Airport, Bangladesh Railways Airport station, etc., construction of a multi-mode airport terminal under a public-private partnership (PPP) scheme is being planned for Airport Terminal.



Source: GDSUTP

Figure 2.3 BRT Route Map

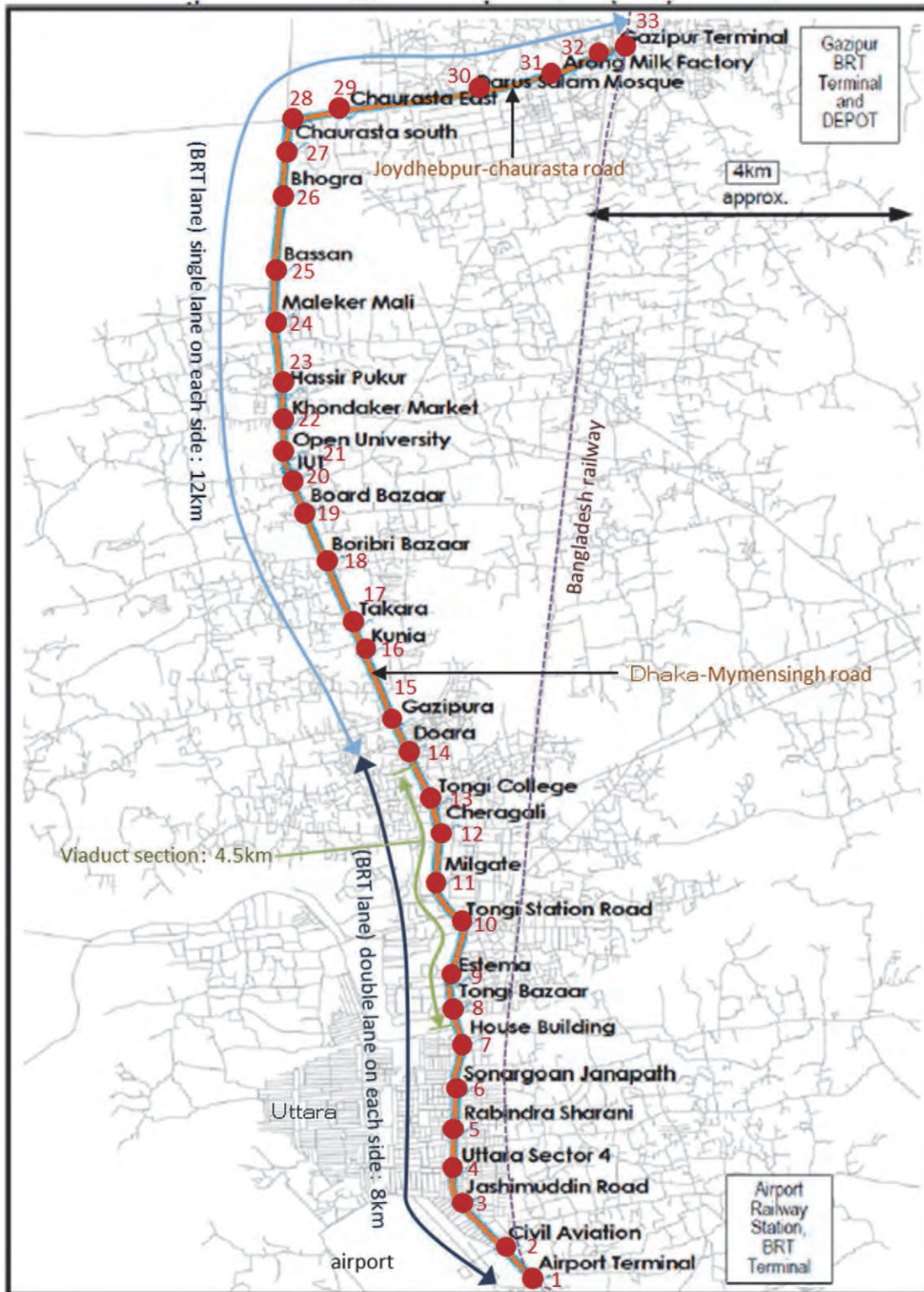
BRT will be operated by the Dhaka Bus Rapid Transit Company Ltd. (Dhaka BRT), a wholly owned Government corporation established in June 2013. The key features and concepts of the Dhaka BRT Line 3 system are as follows:

- Buses will run every two minutes at peak times.

- Bus stops (stations) will be located in the middle of the street and accessed by underground passageways. They will be equipped with escalators and the like for elderly and disabled users.
- The platform shall provide a safe, comfortable waiting area, and the platform and bus floor will be at the same level in order to facilitate rapid, smooth boarding/disembarking.
- An IC card-based fare collection system will be used, and bus fares will be collected when entering the bus stop (station).
- Facilities will be provided with information for users, such as displays of bus locations, notices about the next stop, etc.
- The BRT will link with other transportation mode systems, such as local street buses and rickshaws, in order to form an optimal transportation network.

2.2.4 Outline of BRT Line 3 Construction

1) Overview of BRT Line 3 ADB-Supported Section (Airport Terminal to Gazipur Terminal)



Source: GDSUTP

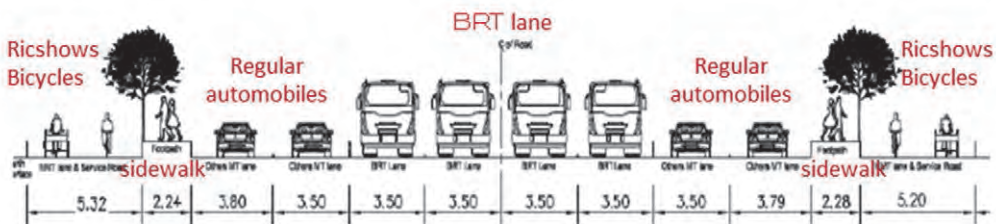
Figure 2.4 Map of BRT Line 3 ADB-Supported Section Route

1) Overview of Infrastructure Construction

The route between Airport Terminal and Gazipur Terminal has a length of approximately 20 km and is comprised of 33 stations including both terminals. It is anticipated that it will have 100,000 users per day when it opens and 150,000 by 2020. In addition, once it is operated together with the Airport Terminal to Keraniganj route (WB-supported section), it is provisionally estimated that the number of users per day will increase to 300,000.

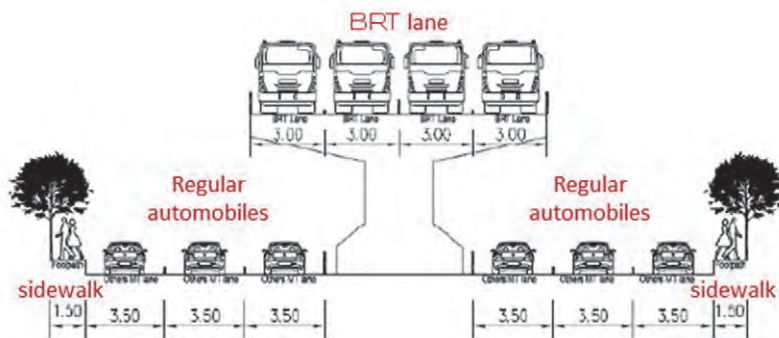
It is planned that the approximately 8 km section starting from Airport Terminal will have two dedicated BRT line lanes per side, while the remaining 12 km section will have one dedicated BRT line lane per side. The Tongi area will be an elevated section with a length of approximately 4.5 km, while the 15.5 km ground-level section will be equipped with seven flyovers at intersections and six pedestrian bridges. There are plans to furnish both the Dhaka-Mymensingh Road and Joydhebpur-Chaurasta road where the BRT line will be constructed with streets (for regular automobiles, rickshaws, and bicycles), sidewalks, traffic light facilities (70 BRT priority traffic lights, etc.), CCTV cameras (approx. 150) at intersections and the like, streetlights (approx. 1,000), sidewalk drainage facilities, etc. Moreover, a BRT depot will be set up (near Gazipur Terminal), the existing eight-lane Tongi bridge will be reconstructed, connecting link roads (141 locations; total length of 57 km) will be repaired, and markets and the like which obstruct the route will be modified. In addition, for this project, there are plans to procure 50 articulated buses and introduce an Intelligent Transport System (ITS) and ticketing and fare collection system.

Detailed design was completed in 2014, and the project is now entering the construction stage with a view to completion during 2016.



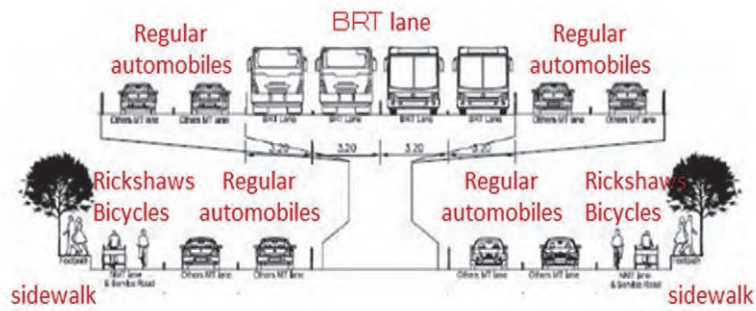
Source: GDSUTP

Figure 2.5 Image of BRT Line (Ground-Level Section)



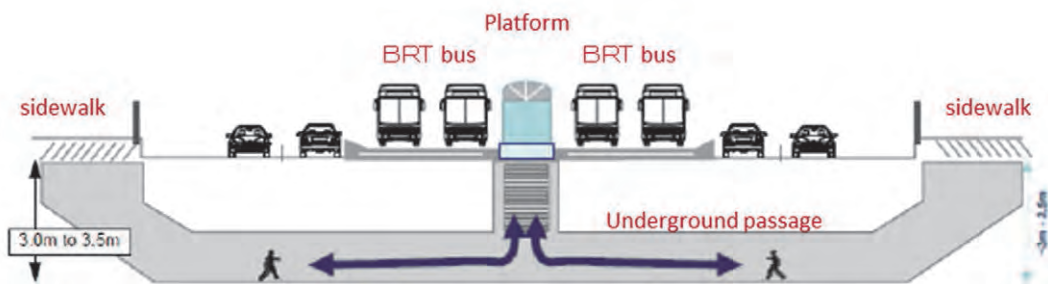
Source: GDSUTP

Figure 2.6 Image of BRT Line (Elevated Section)



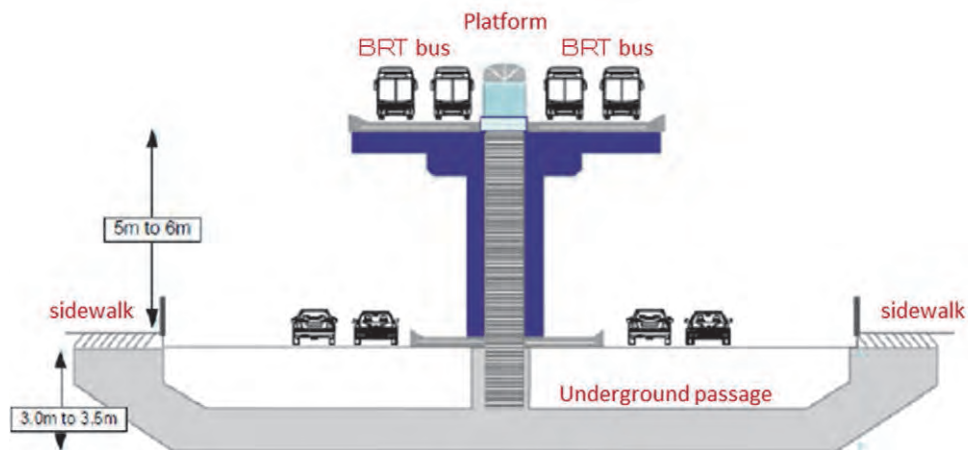
Source: GDSUTP

Figure 2.7 Image of Intersection Flyover



Source: GDSUTP

Figure 2.8 Image of Station (Ground-Level Section)



Source: GDSUTP

Figure 2.9 Image of Station (Elevated Section)

2) Project Structure

There are four consulting service packages for this project which are as follows:

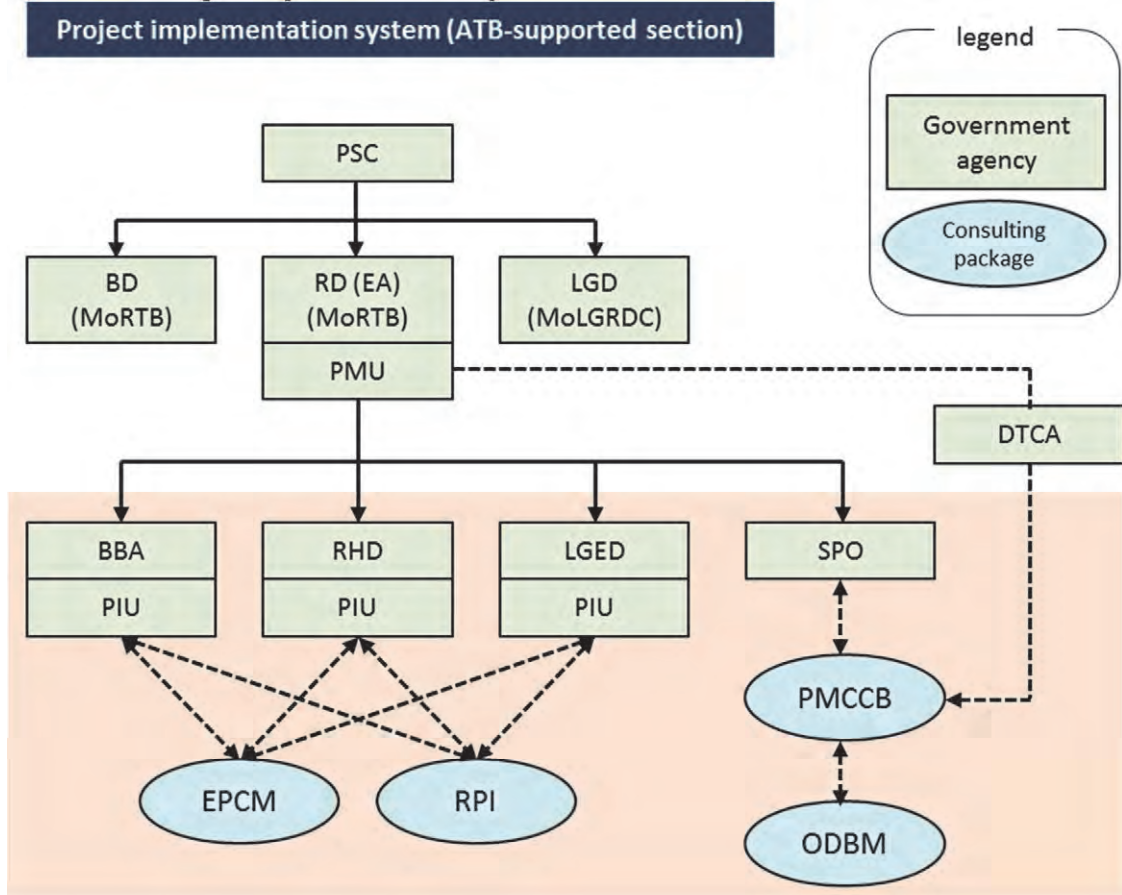
1. Project Management Coordination and Capacity Building (PMCCB)
2. Engineering Procurement and Construction Management (EPCM)
3. Operational Design and Business Model (ODBM)
4. Resettlement Plan Implementation (RPI)

The project implementation system is shown in Fig. 2.2.9. The Project Steering Committee (PSC) determines operating policies throughout the duration of the project, as well as preparing related organizations in order to facilitate the smooth advancement of the project.

The Road Division (RD), as the project supervisor, forms the dedicated Project Management Unit (PMU), coordinates the progress of the Project Implementation Unit (PIU), conducts inspections, etc. and manages the progress, finances, compliance, etc. of the overall project.

The Roads and Highways Department (RHD), Bangladesh Bridge Authority (BBA), and Local Government Engineering Department (LGED) form the dedicated Project Implementation Unit (PIU), perform various roles within the project, including procuring materials and overseeing contracted work, withdraw funds, and so forth.

The SPO was established by the Dhaka Bus Rapid Transit Company Ltd. (Dhaka BRT) in June 2013 and is pushing forward with regard to the DTCA as well as the PMCCB and ODBM.



PSC : Project Steering Committee
 EA : Executing Agency
 MoLGRDC : Ministry of Local Government and Rural Development and Cooperatives
 PMU : Project Management Unit
 SPO : Special Project Organization
 PIU : Project Implementation Unit

Source: Ministry of Road Transport and Bridges

Figure 2.10 BRT Line 3 (ADB-Supported Section Implementation System)

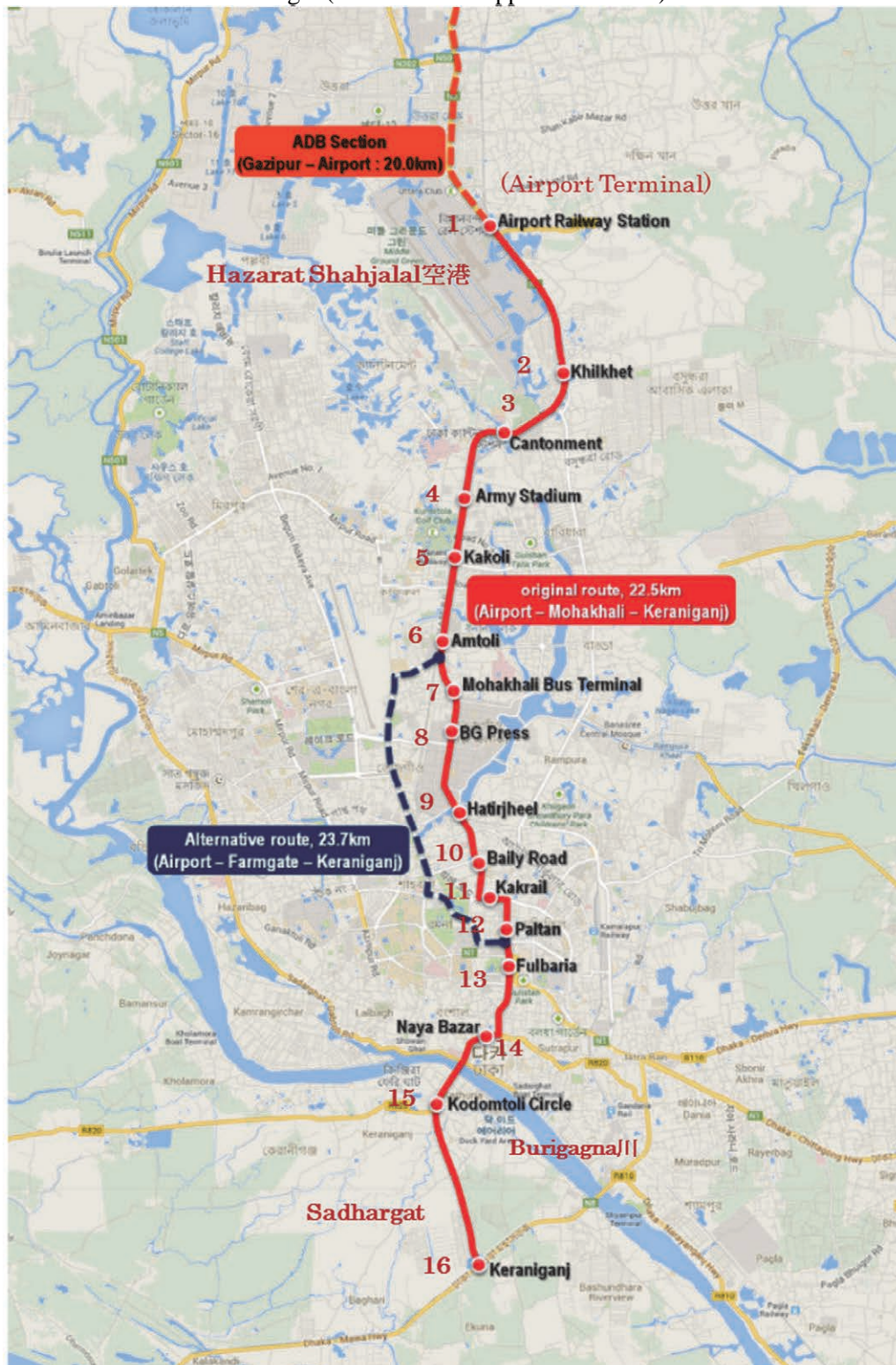
3) Project Timeframe and Costs

The project is set to be implemented from December 1, 2012, to December 1, 2016. The costs are as shown below.

- o Total cost: US\$ 255 million

- Investment breakdown:
 - GoB US\$ 45.4million (17.8%) Government of Bangladesh
 - ADB US\$ 160.0million (62.75%) Asian Development Bank
 - AFD US\$ 45.0million (17.65%) Agence Francaise de Developpement
 - GEF US\$ 4.6million (1.8%) Global Environment Facility

1) BRT Line 3: Uttara to Sadhargat (World Bank-Supported Section)



Source: DTCA Detail Engineering Design Work for Bus Rapid Transit Line-3
 Figure 2.11 Route Map of BRT Line 3 between Uttara and Sadhargat (World Bank-Supported Section)

This route runs from the Uttara area Airport Terminal to southern Keraniganj via central Dhaka and across the Buriganga River. The length of the route is approximately 22.5 km from Airport Terminal to Keraniganj, and it consists of 16 stations including Airport Terminal. The number of users once it opens is expected to be around 30,000 people during peak times.

The World Bank (WB) has been supporting development of this route as part of the Clean Air and Sustainable Environment (CASE) project since 2009.

In 2010 and 2011, the “BRT and Corridor Restructuring Implementation Study and Preliminary Design Work for the Uttara-Mohakhali-Ramna-Sadarghat Corridor in Dhaka” was conducted by the DTCA.

At present, South Korean consultant Sunjin Engineering and Architecture Co., Ltd. is moving forward with “Detail Engineering Design Work for Bus Rapid Transit Line-3 Corridor in Dhaka” under the jurisdiction of the DTCA (Dhaka Transport Coordination Authority). The key implementation items of this design work are shown below.

- Operational Plan & Business Case
- Environmental assessment-related support
- BRT operation plan
- Consideration of route and alignment
- Detailed design of infrastructure facilities
- Upgrading plan for existing facilities such as access roads, etc.
- Obstacle relocation plan
- Determination of rolling stock specifications and support for procurement
- Supporting development and fund procurement
- Supporting development of fare collection and ticketing system
- Calculating project costs
- Work plan and project implementation plan

This design work is scheduled to continue from January 2014 to May 2015, and in the future, based on the progress of the detailed design, the project costs and implementation system scheme will be decided.

2.3 Progress Status of Project for establishment of clearing house for integrating transport ticketing system in Dhaka city area

In 2011 and 2012, an ICT upgrade project for the Dhaka urban transportation fare collection system was carried out by JICA. Using a contactless FeliCa-type IC card, it was implemented on BRTC bus line 2 with the name Spass. It has since been added to Bus Line 1 and BR, and at the present time, the pilot program is still ongoing. In addition, Spass system is planned to introduce to the car ferry operated by BIWTC (Bangladesh Inland Water Transport Corporation).

At present, in order to found the integrated clearing house for expanding the fare collection by the IC card and preparing the introduction to the Metrorail and BRT, “Project for establishment of clearing house for integrating transport ticketing system in Dhaka city” conducted by JICA was started in May, 2014 and is scheduled to be carried out by March, 2017. In this project, coordination with related organization and the system design and development is now ongoing. The objectives of the project are as follows,

- (1) Formulating operation strategy of Clearing House based on Common IC Card,
- (2) Establishing Integrated Clearing House
- (3) Improving operation of fare collection of the existing public transport operator who Introduce ICT Fare Collection System.

The steps completed to date and future steps for introducing the IC card are shown below.

- Step 1: Start of trial use on BRTC (buses) – from 2012
- Step 2: Start of trial use on BR (railway) – from October 2013

- Step 3: Start of full use on BRTC (buses) – from 2015
- Step 4: Start of full use on BRT (buses) – from 2017
- Step 5: Start of full use on MRT – from 2020 or after

Source: Project for establishing Clearing House One card for all public transportation

2.4 BR Technical Standards, Etc.

2.4.1 Civil and Track Structures

In terms of materials relating to Technical Standards for railway facilities in Bangladesh, the Way & Works Manual by Bangladesh Railway is available. This is a guideline for performing maintenance work on railway facilities and describes maintenance-related reference values for railroad tracks, etc. Bangladesh does not have its own design Standards for railway structures.

2.4.1.1 Overview of Bangladesh Railway

1) Total route length, etc.

Bangladesh Railway is the national railway of Bangladesh, owned and operated by the Government. The total route length is 2,835 km. The eastern region uses 1,000 mm-gauge track (meter gauge) and has a total route length of 1,266 km, of which 34 km is dual-gauge track combined with 1,676 mm (broad gauge) track. The western region has 659 km of broad-gauge sections, 535 km of meter-gauge sections, and 375 km of dual-gauge sections. There are a total of 440 stations, including one interchange point, 13 train halts, and four goods stations.

2) Bridges

Bridges are classified as follows:

- a) Minor: Single span of <40' or total length of <60'
- b) Major: Single span of >40' or total length of >60'
- c) Important: Span of >100' or designated as such by Chief Engineer

There are a total of 3,452 bridges, of which 2,928 are minor and 524 are major.

3) Level Crossings

Places where roads and railway tracks intersect at the same level are designated as level crossings. They are classified as follows:

- a) Special Class: Crossings that intersect with the National Highway, which has an extremely large volume of traffic
- b) "A" Class: Crossings that intersect with roads that have a large volume of traffic
- c) "B" Class: Crossings that intersect with roads that have a relatively large volume of traffic
- d) "C" Class: Crossings that intersect with unpaved roads
- e) "D" Class: Crossings that intersect with roads used only by livestock and pedestrians

Bangladesh Railway has a total of 2,541 level crossings, of which 1,413 are authorized and the remaining 1,128 are unauthorized.

2.4.1.2 Track Structures

1) Rails

Various types of rails are used, including 50 lbs, 60-R, 75-R, 75-A, and 90-A.

2) Sleepers

Three types of sleepers are used: wooden, PC, and steel. Sleeper dimensions are as follows:

- a) For broad-gauge track: 9' x 10" x 5"
- b) For meter-gauge track: 6' x 8" x 4.5"

3) Ballast

1.5" to 2"-sized rubble is used. The width of the ballast cushion (from sleeper bottom

to track bed surface) on main lines is set as 6” to 8”.

4) Turnouts

In general, #12 and #8 turnouts are used.

5) Key dimensions

Item	Broad Gauge	Meter Gauge
Horizontal clearance at point 1.0 m above rail surface	5’-6” (1,676mm)	4’-6” (1,372mm)
Horizontal clearance at point 1’ to 14’6” above rail surface	7’-0” (2,134mm)	6’-3” (1,905mm)
Distance from track center to platform edge	5’-6” (1,676mm)	6’-3” (1,905mm)
Rail level to high platform surface	2’-6” (762mm)	2’-0” (610mm)
Rail level to low platform surface	1’-6” (457mm)	1’-4” (406mm)
Embankment section formation level width (single line)	22’-0” (6,706 mm)	18’-0” (5,486mm)
Embankment section formation level width (multiple lines)	37’-0” (11,278mm)	31’-0” (9,449mm)
Cutting section formation level width (single line)	20’-0” (6,096mm)	16’-0” (4,877mm)
Cutting section formation level width (multiple lines)	35’-0” (10,668mm)	29’-0” (8,839mm)
Vertical clearance above track	23’-7” (7,188mm)	23’-7” (7,188mm)

2.4.2 Rolling Stock

The existing regulations relating to rolling stock for the Bangladesh Railway (BR) are described in internal manuals. There are three manuals with regard to rolling stock: the Locomotive and Running Shed Manual, Carriage and Wagon Manual, and Mechanical Workshop Manual. The present versions were written in 1964 and 1965, during the period when it was still the Pakistan Eastern Railway, but fundamentally, they were inherited from the period of British rule. All three manuals are predicated on locomotive-hauled trains, and since the MRT Line 6 system differs considerably, there are no specific parts to be used as reference for the present MRT plan.

2.4.2.1 Locomotive and Running Shed Manual

All regulations relating to locomotives are contained in this manual, including locomotive operation based on the organization regulations for BR’s Mechanical Department and sheds (engine depots), rules relating to employees (including drivers), and locomotive repair and maintenance. The chapter titles and contents are as shown in Table 2.4.

Table 2.4 Chapters and Contents of Locomotive and Running Shed Manual

Chapter	Contents
1. ORGANISATION OF MECHANICAL DEPARTMENT	Items relating to the organization of the Mechanical Department
2. ESTABLISHMENT AND SHED ORDERS	Items relating to operations management
3. SAFETY PRECAUTIONS IN WORKSHOPS, SHEDS AND YARD	Items relating to work safety

4. RESPONSIBILITY AND DUTIES OF SUPERVISING STAFF	Items relating to employees' responsibilities
5. INSPECTION OF SHEDS, ETC.	Items relating to inspection of equipment
6. STATICS	Items relating to statistics
7. STORES AND MATERIALS	Items relating to management of spare parts
8. TOOLS AND PLANTS	Items relating to tools and equipment
9. POWER	Items relating to locomotive operation
10. WORKING OF TRAINS	Items relating to drivers' responsibilities and operation
11. LOCOMOTIVE OPERATION	Items relating to handling locomotives
12. AUTOMATIC VACUUM BRAKE	Items relating to the automatic vacuum brake system
13. RUNNING STAFF RULES	Items relating to drivers
14. ACCIDENTS AND RELIEF TRAINS	Items relating to accidents and accident relief trains
15. CRANE, CHAINS AND WIRE ROPES	Items relating to cranes, chains, and wires
16. EXAMINATION OF STEAM LOCOMOTIVES	Items relating to inspection of steam locomotives
17. REPAIRS TO STEAM LOCOMOTIVES	Items relating to repair of steam locomotives
18. WHEELS AND AXLES	Items relating to inspection of wheels and axles
19. STANDARD DIMENSION AND CONDEMNING SIZE OF B. G. LOCOMOTIVES	Items relating to main dimensions and usage limit values for broad gauge locomotives
20. STANDARD DIMENSION AND CONDEMNING SIZES OF M.G. AND N.G. LOCOMOTIVES	Items relating to main dimensions and usage limit values for meter gauge and narrow gauge locomotives
21. OPERATION OF DIESEL ELECTRIC LOCOMOTIVES	Items relating to diesel electric locomotives
22. MAINTENANCE OF MECHANICAL EQUIPMENT	Items relating to maintenance of mechanical parts
23. MAINTENANCE OF ELECTRICAL EQUIPMENT	Items relating to maintenance of electrical parts
24. DIESEL SHOP EQUIPMENT	Items relating to diesel engine maintenance equipment
25. FUEL SOURCES AND SPECIFICATION	Items relating to fuel specifications
26. RECEIPTS, ISSUES AND DISTRIBUTION	Items relating to fuel distribution
27. FUEL STORAGE AND HANDLING	Items relating to fuel storage and handling
28. FUEL SURVEY AND ACCOUNTAL	Items relating to fuel management
29. FUEL ECONOMY	Items relating to fuel saving
30. EXAMINATION OF BOILERS	Items relating to boiler inspections
31. SUPPLEMENTARY BOILER RULES FOR NON-LOCO BOILERS	Items relating to supplemental boilers and non-locomotive boilers
32. WATERING ARRANGEMENTS	Items relating to water arrangements
33. PLANT, OTHER THAN BOILERS, SUBJECT TO INTERNAL PRESSURE UNDER WORKING CONDITION	Items relating to other pressure containers, etc.

34. RESPONSIBILITY OF BOILER STAFF	Items relating to responsibilities of employees in charge of boilers
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Source: BR Locomotive and Running Shed Manual

2.4.2.2 Carriage and Wagon Manual

The Carriage and Wagon Manual is a manual relating to operation and maintenance of passenger carriages and freight wagons. It also explains items relating to interchange operation with Indian Railways. The chapter titles and contents are as shown in Table 2.5.

Table 2.5 Chapters and Contents of Carriage and Wagon Manual

Chapter	Contents
1. ORGANISATION OF MECHANICAL DEPARTMENT	Items relating to organization of Mechanical Department
2. ESTABLISHMENT AND SHED ORDERS	Items relating to operations management
3. SAFETY PRECAUTIONS IN WORKSHOPS, SHEDS AND YARD	Items relating to work safety
4. RESPONSIBILITY AND DUTIES OF SUPERVISING STAFF	Items relating to employees' responsibilities
5. INSPECTION OF SHEDS, ETC.	Items relating to inspection of equipment
6. STATICS	Items relating to statistics
7. STORES AND MATERIALS	Items relating to management of spare parts
8. TOOLS AND PLANTS	Items relating to tools and equipment
9. CLEANING AND WASHING OF VEHICLES	Items relating to cleaning and washing of rolling stock
10. EXAMINATIONS OF TRAINS	Items relating to train inspections
11. REJECTIONS	Items relating to conditions of rolling stock that cannot be operated
12. AUTOMATIC VACUUM BRAKE	Items relating to automatic vacuum brake system
13. LOADING OF CONSIGNMENTS	Items relating to loading cargo
14. ACCIDENTS AND RELIEF TRAINS	Items relating to accidents and accident relief trains
15. INTERCHANGE	Items relating to interchange operation with Indian Railways
16. PROCEDURE FOR INTERCHANGE	Items relating to procedures for interchange operation
17. WORKING OF INTERCHANGE	Items relating to interchange operation activities
18. BLOCK RAKES	Items relating to train composition management
19. MAINTENANCE OF COACHING STOCK	Items relating to maintenance of passenger carriages
20. SPECIAL INSTRUCTION REGARDING STEEL COACHES	Items relating to maintenance of steel passenger carriages
21. OILING AND REPACKING	Items relating to maintenance of axle boxes
22. MAINTENANCE OF GOODS STOCK	Items relating to maintenance of freight wagons
23. ROLLER BEARINGS	Items relating to maintenance of roller bearings
24. WHEELS AND AXLES	Items relating to inspection of wheels and axles
25. SPECIFICATIONS	Items relating to rolling stock part specifications

Source: BR Carriage and Wagon Manual

2.4.2.3 Mechanical Workshop Manual

The Mechanical Workshop Manual is a manual relating to overall operations for workshops in rolling stock plants. The chapter titles and contents are as shown in Table 2.6.

Table 2.6 Chapters and Contents of Mechanical Workshop Manual

Chapter	Contents
1. ORGANISATION OF MECHANICAL DEPARTMENT	Items relating to organization of Mechanical Department
2. ESTABLISHMENT AND SHED ORDERS	Items relating to operations management
3. RESPONSIBILITY AND DUTIES OF SUPERVISING STAFF	Items relating to employees' responsibilities
4. SAFETY PRECAUTIONS IN WORKSHOPS	Items relating to work safety
5. SUPPLY OF STORES AND MATERIALS	Items relating to supply and management of spare parts
6. TOOLS AND PLANTS	Items relating to tools and plants
7. PRODUCTION ORGANISATION	Items relating to organization of production department
8. PLANNING	Items relating to work planning
9. PROGRESS	Items relating to production management
10. INSPECTION OF MANUFACTURE	Items relating to quality inspection
11. ROWAN'S BONUS SCHEME	Items relating to bonus system if work is performed efficiently
12. WORK ORDERS	Items relating to work orders
13. ACCOUNTAL OF OUTTURN FROM PROCESS SHOP	Items relating to accounting processes
14. SCHEDULING OF REPAIRS TO LOCOMOTIVES	Items relating to locomotive repair planning
15. SCHEDULING OF CARRIAE CARRIAGE AND WAGON REPAIRS	Items relating to passenger carriage and freight wagon repair planning
16. INSPECTIONS OF ENGINES AND ROLLING STOCK	Items relating to rolling stock inspections
17. REPAIRS TO LOCOMOTIVES	Items relating to locomotive repairs
18. REPAIRS TO BOILERS	Items relating to boiler repairs
19. REPAIRS TO COACHING STOCK	Items relating to passenger carriage repairs
20. REPAIRS TO WAGONS AND UNDER FRAMES	Items relating to freight wagon repairs
21. WHEELS AND AXLES	Items relating to inspections of wheels and axles
22. WELDING	Items relating to welding
23. ROLLER BEARINGS	Items relating to roller bearing maintenance
24. CONDEMNING SIZE OF B. G. LOCOMOTIVES	Items relating to usage limit values for broad gauge locomotive parts
25. CONDEMNING SIZES OF M.G. AND N.G. LOCOMOTIVES	Items relating to usage limit values for meter gauge and narrow gauge locomotive parts
26. CONDEMNING SIZES OF C. & W. COMPONENTS	Items relating to usage limit values for passenger carriage and freight wagon parts
27. REPAIRS TO CHAINS AND WIRE	Items relating to chain and wire repairs

ROPES	
28. REPAIRS TO CRANES	Items relating to crane repairs
29. REPAIRS TO MACHINERY	Items relating to mechanical equipment repairs
30. EXAMINATION OF BOILERS	Items relating to boiler inspections
31. SUPPLEMENTARY BOILER RULES FOR NON-LOCO BOILERS	Items relating to supplemental boilers and non-locomotive boilers
32. WATERING ARRANGEMENTS	Items relating to water arrangements
33. PLANT, OTHER THAN BOILERS, SUBJECT TO INTERNAL PRESSURE UNDER WORKING CONDITION	Items relating to other pressure containers, etc.
34. RESPONSIBILITY OF BOILER STAFF	Items relating to responsibilities of employees in charge of boilers

Source: BR Mechanical Workshop Manual

2.4.3 Operation

2.4.3.1 General Rules

Rules relating to the operation of Bangladesh Railway are described in the General Rules, which are BR's internal regulations. These regulations describe the details of operations such as signaling, block systems, CTC, train departure procedures, etc.

However, these regulations are based on the assumption that diesel locomotive trains will be operated, and there are no parts that can be specifically referred to with regard to the present MRT plan featuring an ATC system. The chapter titles and contents of the General Rules are as shown in Table 2.7 below.

Table 2.7 Chapters and Contents of General Rules

Chapter	Contents
1. Preliminary	Definitions Classification of stations
2. Signaling and Interlocking	Use of signals Types of signals Types of daytime and nighttime signals Duties of drivers with regard to observing signals Use of fixed signals Types of fixed signals General installation position of fixed signals, etc.
3. Working of trains generally	Employment of Government standard time Adherence to announced schedule Operation within speed limits Precautions before starting train Duties of staff during operation Duties of staff upon train arrival Train lights and tail boards, etc.
4. Accidents	Measures required in the event of an accident Measures for accidents in sections with multiple lines Instructions in the event of breakdowns and accidents Measures required in the event of a fire

5. Additional rules applying to railway staff generally	Safety verification duties Assistance in increasing comprehension of assigned duties Not changing hours or work without a supervisor's permission Prohibition on performing tasks under the influence of alcohol or the like Etc.
6. Additional rules applying to Station Master	Duties of station master in order to improve staff's ability to perform tasks Unacceptability of allowing trains to approach or leave without the station master's permission Reporting of locations of problems with station signals, points, crossings, etc., to management department Etc.
7. Permanent-way or works	Track maintenance duties Periodic inspections Inspections of signals and couplings Maintaining accurate knowledge of signals, etc. Prohibition on track maintenance without permission of supervisor Prohibition on track maintenance work during thick fog or bad weather Verification after track removal work Duties of staff in the event of danger Methods of protecting trains
8. System of working	Types of operating systems: - absolute block - automatic block - section opening - continuous operation - staffing and ticketing systems - pilot system - engine block system
9. The Absolute Block System	Explanation of absolute block system. Method whereby a train departs after verifying that the preceding train has arrived at the next block station. There are various types.
10. The Automatic Block System	Explanation of how block is created automatically based on entry of train into track circuit.
11. The Centralized Traffic Control System	Summary explanation of system.

Source: BR General Rules

Chapter3 Legal Framework for Dhaka Metrorail Project

3.1. General

Since the period of rule, the United Kingdom influenced the legal culture in Bangladesh, where Act sets forth every power of the Government, rights and duties of the citizens. Without delegation by the Act, no legal forms may impose any duties on the citizens. In Bangladesh, such legal forms include Rule and Regulation, which shall be established by the public administration. Choice of Rule or Regulation depends on the entity to which the Act delegates the power, i.e. the Government or the Authority. It means power to make Rule and Regulation belongs to the Government and the Authority, respectively. Both of them are legally binding and require consultation with the Government, particularly the Ministry of Law. With respect to the legal framework for the Metrorail Project, however, the Authority drafted the Metrorail Rules to be enforced by the Government.

Directive is another form of administrative documents. As this it has no legal binding power, either the Government or the Authority by itself may issue through the internal procedures without consultation with other entities. In this sense, Directive is in the similar form as Circular Notice in Japan. Meanwhile, in Bangladesh, Act may delegate its power to impose duties, offences and penalties to Directive. In light of ease of issuing, Directive is a preferred form for the subject requiring frequent alterations, e.g. technical statements.

The legal framework in Bangladesh is, therefore, summarized in the following table 3.1.

Table 3.1 Legal Framework and Statutory Power in Bangladesh

	Statutory Power	Issuing Body	Consultation	Remarks
Act	Power of the Government, rights and duties of the citizens	Parliament		
Rule	Discretionary power of the Government delegated by Act	Government	Ministry of Law	
Regulation	Discretionary power of the Authority delegated by Act	Authority	Respective Ministry and Ministry of Law	
Directive	No legally binding power	Government or Authority	Board of Authority	Specific Directive may become legally binding if delegation of power is stated in the Act

3.2. Legal Framework for Dhaka Metrorail Project

Bangladesh earlier decided to build the Metrorail Act as a fundamental law for Metrorail development in the nation and compose the legal framework through a combination of Rule, Regulation and Directive by delegation of powers from the Act. Therefore, every power of the Government, rights and duties of the Metrorail business operator and the citizens must be vested in the Act, while actual administrative procedures for the exercise of powers in the Act shall be prescribed in the rules.

For the choice of legal forms, special attentions must be paid to the ease of issuing. Otherwise, it will be hard to meet the implementation schedule of the Metrorail Project. Also, ease of issuing becomes important when any amendments in the legal forms are required, e.g. from time to time making changes in the technical standards to reflect technology innovations. For these reasons, with respect to the legal framework for Metrorail development in Bangladesh, all the

necessary administrative procedures are incorporated in the Rules, while technical standards and other subjects that require frequent changes are defined in the Directives.

Chapter4 Assistance for Enactment of Metrorail Act

4.1 Policy and Approach for Assistance

Prior to this study, JICA dispatched experts since 2011 on "Institutional Building Assistance (IBA) for Dhaka Mass Rapid Transit System Project". The IBA confirmed the legal framework for development of Dhaka MRT and prepared the first draft of Urban MRT Act. Based on the result of these activities, Bangladesh side prepared "the Metrorail Act" in 2013.

This study pertaining to legal setup is to assist the enactment of the Metrorail Act over the approval process. In particular, the Study Team from time to time addressed requirements of the concerned ministries for clarifications and enhancements of the draft Act during the review inside MoRTB, amendments to obtain cabinet nods, until the parliament approval.

Policy and approach of the Team's assistance for enactment of the Metrorail Act are as follows.

- Ensuring flexible, adaptable, and well-balanced assistance to meet the needs of Bangladesh side as well as to enhance the effect of MRT Line 6 Project.
- Ensuring timely approval and institution of the Act in close liaison with Bangladesh side in order to accelerate the implementation of MRT Line 6 Project.
- Dispatching information about the progress on enactment of legislations, regulatory framework, and outlines in order to promote the activities of the entities interested in the MRT Project.
- Strengthening the function of public administration and enhancing public service through the development of sound regulatory system and structuring of good governance.
- Building capacity of the personnel involved in institutions and enforcement of the Act, rules, and directives till completion of the Project and after commencement of service.

4.2 Procedures and Anticipated Schedule for Enactment

4.2.1 Procedures and Progress

In 2011, the Institutional Development Assistance (JICA expert dispatching program) confirmed the necessity of new legal framework for the mass transit development in Dhaka. This was based on the decision of the Bangladesh Government to completely separate the institutional systems from the existing Bangladesh Railway. In the course of the said IBA program, the JICA expert team prepared the first draft of the Act and presented to the Secretary of ex-MOC and the Executive Director of DTCA. The Bangladesh side later determined the policy to simplify the Act and give broad power and duties in accordance with the legal culture of the nation. The first revision was prepared by the Bangladesh side and made available in September 2013 when this study began.

Since then, the Team provided continuous assistance in review of the Act, answers to the queries and comments from ministries, and preparation of enhanced drafts.

Procedures and progress for enactment of the Metrorail Act are illustrated in the following table. The Act is now in force by virtue of ordinary operation of the parliament despite political imbroglio and thanks to the attention of Bangladesh side to keep the Act as the highest priority. Cabinet nods and parliament approval were widely reported in the local media.

Table 4.1 Procedures and Schedule for Enactment

General Admin. Procedures for Passing a Bill of an Act	Progress	Expected timing
- Preparation of the draft Act by DTCA	Completed	Beginning of this study

- Endorsement by MOC (by the Deputy Secretary)	Completed	October 2013
- Inter-ministerial coordination	Completed	Since October 2013
- Public comment period	Completed	November 2013
- Circulation to the line ministries and other entities	Completed	April 2014
- Receiving of comments and making of a draft bill	Completed	Since May 2014
- Cabinet meeting	Completed	27 April 2014
- Review by MOL, preparation of the final bill	Completed	Since May 2014
- Cabinet meeting	Completed	28 November 2014
- Notification to MOC the result of review by MOL	Completed	January 2015
- Parliamentary approval of the bill	Completed	2 February 2015



Source : bdnews24 (Left) the Daily Star (Right)

Figure 4.1 Media Report (Left: Cabinet Nods, Right: Parliament Approval)

4.2.2 Engagement of Local Consultant

In preparation of the draft Act and subordinate rules, etc., the Team hired a local consultant for the purpose to review the legal framework, prepare texts in English and Bengali, catch up the progress of enactment and institution, etc.

Till now, the consultant attended the meeting organized by the ministries, gave legal advice during the inter-ministerial meetings, checked progress of enactment from time to time, and delivered English translation whenever major revisions of any provisions were made. In close liaison with the Team, the consultant made significant contribution to the enactment within the study period.

4.3 Basic Research on Legal Framework

4.3.1 MRT Act in Japan and Asian Countries

Referable legislations to the draft Metrorail Act vary in each country. Some apply “Railway Act” covering nationwide railway network, while others established a kind of “Metrorail Act” separately from such Railway Act. Comparing these legislations in a single uniform is generally hard as the backgrounds of railway development, legal culture (Common Law and Civil Law), scheme of railway business, regulatory regime (direct government regulation or regulation based on market principle), extent of privatization, asset ownership, etc., are different in each country. With this understanding, the Team reviewed the following legislations in Asia.

- Japan Railway Law, Railway Business Law
- India Metro Act, Delhi Metro Act, Kolkata Metro Act
- Singapore Rapid Transit Systems Act, Public Transport Council Act
- Thailand Mass Rapid Transit Authority Act

4.3.1.1 Scheme of Railway Business

Each country has different scheme of railway business, i.e. direct (in-house) management by the public entity (India, Thailand), licensing (permission) system (Japan, Bangladesh), or both (Singapore). Choice of business scheme is largely influenced by the institutional framework for public service and the extent of deregulation.

Table 4.2 Scheme of Railway Business

Japan	<ul style="list-style-type: none"> • In response to the application, the Government assesses and grants license (or give permission) to the applicant.
India Thailand	<ul style="list-style-type: none"> • In compliance with the business plan designed by the Government, a public entity (e.g. State-Owned Enterprise) directly manages and carries out railway business. • Through exchange of concession contract, public entity may appoint concessionaire to carry out railway business on its behalf.
Singapore	<ul style="list-style-type: none"> • In compliance with the business plan designed by the Government, a public entity (e.g. State-Owned Enterprise) directly manages and carry out railway business, or; • In response to the application, the Government assesses and grants license (or give permission) to the private entity.

4.3.1.2 Fare Fixation

Each country has different approach for fare fixation, i.e. direct fixation by the Government (India, Bangladesh), fixation of upper limit by the Government and determination of fare within the limit by the Operator (Japan, Singapore, Thailand). Choice of fare fixation model is largely influenced by the degree of maturity of the market economy and the extent of privatization.

Table 4.3 Approach for Fare Fixation

Japan Singapore	<ul style="list-style-type: none"> • Application of upper limit by the Operator and fixation of upper limit by the Government • The Operator determines the fare within the limit.
Thailand	<ul style="list-style-type: none"> • Application by the Operator (normally Concessionaire) and approval by the Government • Determination of fare under Concession Agreement
India	<ul style="list-style-type: none"> • Direct fare fixation by Fare Fixation Committee appointed by the Government

4.3.1.3 Confirmation of Safety, etc.

Where the Government directly manages and carries out railway business, such as in India and Singapore, site-entry inspection is required for opening of the system to the public. In the meantime, no technical examinations are mandated till completion of works. When carrying out this on-the-spot inspection, the Government or the Authority appoints individual inspectors or commissioners giving power to such individuals. In the case of Thailand, no legislations give

such power of inspection to the Authority. It means the Authority must carry out internal supervisions and audits with the power of the project owner.

Meanwhile in Japan, where the private sector shall obtain license for carrying out railway business, the Government examine technical soundness through drawings prior to the commencement of construction works. In addition, site-entry inspection is mandated for opening of the system to the public which is similar to the case of Singapore and India. In the case of Japan, however, the Government shall appoint inspectors and commissioners from public administration (not individuals) to carry out site-entry inspection. Therefore, such orders shall also be made by the public administration.

Table 4.4 Confirmation of Safety, etc.

India Singapore	<ul style="list-style-type: none"> Specialist appointed by the Government (Inspector or Commissioner) shall, as and when required, carry out inspections and audits with the jurisdiction as an individual. In India and Singapore, any person may be appointed.
Japan	<ul style="list-style-type: none"> Officer of the Ministry shall carry out inspection and audit as prescribed in the provisions of permission under the Law and Ordinance. As and when required, ad-hoc inspection may be performed.
Thailand	<ul style="list-style-type: none"> Without any legal bases, inspections and audits are performed by the public entity as the project owner.

4.3.1.4 Technical Standards

Each country has different approach for the status of technical standards, i.e. “standards specified by the Government and the Operator to develop detailed standards for execution” or “leaving the responsibility of developing technical standards to the Operator”.

Table 4.5 Status of Technical Standards

Japan, India	<ul style="list-style-type: none"> Standards specified by the Government and the Operator to develop detailed standards for execution in compliance with the requirement.
Thailand, Singapore	<ul style="list-style-type: none"> Leaving the responsibility of developing technical standards to the Operator.

4.3.2 Review of Existing Legislations Relative to Metrorail

For the development of act, rules and directives in relation to implementation and operations of MRT Line 6, the Team identified the existing legislations requiring coordination with the new Act, which may include the following:

4.3.2.1 Railways Act-related

Bangladesh Railways Act (1890) is comprised of the following elements.

Table 4.6 Composition of Bangladesh Railways Act

Chapter 1	Preliminary
Chapter 2	Inspection of Railways
Chapter 3	Construction and Maintenance of Works
Chapter 4	Opening of The Railway
Chapter 5	Traffic Facilities
Chapter 6	Working of Railways

Chapter 6A Limitation of Employment of Railway Servants
Chapter 7 Responsibility of the Railway Administrations as Carriers
Chapter 8 Accidents
Chapter 9 Penalties and Offences
Chapter 10 Supplemental Provisions

Since this act stipulates provisions concerning operation and management of existing Bangladesh railways, it does not stipulate procedures with the government regarding maintenance of newly constructed railways, approvals and licenses, technology standards.

4.3.2.2 Safety Certification

Under the Act IX of 1980 the General Inspector of Bangladesh Railway (GIBR) is mandated to approve structures and operation of rolling stocks after physical inspection. In the fiscal year of 2011-2012 GIBR conducted 16 annual and 17 general inspections the three years from 2009 to 2012. In addition, 102 approvals were given for the safe rail transportation.

Inspections and approvals for MRT will be separately undertaken by DTCA in line with the mandates specified under the Metrorail Act.

4.3.2.3 Technology-related Acts (Telecommunications Business Act, Building Standards Act, Disaster Prevention-related Act, etc.)

4.3.2.3.1 Bangladesh National Building Code

From Bangladesh National Building Code existed in 2006, and the related articles based on the on-site inspection documents of the Building code is excerpted below.

4.3.2.3.2 The provisions of accessibility for people with disabilities

In the article 3 “Requirements, restrictions and rules of general buildings” of the Building code, the followings are stated;

- Considering the crossing of pedestrians and wheel chair users, the minimum width of walkway should not be too narrow
- In the parking area outside roads, the minimum width of the slope for wheel chair users should not be too narrow
- The minimum height of the riser of stairs should not be too high

4.3.2.3.3 The provisions of fire protection

In the article 4 “Fire prevention” of the Building code, the followings are stated;

- Exit doors and the passages should have slopes when its height exceeds 300mm
- All exit doors should be clearly visible, and passages to the doors should be marked and directional signs should be placed

4.3.2.3.4 The provisions of lifts

In the article 8 “Building services” of the Building code, the followings are stated;

- Lifts must be installed for buildings with six floors or more, or with a height of 20m or higher
- At least one stretcher-type lift must be installed for buildings with 10 floors or more, or with a height of 32m or higher

4.3.2.4 Land Acquisition

Aiming the empowerment of the executing agency to acquire necessary land for infrastructure creation, the first draft of the MRT Act prepared under IBA Study envisaged that special authorities may apply separating from the existing Act. The Metrorail Act, however, specifies the reference to the existing provisions of the Acquisition and Requisition of Immovable Property Ordinance, 1982 (Ord. II of 1982) instead of the articles prepared under IBA Study.

4.3.2.5 The Public Demands Recovery Act

Land revenue shall be recoverable under the Public Demands Recovery Act. The Recovery Act is referred to in the latest draft.

4.3.2.6 The Criminal Procedure Code

The Code specifies the criminal procedure in Bangladesh. Juridical system of Bangladesh and that of India have plenty of similarity as the two countries have the same source of law, legal system, judiciary regime under the Code from Britain. Most of legislations about criminal procedure developed during the time of British India are still commonly used at present.

4.4 Analysis of the Metrorail Act

This section provides the result of analysis of the Act in comparison with the similar legislations in Japan (Railway Law and Railway Business Law), India (Metrorail Construction Act, Delhi Metro O&M Act, and Kolkata Metro O&M Act), Singapore (Rapid Transit Systems Act), and Thailand (Mass Rapid Transit Act). It should be noted, however, each country has differences in their historical backgrounds, legal culture (Common Law or Civil Law), regulatory regimes (direct government regulation or regulation based on market principles), extent of privatization, asset ownership, etc., which significantly influence on the provisions of each legislation.

4.4.1 Comparative Analysis of Regulatory Systems

4.4.1.1 Scheme of Railway Business

In Bangladesh, the relationship of the Authority (regulatory body) and Corporation (operating body) is commonly applied to public transport services, such as public bus and inland water transport sectors. The same approach is envisaged for institutional framework of the MRT Line 6 with the provision of licensing system.

4.4.1.2 Fare Fixation

In Bangladesh, the Government directly fixes fare based on the recommendation of the Fare Fixation Committee. This decision was made because of the opinion that the Operator should not have a freedom to set fare as the entity is to receive subsidy for O&M service (this idea resembles to the case in India where the Government directly appoints railway business entity). It implies, in other words, the Government should determine the upper limit of the fare as in Japan and Singapore when the Operator becomes financially sustainable by itself.

4.4.1.3 Confirmation of Safety, etc.

In Bangladesh, the Act gives DTCA the comprehensive power of technical authorization, including facility, rolling stock, maintenance, and safety management. Similar to the case in Japan, the licensee must obtain such approvals prior to the commencement of works or use. The concrete procedures need to be framed in the subordinate rules.

The Act gives power to the Inspector as an individual as in India and Singapore. Meanwhile, the inspectors shall be appointed from the members of regulatory authority unlike in India and Singapore.

4.4.1.4 Technical Standards

In Bangladesh, technical standards are framed as "the directive" that the regulatory authority has the power to mandate to the licensees. Any departures from the technical standards shall obtain prior approval from the authority.

4.4.2 Comparative Analysis of Each Provision of the Act

4.4.2.1 Chapter 1 (Preliminary)

This Chapter covers premises of the Metrorail Act (Section 1) and definitions of the terms used in the Act (Section 2).

Section 1: Short title, application and commencement

- The section specifies short title, areas of application, and commencement on such date as the Government may, by notification in the Gazette, appoints.
- This Act primarily applies to Dhaka, Narayangonj, Munshigonj, Manikgonj, Gazipur, and Norshindi and thereafter to the other district by notification in the Gazette.

(Case Study)

- Metrorail Construction Act (IND) has similar descriptions (Section 1).
- Delhi Metro O&M Act (IND) limits the application to Delhi (Section 1).
- Kolkata Metro O&M Act (IND) limits the application to Kolkata (Section 1).
- MRTA Act (THA) gives power to MRTA to carry out MRT business in Bangkok and its vicinity including other provinces as prescribed in the Royal Decree (Section 7).
- Railway Law (JPN), Railway Business Law (JPN), and Rapid Transit Systems Act (SIN) do not have such provisions because these acts / laws are applicable to the nationwide network.

(Analysis)

- Indian Metrorail legislations are segregated to the Construction Act, which may apply to other districts by notification to the Official Gazette, and the O&M Act, which is applicable only to each district. Other overseas cases envisage applicability to the nationwide network. The provision of the draft Act itself is, therefore, deemed appropriate.

Section 2: Definition

- "Definition" includes the terms that are generally used in the similar laws and acts.
- Definition of the "Licensee" means an entity licensed for any or all of establishing, operating, maintaining and developing a Metrorail system.

(Case Study)

- Railway Act (JPN) sets force, Class 1 Operator (integrated operator), Class 2 Operator (an entity to engage in O&M service only) and the Class 3 Operator (an entity to build railway systems only).
- Metrorail Construction Act (IND), Delhi Metro O&M Act (IND), Kolkata Metro O&M Act (IND) does not have such provisions as they envisage, in principle, integrated operation by the entity directly appointed by the Government.
- MRTA Act (THA) gives power to MRTA to have ownership of MRT facility and to grant concession of all or part of MRT business to a private individual. (Section 9).

- Rapid Transit Systems Act (SIN) clearly separates construction and O&M activities and license scheme is introduced to O&M service only.

(Analysis)

- As described below, there is a potential demand for implementation of Metrorail projects under PPP scheme that may possibly adopt so-called vertical separation. This provision makes possible any kinds of PPP scheme in a flexible manner.

Section 3 : Overriding Effect of the Act

- Notwithstanding anything contained in any other law or any other deed having the force of law for the time being in force, the provisions of this Act shall prevail.

(Case Study)

- Metrorail Construction Act (IND) specifies that provisions of the Act or by-laws, subordinate rules, etc. shall have effect notwithstanding anything inconsistent with any other law, etc (Section 40). Also, the provisions of the Act shall be in addition to and in derogation of the Indian Railways Act 1890 (Section 43).
- Delhi Metro O&M Act (IND) specifies that effect of Act inconsistent with other enactments shall have effect (Section 103). Also, it prescribes that the provisions of the Act shall be in addition to and not in derogation of the Metrorail Construction Act (Section 103).
- Kolkata Metro O&M Act (IND) has the same provision as the Delhi Metro O&M Act (IND) (Section 19). Also, it prescribes the application of Indian Railways Act 9 of 1890 and the rules, etc., made thereunder to the metro railway (Section 18).
- Rapid Transit Systems Act (SIN) specifies that nothing in the Railways Act shall apply to the Authority or any railways under the Act (Section 46).

(Analysis)

- Some cases in overseas specifies application or no application of the existing Railway Act or the like, while the draft Act prescribes overriding effect of the Act notwithstanding anything contrary to the other laws. The provision is generally appropriate.

4.4.2.2 Chapter 2 (Acquisition of Land)

Section 4: Acquisition of Land for Implementation of Metrorail

- Land necessary for the public interest shall be acquired in accordance with the existing legislation (Acquisition and Requisition of Immovable Property Ordinance, 1982).

(Case Study)

- Metrorail Construction Act (IND) has a provision that nothing in the Land Acquisition Act, 1894, shall apply to an acquisition under the Act (Section 17). Instead, the Metrorail Construction Act reinforces the power of the Government exclusively for Metrorail.
- Rapid Transit Systems Act (SIN) gives power to the Authority or the person appointed by the Authority to enter State of private land to lay railway, and where appropriate, do all things as are reasonably necessary for the laying, construction, maintenance and operation of the railway (Section 4 and Section 5).
- Railway Law (JPN) does not have any provisions about land acquisition but the requirements of the directly concerned laws shall be applicable.
- MRTA Act (THA) the acquisition of immovable property for mass transit shall proceed with the law on expropriation of immovable property (Section 35). The Minister shall publish the notification determining the MRT area and the MRT protection area in the Government Gazette (Section 37). MRTA shall have the power to issue a notification specifying the conditions in the construction, alteration or demolition of any building or other structure that may affect the MRT

system. Before granting permission to such construction, alteration or demolition, the licensing authority under the law on building control shall consider the compliance with the notification and notify MRTA (Section 38).

(Analysis)

- The same approach as the Metrorail Construction Act of India was envisaged at the time of preliminary study (Institutional Building Assistance (IBA) Study) for the purpose to strengthen the power of land acquisition. The conclusion made by the Bangladeshi side is, however, to apply the existing ordinance. The Team considers it appropriate as the additional provisions, i.e. Section 4 and Section 5 below, are able to supplement the requirements.

Section 5: Special Provision

- A person shall not be entitled to any compensation for construction or under construction establishments with the objective against the public interest on the land acquired for implementation of Metrorail, etc.

Section 6: Overriding Effect of Section 5

- The special provision of Section 5 shall remain in force to acquire land for implementation of Metrorail.

(Case Study)

- Metrorail Construction Act (IND) strengthens the power of the Government for acquisition of land by separately specifies the provisions for the same purpose. This includes power to acquire land (Section 6), publication of notification for acquisition (Section 7), power to enter for survey (Section 8), hearing of objection (Section 9), declaration of acquisition (Section 10), power to take possession (Section 11), right to enter into the land where right of user, etc., is vested in the Central Government (Section 12), determination of amount payable for acquisition (Section 13), deposit and payment of amount (Section 14), competent authority to have certain powers of civil court (Section 15), power to inspect property under acquisition (Section 15A), and powers of the appellate authority (Section 16).
- Rapid Transit Systems Act (SIN) allows the Authority to create rights in, under or over land by notification to the Official Gazette (Section 6).

(Analysis)

- The provision is considered appropriate. For the issue of the rights in, under or over land for the Metrorail in Bangladesh is still pre-matured to be incorporated in the Act as this requires intensive discussion among all the stakeholders.

4.4.2.3 Chapter 3 (License)

Section 7: Requirement of License for the Operation of Metrorail

- Any entity to engage in operation of Metrorail shall need a license.

Section 8: Application for license, renewal of license, etc.

- Entire process over the license, including application, period, renewal, issue and renewal fee, preservation and presentation, conditions, amendment, suspension and cancellation, shall be prescribed by the rules to be framed under the Act.

Section 9: Issuance of license, etc.

- The Government shall issue license according to the recommendation of the Selection Committee in the manner prescribed by rules and subject to payment of fee.

Section 10: Transfer of license

- A license shall be transferable on the prior approval of the government.

- The obligation of licensee, term of license, condition and procedure and relevant matters shall be prescribed by rules.

Section 11: Selection Committee

- The Government shall constitute a 7 members committee under the leadership of Executive Director for processing applications for license.
- Duty and functions of the Committee shall be prescribed by rules.
- The government may issue, renew suspend or cancel the license in considering the recommendation by the Committee.

(Case Study)

- Delhi Metro O&M Act (IND), Kolkata Metro O&M Act (IND) does not have provisions of license as they envisage, in principle, integrated operation by the entity directly appointed by the Government.
- MRTA Act (THA) allows the Authority to grant concession, in whole or in part, of MRT business to a private individual (Section 43). Concessionaire must be a Thai juristic person, have sufficient capital, machines, equipment, and experts with knowledge and experience in modern technology, and have other qualifications as prescribed in the Ministerial Relation (Section 44). The transfer of concession shall be made only when the Council of Ministers is of the opinion that it is necessary for the provision of services to the public and the transferee is of the qualifications prescribed in the Ministerial Relation (Section 49). Also, transfer of concession in the event of bankrupt, liquidation or receiving (Section 50), conditions of revoke of the concession by the Board (Section 51), resolution by the Council of Ministers (Section 53) are specified under the Act.
- Rapid Transit Systems Act (SIN) employs licensing to operate rapid transit systems (Section 13), and license charge (Section 13A), application (Section 13), cause of granting license (Section 14), conditions of license (Section 15), modification of terms and conditions of license (Section 16), restrictions on transfer and surrender of license (Section 16B), directions affecting license (Section 18), suspension or cancellation of license (Section 19), etc., are prescribed in the Act. Also, it specifies the Authority to operate rapid transit system in the absence of licensee to operate rapid transit systems (Section 21). Also, voluntary winding up, etc., is restricted under the Act (Section 27D).
- Railway Law (JPN) envisages licensing (permission) system, where application, cause of granting license by the Minister of MLIT, cause of disqualification are specified under the Law (Section 3 – Section 6). Also, inheritance (Section 27), suspension and cancellation of railway business (Section 28), dissolution (Section 29), termination of railway business and license (Section 30) are prescribed in the Law.

(Analysis)

- As far as licensing system is employed, each country has provisions for entire process of licensing unlike the draft Metrorail Act of Bangladesh. The Team left the decision to the Bangladeshi side as the local expert advised that the system can maintain functionality as long as necessary rules are framed under the Act and so stated in the Act itself.

Section 12: Establishment, operation and maintenance of Metrorail on the basis of PPP

- This provision enables establishment, operation and maintenance of Metrorail on the basis of PPP by providing prescribed license fee.

(Case Study)

- Delhi Metro O&M Act (IND), Kolkata Metro O&M Act (IND) does not have provisions of license as they envisage, in principle, integrated operation by the entity directly appointed by the Government, provided, however, non-Government

metro railway may work with prior permission from the Central Government (Section 87).

- Railway Law (JPN), keeping options of private entity open, defines 3 classes of railway business operators and makes vertical separation scheme possible (Section 2, 15 and 25 etc.).
- MRTA Act (THA) allows the Authority to grant concession, in whole or in part, of MRT business to a private individual (Section 43). Concessionaire must be a Thai juristic person, have sufficient capital, machines, equipment, and experts with knowledge and experience in modern technology, and have other qualifications as prescribed in the Ministerial Relation (Section 44).
- Rapid Transit Systems Act (SIN) keeps open the options of private entity to any or all of establishment, operation, and maintenance.

(Analysis)

- The provision keeps the possibility of Metrorail operations under PPP scheme in future. As the licensing power is vested to the Government, this provision is workable as far as relevant PPP Act is functional.

4.4.2.4 Chapter 4 (Right to Entry, etc.)

Section 13: Right to entry

- The Operator may enter under, in, upon or over the land or establishment besides Metrorail area for the establishment, operation, maintenance and development of Metrorail.

(Case Study)

- All the reviewed cases have provisions of the right to entry.
- Metrorail Construction Act (IND) gives power to the metro railway administration or any person authorized by that administration to enter the metro alignment and the vicinity for the purpose of construction or any other work connected therewith (Section 24).
- Railway Law (JPN) specifies the right to entry to the railway protection zone (Section 22).
- MRTA Act (THA) has a provision for the right to entry of the Authority for the purpose of obtaining information to launch the construction of MRT system (Section 32). Also, if the officials cause any damage to the owner, the owner, occupier or holder of real rights, such injured person is entitled to claim compensation from the Authority (Section 33).

(Analysis)

- Right to entry to the site is regarded as an essential provision for any legislation on construction works of Metrorail systems. The provision is generally appropriate.

Section 14: Restriction on stopping civic facilities, etc. without prior approval

- Licensee shall not suspend, remove or transfer civil facilities without prior approval of emergency service providing organization for the purpose of construction, development operation of Metrorail.

(Case Study)

- Metrorail Construction Act (IND) gives power to the Metro Railway Administration to build rail tracks and other rail facilities upon, under, along or across any land, canal, river, street or road on or in the metro alignment (Section 18). Also, the Authority shall impose conditions to the person who develop any land or building along or on the metro alignment with regard to the safety and other matters as may be prescribed (Section 20). In addition, the Authority has a power to prohibit or regulate construction to buildings and excavation in the

premise and vicinity of metro alignment (Section 21), while any person sustains any loss or damage such person shall be paid compensation (Section 22). If the metro railway administration finds its necessary, the administration shall have a power to underpin building or otherwise strengthen it (Section 23). In terms of public utilities, the Administration may, by writing, request any person or body of persons controlling the utilities to carry out any alterations at the expense of the administration (Section 24). Lastly, the Act prescribes that no claim shall be against the administration unless such claim is made within a period of 12 months from the date of completion of the construction (Section 26).

- Rapid Transit Systems Act (SIN) gives power to the Authority to serve notice on the owner or supplier of public utilities to alter the course or position of the utilities or repair any street surface (Section 10). Also, the Authority may give notice to the owner of any land or building in the railway area to remove any object or structure (Section 11).

(Analysis)

- The licensee requires prior approval for the relocation of utilities, etc. that is necessary for the development of Metrorail. As there is no provision for the empowerment of the government or licensee for the relation of such public services, it may have significant impact during the execution of construction works.

4.4.2.5 Chapter 5 (Technical Standards)

Section 15: Compliance to technical standards, etc.

- Licensee shall take approval for all technical matters including infrastructural facilities and establishment of rolling stock, maintenance and safety management.
- These shall be as per the directives regarding technical standards issued by the Authority.
- Licensee shall take permission from the Authority for any departures from the standards.

Section 16: Submission of report to the authority

- The licensee shall submit report safety management to the Authority in the manner and time specified by rules.
- The Authority may issue directives from time to time on the basis of the report.

(Case Study)

- Metrorail Construction Act (IND) and Delhi Metro O&M Act (IND) specify that the fitness to the technical requirements shall be inspected prior to the opening to public (section 27). The obligation of reporting to the Administration shall be prescribed in the rules (section 47 and 100). Besides, Delhi Metro O&M Act (IND) requires approval of rolling stock prior to use (section 20).
- Railway Law (JPN) specifies approval for commencement of construction works (section 8), alteration of construction plan (section 9), inspection upon completion of works (section 10), inspection of railway facilities (section 11), alteration of railway facilities (section 12), confirmation of rolling stock (section 13), are mandated to ensure compliance with the technical standards. With respect to the reporting of safety, Railway Law (JPN) has provisions such as reporting of accident, publication of safety report by the licensee (section 19), collection of information and report (section 55).

(Analysis)

- Compliance with the technical standards is clearly mandated in the Act with the provisions of comprehensive technical assessment and reporting requirements. As the intention and approach are appropriately stated, the system is highly workable.

With the subordinate rules and directives, effective operation of the technical authorization system will be made possible.

4.4.2.6 Chapter 6 (Fare, etc.)

Section 17: Fare Assessment

- The Authority shall determine passenger fare on getting directives from the Government.

Section 18: Fare Assessment Committee

- The Government shall constitute a 7 member Fare Assessment Committee headed by the ED for the assessment of Metrorail fare.
- The Committee shall recommend the highest and lowest fare rate considering the operation cost and financial ability of the public.
- The qualification of the members of the Committee and process of fare assessment shall be determined by the rules.

(Case Study)

- Delhi Metro O&M Act (IND) prescribes that the Central Government may, from time to time, constitute a Fare Fixation Committee for the purpose of recommending fare. One member each shall be nominated by the Central Government and the Government of Delhi respectively. Also, a sitting Judge of a High Court shall be appointed after consultation with the Chief Justice of that High Court (Section 34). There are no criteria for assessment and no intervals of assessment (i.e. from time to time) (Section 34 and 35).
- Rapid Transit Systems Act (SIN) has no provisions for fare as such mandate is given to the Public Transport Authority (PTC). Under PTC Act, fare is assessed by the council members appointed by the Minister (Section 3), but in fact the council consists of the members from the representatives of each community to ensure social equity.
- Public Transport Council Act (SIN) specifies that the Council shall regard to the profitability of the Operator, benefit of the citizens, and demand management over the public transport network (Section 23 and 24). Also, as and when necessary, public consultation shall be held (Section 24B). Notwithstanding the Act prescribes that the assessment may be carried out at any time as the PTC finds necessary, it is practiced regularly once in a year (Section 24AA).
- Railway Law (JPN) specifies that the Operator shall set forth the upper limits of the fares and the charges prescribed by an ordinance of the MLIT and obtain an approval of the Minister of MLIT (Section 16). The Law specifies that the fare level shall not exceed “appropriate operations cost” under the efficient management plus “reasonable profit” defined by the regulator. Also, MLIT may order for deviation if the Ministry is of the opinion that the fare causes social inequity or unreasonable competition between the public transport operators (Section 16). The Director of the District Transport Bureau shall, if there is an application by an interested person over the fare issues, request appearance of the interested persons and witnesses to hear their opinions (Section 65).

(Analysis)

- Social equity must be taken into consideration in assessment and determination of Metrorail fare as clearly stated in Delhi Metro O&M Act (IND) and Rapid Transit Systems Act (SIN). The provision of the Fare Assessment Committee in the draft Act has the same direction in principle and deemed appropriate.

Section 19: Publication of Fare Related Information

- The Operator shall display and preserve the list of fare in the website, station, inside the coach etc. for the convenience of the passengers.

(Case Study)

- Delhi Metro O&M Act (IND) specifies the requirement of displaying fare table in the stations as a provision for “Working of Metro Railway”, not in the Chapter of Fare (Section 23).
- Rapid Transit Systems Act (SIN) has no such provisions in the Act. Instead, information about fare is required under the Rapid Transit Systems Regulation (Section 33).
- Railway Business Law (JPN) prescribes that the fare and other terms of transportation shall be displayed at relevant stations (Section 3).

(Analysis)

- The provision is similar to the one in the Delhi Metro O&M Act (IND) and considered appropriate.

Section 20: Reservation of Seat

- In the Metrorail, seat shall be reserved for war injured freedom fighters, women, children and aged persons.

(Case Study)

- Delhi Metro O&M Act (IND) has no equivalent provisions or the like.
- Kolkata Metro O&M Act (IND) specifies that it shall not necessary to reserve any compartment in any train for the exclusive use of females (Section 6).
- Rapid Transit Systems Act (SIN) has no such provisions.
- Railway Law (JPN), Railway Business Law (JPN) has no equivalent provisions, but provisions for barrier free are partly related.
- MRTA Act (THA) has no equivalent provisions, but specifies that the Authority shall provide sufficient facilities to passengers especially disabled persons, senior citizens and children as appropriate for using MRT services (Section 59).

(Analysis)

- Notwithstanding it is desirable to prescribe comprehensive provisions for barrier free as the Railway Law (JPN). The draft Act is generally appropriate.

4.4.2.7 Chapter 7 (Appointment of Inspector and Appellate Authority)

Section 21: Appointment of Inspector

- The Authority may appoint any of its officers as an Inspector.

(Case Study)

- Metrorail Construction Act (IND) specifies that the Central Government may appoint Commissioner (Section 27).
- Delhi Metro O&M Act (IND) has the same provision (Section 7).
- Rapid Transit Systems Act (SIN) specifies that the Minister may appoint any person to be an inspector and the inspector may appoint such persons as he considers necessary to assist him in the performance of his duties (Section 22).
- Railway Law (JPN) specifies that the Minister of MLIT may have his/her officials enter into the offices or other workplaces of the Operator to inspect the status of business activities (Section 56).

(Analysis)

- Any cases have a provision for appointment of inspector, commissioner or the like, though the duties and powers partly differ. Therefore, the provision is considered appropriate.

Section 22: Power of Inspector

- Inspector shall have powers to enter any place related to Metrorail, examine and collect information, submit report with specific recommendations to the Authority after inspection.

Section 23: Providing assistance to the Inspector

- The operator shall render all cooperation to the Inspector to enter any place and carry out inspection.

(Case Study)

- Delhi Metro O&M Act (IND) sets forth the duties and powers of the Commissioner separately. In comparison with the draft Act, their powers are equivalent but the duty of inspection upon completion of works prior to the opening to the public is additional. This is probably the reason why the Act uses the term “Commissioner” instead of “Inspector” (Section 8, 9, 11 and 12).
- Metrorail Construction Act (IND) has the same provisions (Section 27 and 28).
- Rapid Transit Systems Act (SIN) has the similar provisions. In particular, areas where the power to entry is applicable, offences and penalties for obstructing the duties of the Inspector also are prescribed in the Act (Section 23).
- Railway Law (JPN) has the similar provisions (Section 56).

(Analysis)

- The draft Act has almost similar provisions to the overseas cases and considered appropriate.

Section 24: Appellate Authority

- Any person or organization aggrieved by the order of the authority may prefer appeal. The Government shall dispose of the appeal within 30 days.

(Case Study)

- Delhi Metro O&M Act (IND) prescribes that the Central Government may appoint a Claims Commissioner for the purpose of adjudicating upon claims for compensation in respect of accidents involving the death of, or bodily injury to person, or damage to any property arising out of the working of the metro railway. (Section 48).
- Rapid Transit Systems Act (SIN) specifies no appellate authority for the same purpose but the decision of the Minister shall be final.

(Analysis)

- Constitution of the appellate authority should be the reasonable solution for Bangladesh and considered appropriate.

4.4.2.8 Chapter 8 (Compensation and Insurance for Damage Caused by Accident, etc.)

Section 25: Awarding compensation

- If any person becomes injured or suffers damage or died due to an accident from Metrorail operation, the licensee shall be liable to pay compensation to him or his family in the manner and amount to be prescribed by the rules.

Section 26: Medical Treatment of Accident Victim

- The Operator shall arrange the transfer of victims of accident to the nearest hospital for proper treatment if the Metrorail falls into accident and inform the matter of accident to the Authority and emergency service providing organizations.

Section 27: Report on fatal accident

- The licensee shall forthwith inform the emergency service providing organizations about the fatal accident and submit report to the Authority.

(Case Study)

- Delhi Metro O&M Act (IND) specifies the provisions for compensation and insurance over the accident. With regard to the accident, the metro railway administration, within whose jurisdiction the accident occurs shall give notice of the accident to the Government of Delhi and the Commissioner having jurisdiction over the place of the accident (Section 38 -47).

- Rapid Transit Systems Act (SIN) has no provisions for compensation and insurance.
- MRTA Act (THA) specifies that the concessionaire shall provide an insurance against any loss for the maintenance of safety in the use and keeping of MRT properties, systems, passengers and other persons within the MRT Area (Section 55).

(Analysis)

- Although most of the overseas cases have no provisions in this regard, specifying the medical treatment of accident victim itself is considered appropriate.

Section 28: Compulsory insurance for Metrorail and passenger

- Every licensee shall cause insurance for Metrorail and all passengers of it and third party.
- In case of accident, the licensee shall within 90 days from the claim, on realizing the compensation money from the concerned company.

(Analysis)

- Delhi Metro O&M Act (IND) specifies the provisions for compensation and insurance over the accident. With regard to the accident, the metro railway administration, within whose jurisdiction the accident occurs shall give notice of the accident to the Government of Delhi and the Commissioner having jurisdiction over the place of the accident (Section 38 -47).
- Rapid Transit Systems Act (SIN) has no provisions for compensation and insurance.
- MRTA Act (THA) specifies that the concessionaire shall provide an insurance against any loss for the maintenance of safety in the use and keeping of MRT properties, systems, passengers and other persons within the MRT Area (Section 55).

(Analysis)

- Cause of insurance for Metrorail is common to the above cases in overseas and considered appropriate.

Section 29: Compensation of third party for accident of Metrorail

- In case of any damage to be caused by the accident of Metrorail to the establishments other than the Metrorail or its passengers, the licensee shall within 90 days from raising the claim on realizing the compensation from the concerned company.

(Analysis)

Although no equivalent provisions are found in the overseas cases, the description of the section is considered appropriate.

4.4.2.9 Chapter 9 (Offences and Penalties)

The Chapter prescribes the practical offences and penalties.

Section 30: Establishment, Operation, Maintenance and Development of Metrorail without License

- No organization shall establish, operate, maintain and develop Metrorail without license and violation of the same punishable with sentence of imprisonment or with fine or both.

(Analysis)

- Delhi Metro O&M Act (IND) does not have provisions of license as they envisage, in principle, integrated operation by the entity directly appointed by the Government. Prior to the operation, sanction of Central Government is required. For the close of metro railway, the Central Government shall decide based on the opinions of the Commissioner (Section 14 – 19).

- Rapid Transit Systems Act (SIN) specifies that no person except the Authority or a person licensed by the Authority shall operate any rapid transit system. Also, it prescribes the offences and penalties of the operation without license (Section 12).
- Railway Law (JPN) specifies that any person to operate railway business without permission by the Ministry is of guilty and subject to imprisonment or fine or both (Section 67, etc.).

(Analysis)

- As long as license system is employed, any cases have provisions for offences and penalties against operation without license. The provision is generally appropriate.

Section 31: Penalty for Transfer License

- No licensee shall transfer license of Metrorail without the written permission of the Authority.

(Case Study)

- Delhi Metro O&M Act (IND) does not have provisions of license as they envisage, in principle, integrated operation by the entity directly appointed by the Government.
- Rapid Transit Systems Act (SIN) specifies that every license shall not be capable of being transferred or assigned unless the license contains a condition authorizing such transfer or assignment and the Authority consents in writing to such transfer or assignment (Section 16B).
- Also, it prescribes that no person shall acquire any essential operating asset of a rapid transit system unless the person is a licensee authorized by license to operate, or the Authority consents in writing to such acquisition (Section 16A).
- Railway Law (JPN) specifies that the Operator shall not allow other person to use his/her name for railway business (Section 24). Also, the assignment and receiving assignment of railway business shall not be effective unless approved by the Minister of MLIT (Section 26). If the railway business operator died, the decedent of the railway business shall obtain prior approval from the Minister of MLIT. With regard to the transfer of facilities from Class 1 or Class 3 Operators to Class 2 Operator, prior approval from the Minister of MLIT shall be required (Section 15).

(Analysis)

- In addition to the prior approval from the Authority, some cases of overseas specify the conditions of license and areas of transfer for operating license and assets / facilities. In the meantime, Bangladesh case intends to prescribe these in the subordinate rule. This arrangement is generally appropriate according to the local consultant.

Section 32: Penalty for obstructing right to entry

- No owner, possessor or custodian of land or establishment shall obstruct or refuse or create nuisance to the right to entry. Violation of the same shall be punishable.

(Case Study)

- Metrorail Construction Act (IND) gives power to the metro railway administration to prohibit or regulate construction to buildings and excavation and penalty for violation of the same (Section 20). Also, the metro railway administration may demolish obstructing building or make necessary additions or alternations thereto (Section 36).
- Rapid Transit Systems Act (SIN) specifies the penalty for unlawful obstruction in exercise of duties of an agent or employee of the Authority (Section 9).
- MRTA Act (THA) specifies that any person who obstructs the Act of MRTA or its officials shall be liable to penalty (Section 76).

(Analysis)

- Despite the depth of prescription and approaches differ in each case, the provision in the draft Act is similar and considered appropriate.

Section 33: Penalty for creating obstruction on Metrorail construction, development, operation and performing any other activities including maintenance

- Any person without lawful reason shall not do anything or create any obstruction in performing any activity including construction, development, operation and maintenance of Metrorail.

(Case Study)

- Delhi Metro O&M Act (IND) prescribes that endangering the safety of passengers by metro railway official is punishable with imprisonment or with fine or both (Section 65). Also, abandoning duties of running a train, etc., without authority is subject to imprisonment or fine or both (Section 66). In addition, maliciously wrecking a train or causing sabotage also is subject to imprisonment or fine or both (Section 74).
- Railway Business Law (JPN) prescribes that the staff organization of railway staff shall be stipulated by the Ordinance of the MLIT (Section 19). Also, the Operator shall establish service rules for its railway staff (Section 20).
- MRTA Act (THA) prescribes that in the case where any passenger or other person within the MRT area has suffered damage from the activity of MRTA or the concessionaire; such person shall be entitled to submit a petition to the Board (Section 60). Also, offences and penalties of the same are specified (Section 77). In addition, failure to facilitate the competent officials in the performance of their duties shall be liable to a fine.

(Analysis)

- Despite the depth of prescription and approaches differ in each case, the provision in the draft Act is similar and considered appropriate.

Section 34: Penalty for unauthorized trespass to the restricted area of Metrorail

- Except lawfully empowered person or organization, no one shall enter in the restricted area of Metrorail and violation of the same is punishable.

(Case Study)

- Delhi Metro O&M Act (IND) prescribes penalty for unlawfully entering or remaining upon metro railway or walking on metro track (Section 64) and power to remove persons from metro railway and its carriages (Section 31).
- Railway Business Law (JPN) specifies that any person who has trespassed in a station or other railway premises without due cause shall be punished by a petty fine (Section 37). Also, it specifies that a railway staff may cause a passenger or public to depart from a rolling stock or railway (Section 42).
- MRTA Act (THA) gives power to the competent officials to deport offenders within the MRT area (Section 63).

(Analysis)

- The provision has similarity to the cases of overseas and considered appropriate.

Section 35: Penalty for impeding safety of Metrorail and its passengers

- If any person accomplishes any action for which the safety of Metrorail or its passengers impedes or likely to be impeded, the said action of the said person shall be an offence.

(Case Study)

- Delhi Metro O&M Act (IND) prescribes that endangering the safety of passengers by metro railway official is punishable with imprisonment or with fine or both (Section 65). Also, abandoning duties of running a train, etc., without authority is subject to imprisonment or fine or both (Section 66). In addition, maliciously

wrecking a train or causing sabotage also is subject to imprisonment or fine or both (Section 74).

- Rapid Transit Systems Act (SIN) specifies that any person who willfully does or omits to do anything in relation to any railway as a result of which the safety of any person travelling or being upon the railway is endangered, or is likely to be so endangered, shall be guilty of an offence and shall be liable on conviction to a fine or to imprisonment or to both (Section 25).
- Railway Business Law (JPN) prescribes punishment for discharge of a firearm (Section 39) and casting of a tiling or stone (Section 40). Also, it specifies that a person who has engaged into the falsification, destruction, or removal of the sign or posting, or extinguished a light or disabled the use thereof shall be punishable (Section 36).
- MRTA Act (THA) prescribes that MRTA shall have the duty to impose any safety measure to protect passengers and other persons within the MRT Area and in the case where such damage occurred resulting from the insufficiency of safety measures or the acts of MRTA officials; MRTA shall be responsible for the damages resulting therefrom (Section 61).

(Analysis)

- Despite the depth of prescription and approaches differ in each case, the provision in the draft Act is similar and considered appropriate.

Section 36: Penalty for selling Metrorail ticket or pass without authorization or distorting or counterfeiting ticket or pass

- No person or organization shall counterfeit or distort the ticket of Metrorail or sell the ticket after counterfeiting or use counterfeit ticket. Violation of the same shall be punishable.

(Case Study)

- Delhi Metro O&M Act (IND) specifies that if any person willfully breaks the security code of any pas or ticket, or defaces or alters or counterfeits or duplicates it or acts in any way to cause revenue loss to metro railway, he shall be punishable (Section 71). Also, it specifies the penalty for unauthorized sales of tickets (Section 75).
- Railway Business Law (JPN) has no provision for penalty for unauthorized sales of tickets or counterfeit of tickets.

(Analysis)

- The provision has similarity to the case of Delhi Metro O&M Act and considered appropriate.

Section 37: Penalty for abuse of Metrorail or its machinery by employee

- If any employee of the licensee uses Metrorail or its Machinery in such a way for which the safety of Metrorail or its passengers may be hampered, and during his duty uses the Metrorail or its machinery in such a way, the power of which was not given to him in that case the said action of the said person shall be an offence.

(Case Study)

- Delhi Metro O&M Act (IND) prescribes that endangering the safety of passengers by metro railway official is punishable with imprisonment or with fine or both (Section 65). Also, abandoning duties of running a train, etc., without authority is subject to imprisonment or fine or both (Section 66). In addition, maliciously wrecking a train or causing sabotage also is subject to imprisonment or fine or both (Section 74).
- Railway Business Law (JPN) prescribes that the staff organization of railway staff shall be stipulated by the Ordinance of the MLIT (Section 19). Also, the Operator shall establish service rules for its railway staff (Section 20).

- MRTA Act (THA) prescribes that in the case where any passenger or other person within the MRT area has suffered damage from the activity of MRTA or the concessionaire; such person shall be entitled to submit a petition to the Board (Section 60). Also, offences and penalties of the same are specified (Section 77). In addition, failure to facilitate the competent officials in the performance of their duties shall be liable to a fine.

(Analysis)

- Despite the depth of prescription and approaches differ in each case, the provision in the draft Act is similar and considered appropriate.

Section 38: Obstructing Inspector in Performing Duty or Providing False or Misleading Information

- The licensee or his representative shall not obstruct the Inspector, create obstruction or provide false or misleading information. Violation of the same shall be punishable.

(Analysis)

- Railway Law (JPN) specifies that the person who refused, interfered with or evaded the inspection or did not make a statement or made a false statement shall be punishable (Section 70).

(Analysis)

- The provision is similar to the case in overseas and considered appropriate.

Section 39: Penalty for not causing insurance

- If any licensee doesn't make any insurance for licensee or its passengers or for third party, in that case the said action of the said person shall be an offence.

(Case Study)

- MRTA Act (THA) specifies that insurance against loss and damage to life and body of a passenger shall be provided in accordance with the rules, procedure and conditions prescribed in the Ministerial Regulation (Section 58). Also, penalty for not providing insurance shall be punishable (Section 78).

(Analysis)

- The provision is similar to the case in overseas and considered appropriate.

Section 40: Penalty for Travelling by Metrorail without Ticket or a valid pass

- No person shall travel by Metrorail without ticket or adopt any means to avoid fare. Violation of the same may cause fine.

(Case Study)

- Delhi Metro O&M Act (IND) specifies that travelling without proper pass or ticket or beyond authorized distance shall be liable to pay the excess charge (Section 25). Also, if such passenger fails or refused to pay the excess charge shall be punishable (Section 69).
- Railway Business Law (JPN) specifies that no passenger may be on board any train without obtaining a railway ticket by paying fare (Section 15). Also, a passenger not in possession of a valid train ticket or rejects a ticket inspection or otherwise refuses to return his/her ticket upon collection shall be liable to pay the excess charge (Section 18). Offences and penalties for such passengers also are prescribed (Section 29).
- MRTA Act (THA) specifies that any person who fails to pay a fare at the rate shall be liable to a fine (Section 80).

(Analysis)

- The provision has similarity to the cases of overseas and considered appropriate.

Section 41: Penalty for not Following Technical Standards

- If licensee constructs or establish, operate, maintain and perform safety management of rolling stock without the approval from the Authority or without following the directives regarding technical standards that shall be an offence.

(Case Study)

- Railway Business Law (JPN) has a penalty clause for not following technical standards (Section 69 - 71).

Section 42 : Commission of Offence by Operator

- If any offence is committed, it shall be deemed to be committed by the member of the board of directors, Chief Executive Officer and officer and employee, concerned with the offence unless he or they prove it that the offence is committed without is notice or he or they make sufficient effort to prevent the offence.

(Case Study)

- Delhi Metro O&M Act (IND) specifies that where an offence has been committed by a company, every person who, at the time the offence was committed, was in charge of, and was responsible to, the company, for the conduct of the business of the company as well as the company, shall be deemed to be guilty of the offence (Section 81).
- Kolkata Metro O&M Act (IND) has a similar provision (Section 17).
- Metrorail Construction Act (IND) has a similar provision (Section 38).
- Rapid Transit Systems Act (SIN) has a similar provision (Section 43). Also, penalty for the same is specified (Section 44).
- MRTA Act (THA) has a similar provision. Also, penalty for the same is specified (Section 86).
- Railway Business Law (JPN) specifies that railway staffs who have committed misconduct against a passenger or public on his/her duty shall be punishable (Section 24). Also, a staff who has engaged in a conduct where he/she has neglected his/her duties and thereby running a risk of exposing a passenger or public hazard shall be punishable (Section 25).

(Analysis)

- The provision is similar to the cases in overseas and considered appropriate.

Section 43 : Penalty for Abatement, Instigation and Conspiracy of Commission of Offence

- Any person if abates or instigates or makes conspiracy to commit an offence shall be deemed to commit the offence and shall be punishable.

Section 44 : Penalty for Recommitting Offence

- If any person on being convicted and sentenced for any offence stated in this Act, commits the same offence again, in that case he shall be liable to be sentenced.

(Case Study)

- Delhi Metro O&M Act (IND) has no similar provisions.
- Railway Business Law (JPN) has no similar provisions.

(Analysis)

- Despite no similar provisions are found in the overseas cases, the content of the provision is generally appropriate.

Section 45 : Cognizance of Offence

- Notwithstanding anything contained in the Criminal Procedure Code, no subordinate court shall take cognizance of any case without written complaint by an officer duly empowered by the Authority or an Inspector.

Section 46 : Application of the Criminal Procedure

- The Criminal Procedure Code shall be applicable for the investigation, trial, appeal etc. under this Act.

Section 47 : Jurisdiction of Mobile Court

- The offences under this Act may be tried under Mobile Court Act, 2009.

(Case Study)

- Delhi Metro O&M Act (IND) specifies that notwithstanding anything contained in the Code of Criminal Procedure, 1973, no court inferior to that of a Metropolitan Magistrate shall try an offence under the Act (Section 84). Also, offence under the Act shall be triable in any place in which he may be, or which the Government of Delhi may notify in this behalf. Every notification in this regard shall be published by the Government of Delhi in the Delhi Gazette (Section 85).
- Metrorail Construction Act (IND) specifies that no suit or application for injunction shall lie in any court against the Central Government or the metro railway administration, or other employee of the Government or the metro railway (bar of jurisdiction) (Section 39).
- Rapid Transit Systems Act (SIN) specifies that notwithstanding the provisions of any written law to the contrary, a District Court or a Magistrate's Court shall have jurisdiction to try any offence under the Act and award the full punishment for offence (Section 42).
- Railway Business Law (JPN) specifies that no prosecution may be instituted for any conducts without a complaint filed by the railway (Section 30).

(Analysis)

- The provisions are drafted in accordance with the custom and practices of Bangladesh and generally appropriate.

4.4.2.10 Chapter 10 (Miscellaneous)

Section 48: Delegation of Powers

- ED may at any time delegate any of his power to any other officer.

(Case Study)

- Delhi Metro O&M Act (IND) specifies that the Central Government may, by notification, direct that all or any of the powers, except some of the sections of the Act, shall be exercisable also by such officer or authority subordinate to the Central Government or by the metro railway administration (Section 98).
- Rapid Transit System Act (SIN) specifies that the Authority may, with the approval of the Minister, in writing authorize any licensee or employee of a licensee to exercise all or any of the powers of an employee of the Authority (Section 41).
- Railway Law (JPN) specifies that the authority of the Minister of MLIT may be delegated to the Director of the District Transport Bureau pursuant to the provision of an ordinance of the Ministry (Section 64).

(Analysis)

- Despite areas of delegation of powers are adjusted in accordance with the practices of Bangladesh, the provision is generally appropriate.

Section 49 : Power to Make Rules

- The Government may, in the prescribed manner by notification in the official Gazette, make rules consistent with the provisions of this Act.

(Case Study)

- Delhi Metro O&M Act (IND) prescribes the power to make rules in each chapter (Section 22, 32, 47, 56, 100). Also, it specifies that rules and regulations shall be laid before parliament (Section 102).
- Kolkata Metro O&M Act (IND) has a similar provision (Section 22).
- Metrorail Construction Act (IND) has a similar provision (Section 44).
- Rapid Transit Systems Act (SIN) has no subordinate rules under the Act.
- Railway Law (JPN) specifies that the procedure and other matters necessary for enforcement of the Act shall be prescribed by an ordinance of MLIT (Section 66).

(Analysis)

- The provision has similarity to the cases of overseas and considered generally appropriate.

Section 50 : Powers to Make Regulations

- The Authority may, by notification in the official Gazette, make regulations, consistent with this Act or rules.

(Case Study)

- Delhi Metro O&M Act (IND) gives power to the metro railway administration to make regulations (Section 101). Also, it specifies that regulations shall be laid before parliament (Section 102).
- Rapid Transit System Act (SIN) prescribes that the Authority may, with the approval of the Minister, make regulations for the specified purposes (Section 45).
- Railway Law (JPN) has no such provision for powers to make regulations.

(Analysis)

- The provision has similarity to the cases of India and Singapore and generally appropriate.

Section 51 : Publication of English Translated Text

- After the commencement of this Act, the Government shall, by notification in the official Gazette, publish an English translated text of this Act. Provided that in the case of any conflict between the Bangla Text and the English Text, Bangla Text shall prevail.

(Case Study)

- Delhi Metro O&M Act (IND) has no such provision about Authentic English Text.
- Rapid Transit Systems Act (SIN) is written in English as a official legislation.
- Railway Act (JPN), Railway Business Act (JPN) has unofficial English translations only.

(Analysis)

- Despite the status of the English translation differ in each case, the provision is generally appropriate.

4.4.3 Comments on Metrorail Act

The Metrorail Act adequately prescribes obligations, offences and penalties, and powers and duties of the licensees and individuals in execution of Metrorail business.

According to the provisions of the Act, involvement of the public administration over the Metrorail business consists of the following.

- [Licensing System] Metrorail business is regulated by licensing system and initiated by the application of the interested entity.
- [Fare Fixation by Committee] Fare is fixed by the Fare Assessment Committee appointed by the Government and assessed once a year by the same Committee.
- [Technical Authorization System] Technical inspections and audits, etc., are under the jurisdictions of the Inspector appointed from the officers of DTCA.
- [Reporting System] The licensee shall report necessary information to the public administration.

The entire regulatory system is thought to be built in combination of the 4 regulatory tools above. Therefore, the Team is of the opinion that the draft Act has, at least, necessary provisions to be functional for Metrorail business.

In the meantime, the Team identified the following issues for the practical operation of the regulatory system. In the opinion of the Team, attentions must be paid in development of the subordinate rules and enforcement of the entire system.

- With the regulatory systems embodied in the Metrorail Act, namely licensing, fare assessment, technical authorization and reporting, the entire administrative procedures can be structured. However, enforcement of the same will be made possible only when the actual procedures are specified in the subordinate rules.

This is the reason why continuous efforts are required for establishment of rules and directives.

- Notwithstanding the licensing provision of the Act, the first-ever Metrorail project in Bangladesh envisages the business scheme similar to the direct appointment to DMTC. It means the regulatory regime is hard to understand as the regulatory authority and the licensee are substantially the same body. Besides, there are some contradictions due to the mixture of the several regulatory systems, e.g. direct fare fixation by the government under licensing system. For this reason, further assistance may be required for effective execution of the regulatory system.
- The Act was based on the case studies in overseas, yet highly adjusted to the local requirements, e.g. the license has its definitive period and fee must be charged upon every update. Although the Team paid due attentions to the differences in the legal culture, i.e. Common Law and Civil Law, actual execution of the legal system should require, from time to time, interpretation in accordance with the legal precedent or otherwise amendment of the provision itself.

Chapter5 Assistance for Institution of Rules Framed under Metrorail Act

5.1 Policy and Approach

In institution of rules framed under the Metrorail Act, the Team assisted the Bangladeshi side with, in addition to the policy and approach for enactment of the Act, the following.

- Ensuring consistent and undeviating designs of institutions from the Metrorail Act.
- Ensuring highly effective regulatory regime even under the briefed Act by clearly stating the entire procedures without omission and being just enough.
- Developing the regulatory system on the basis of Japanese execution standards to enable continuous support for implementation with the initiative of JICA, while adjusting and fitting to the practice of Bangladesh.

5.2 Structure of Necessary Rules

5.2.1 Rule and Regulation

Firstly, it must be determined if the regulatory system shall be established in the form of rule or regulation. In Bangladesh, the hierarchy of legislations are i) Act by the Government, ii) Rule by the Ministry, iii) Regulation by the Authority, and iv) Directive by the Authority. Compared with the structure of legislations in Japan, it can be illustrated in the following table (Japan's case is briefed for ease of understanding).

Table 5.1 Structure of Legislations in Japan and Bangladesh

Japan	Bangladesh			
	Framework	Issuing Body	Consultation	Remarks
Law (Railway Law, Railway Business Law)	Act (Metrorail Act)	Parliament		Powers, duties, offences and penalties shall be prescribed.
Rule (incl. Technical Standards)	Rule	Government	Ministry of Law	Delegation of powers in the Act is necessary.
Announcement	Regulation	Authority	Respective ministry and Ministry of Law	Delegation of powers in the Act is necessary.
Circular Notice (for appreciation of provisions in the Law. Not legally binding)	Directive	Authority	None	Administrative document (which may become legally binding if delegation of power is stated in the Act)

The Team determined the legal framework as follows:

- In discussion with DTCA and the local consultants, the Team recommended that regulatory system and procedures should be established under the rules of the Ministry to ensure effectiveness of the enforcement.

- While the technical standards developed in the course of this study may become an integral part of the said rules or otherwise be set forth as the regulation of the Authority or directives. Given the technological innovative nature of the urban railway industry, the said technical standards should require continuous efforts to review, revise and catch up the latest developments. Therefore, the Team suggested to DTCA that the standards should be defined as the regulation of DTCA to allow the Authority to make deviations at their own initiative. However, the Bangladesh side decided to define it as the directives to make it further easier to amend. Even though Directive itself is not legally binding, it becomes effective once the Act prescribes the obligation to comply with directives and the offences and penalties for violation.

5.2.2 Comparison with Overseas Cases

Licensing system, where the Government or the Authority grants a license to the applicant, is introduced in many developed countries including Japan. In the meantime, in some Asian countries, such as India and Thailand, the Government directly develops the railway business plans and appoints a public entity for execution. Therefore, this section introduces some referable cases, i.e. Japan and United Kingdom, which adopt the similar licensing system.

Table 5.2 Regulatory System in Japan and United Kingdom

	Japan	United Kingdom (ORR)
Commencement of MRT business	Permission (License)	License
Permission or inspection on safety	<ul style="list-style-type: none"> • Approval for execution of construction works • Inspection upon completion of construction works • Validation of rolling stock • Notification of operations plan 	<ul style="list-style-type: none"> • Safety Certificate • Authorization under railways regulations by ORR (on constructing new lines or developing existing facilities)
Management system	Safety Management Regulation	Safety Management System
Inspection, audit and reports on safety operation	<ul style="list-style-type: none"> • Inspection and audit by MLIT • Reports on accidents 	Inspection & audit by ORR Safety Annual Report
Accident investigation	Investigation by Japan Transport Safety Board	Investigation by Railway Accident Investigation Branch
Fare fixation	Approval of the upper limits of the fares with application by Railway Business Operator	Department for Transport determines the upper limits of the fares

The above table shows that there is no particular or very little difference in regulatory systems for railway business in Japan and United Kingdom, albeit the approaches differ to some extent.

In view of the above, the Team firstly introduced the regulatory systems and administrative procedures of Japan as the most referable case for the better understanding of the Bangladesh side. Subsequently, the Team prepared the first draft and adjusted sentence by sentence with the DTCA officers and the Bangladeshi legal expert. During this exercise, each rule was adjusted

and refined in consideration of institutional framework, administrative culture, administrative capacity, future development of Metrorail network, etc., in Bangladesh.

5.2.3 Regulatory Tools of the Government and the Authority

The regulatory systems under the Metrorail Act in Bangladesh encompass several categories putting into;

- Licensing System prescribing that no person may operate Metrorail Business without a license. Any person who intends to operate the business shall submit the application to the Authority.
- Fare Assessment System prescribing that Fare Assessment Committee appointed by the Government shall determine the fare and assess it at least once a year.
- Technical Authorization System enforced by the regulatory authority.
- Safety Management System where the regulatory authority has a power to collect reporting and information to ensure safety.
- Entry Inspection which shall be performed by an Inspector appointed from the officers of the Authority.

Therefore, the regulatory system must be structured with the regulatory tools of the above.

5.3 Approach for Designing of Regulatory System

The Team designed each regulatory system with the following approach.

5.3.1 Licensing System

Railway Law of Japan prescribes permission (licensing) of railway business, deviation of basic business plan, approval of transfer of license upon organizational changes of the licensee etc., order for improvement, cancelation and termination of license. In the meantime, the Metrorail Act specifies that the subordinate rules shall set forth these procedures. For this reason, the Team prepared the draft rules on licensing based on the Railway Law and the execution standards of Japan.

5.3.2 Fare Assessment System

In Japan the Minister of MLIT approves the upper limit of the fare in consideration of the application made by the Operator, while the Metrorail Act of Bangladesh prescribes that the Fare Assessment Committee directly determines the fare, taking the financial capacity of the Operator and the affordability of the citizens, which may be comparable to the provision of the Delhi Metro O&M Act of India (According to the opinions of the Bangladeshi side, the Operator should not have a freedom to set fare as the entity should receive subsidy for O&M service. It implies, in other words, the Government should determine the upper limit of the fare as in Japan and Singapore when the Operator becomes financially sustainable by itself). However, none of the subordinate rules for fare fixation is framed under the Delhi Metro Act.

While fare formulae are strictly applied in Japan and Singapore to ensure transparency of fare determination, India and neighboring countries envisage fixation of efficient fare directly by the independent regulator. In fact, the Fare Fixation Committee of India considers not only the financial capacity of the Operator and the affordability of citizens, but also various socio-economic indicators (e.g. inflation, customer price index, wage index etc.) and sound competition with other transport modes.

As seen in the case of India, the Government secures flexibility of fare determination by not clearly specifying the fare formulae, yet keeps high independence of the Committee in order to avoid arbitrary interference and political intervention (in particular, the Committee consists of 3 persons including the chairperson from the judge of high court and one member each from the Central Government and the Local Government, plus one sitting judge from the high court).

In preparation of the draft rule on fare assessment, the Team clearly states that the Operator shall adapt the fare determined by the Committee, fare shall be assessed by the Committee once a year, yet in the event of radical inflation, etc., the Operator may request for fare assessment.

5.3.3 Technical Authorization

Under the licensing system such as in Japan and United Kingdom, where only outlines of the railway business is being examined at the time of granting license, the regulatory authority must assess the proposed railway in the design stage. This assessment focuses on, not only the technical soundness to ensure safety, but also the compliance to the requirements of the license.

A series of this assessment may be carried out by the regulatory authority or the Inspector with the power as an individual. Whereas individual power tends to be respected particularly under the Common Law Culture, it is highly recommended to give the final decision making power to the regulatory authority itself as the assessment is part of the enforcement to make the licensing system effective.

From this standpoint, the Metrorail Act clearly specifies that the power of technical authorization shall be vested to the regulatory authority. Therefore, the Team designed the technical authorization procedures, including approval for commencement of construction works, confirmation of rolling stock designs, and inspection upon completion of works, notification of train operation plan, notification of Safety Management System, to enforce control over Metrorail facility, rolling stock, train operation and safety management.

5.3.4 Reporting System

As the scope of this study does not include the regulatory systems after opening of the Metrorail system to public, reporting system (annual and occasional on accidents and business) must be developed in the next phase of this assistance.

5.3.5 Inspection System

The Metrorail Act prescribes that the Authority may appoint an Inspector, duties and powers of the Inspector shall include the right to entry and collect information from the Operator. Therefore, the inspection system envisages that the inspection upon completion of works shall be performed by the Inspector as it requires "power to entry", while final decision shall be made by the regulatory authority based on the result of inspection by the Inspector.

The rules on technical audit after opening of the system to public are not included in the rules developed in this study.

5.3.6 Delegation of Powers under the Rule

The Metrorail Act prescribes the broad power to make rules for the purpose to exercise the provisions of the Act, while the Railway Law of Japan gives highly constrained powers to make the Ministerial Ordinances framed under the Law. According to the Bangladeshi legal expert, it is not practical to define additional approving authority under the rule without any legal basis in the Act. Therefore, the Team designed the procedures in the rules within the said framework of i) licensing system, ii) fare fixation system, iii) technical authorization system, iv) reporting system, and v) inspection system.

5.3.7 Ownership of Executive Power

According to the provision of the Act, the power of i) granting license, ii) fixing fare, and iii) technical authorization are vested to the public administration or the Committee appointed by the Government, whereas the power of v) entry inspection is vested to the

Inspector as an individual. Choice of ownership of executive power considerably influences the regulatory system, e.g. social responsibility, time required for the procedures, etc.

For this reason, the Team designed the ownership of executive power in such a manner that:

- The individual power shall be limited to the on-the-spot inspection where "right-to-entry" is necessary.
- Final decision shall be made by the regulatory authority based on the result of inspection by the Inspector.

Misuse of individual power shall be avoided through balancing the powers of individual and public administration.

5.3.8 Procedures and Authorizations Structured in the Rules

The following table indicates the structure of approving procedures and authorizations under the rules.

Table 5.3 Regulatory System of Japan and according to the Provisions of Metrorail Act of Bangladesh

Procedures in Japan	Procedures in Metrorail Act
Licensing	Licensing System
Change of basic business plan	
Approval of transfer of business	
Order to improve business activities	
Suspension of business	
Rescission of business	
Safety management regulation	Inspection System
Notification of technical standards	
Approval of execution of construction (incl. deviation of const. plan)	
Validation of rolling stock	
Notification of operation plan	Inspection System (incl. On-the-spot Inspection)
Completion inspection of construction	
Inspection & audit (safety, account, service)	Inspection System (On-the-spot Inspection)
Reports (annual and occasional on accidents and business)	Reporting System
Obtaining reports, on-site inspection	Inspection System (On-the-spot Inspection)
Investigation of accidents (by Japan Transport Safety Board)	
Fare fixation and adjustment	Fare Assessment System

Note: The rules on pre-opening procedures are highlighted in color.

5.3.9 Composition and Tiles of the Rules

Composition of the rules framed under the Act may be either of the following.

- (1) Alternative 1: Integrating the rules into one (or two) package(s)

In Bangladesh, the BIWTA (Bangladesh Inland Water Transport Authority) enforces regulatory system under the provisions of an integrated rule (the Port Rules 1966). Following these practices, the rules framed under the Metrorail Act may be integrated into one (or two) package(s) (perhaps it may be called as “the Metrorail Rules”. This allows timely institution of

the rules as the development of draft rules and approving process should be carried out in one time. Meanwhile, when it requires amendment, the entire rules have to be under such revision.

(2) Alternative 2: Setting up each rule respectively

The case of Delhi Metro rules is comparable. In the exercise of the powers of the Act, various rules such as Notice of Accidents & Inquiries Rules, Prohibited Carriage Rules, Travelling of Infectious Passenger Rules, are set separately. This can ease the future amendments, while comprehensive structure of the rules is likely to become hard to understand. With the aim to promote the timely implementation of the Line 6 Project, the Team proposed Alternative 1. It should be noted, however, the rules should be separated into the rules applicable to the pre-opening stage and those applicable to the post-opening stage, to focus on the systems in need for the implementation of the Project. In conclusion, following composition and titles of the rules are suggested.

Metrorail Rules (Pre-Opening Procedures) *Prepared in this study

(Contents)

- Approval of business license
- Fixation and adjustment of fare
- Technical authorization by the regulatory authority

(including i) approval of departures from technical standards, ii) approval of execution of construction works, iii) approval of construction works, iv) validation of rolling stock, v) confirmation of operations plan, and vi) approval of safety management system. Note: entry inspection upon completion of works by the Inspector is included in the approval of construction works)

Metrorail Rules (Post-Opening Procedures) *to be prepared subsequently

(Contents)

- Audit (safety, accounting, service)
- Reporting
- Accident investigation

5.4 Progress and the Latest Draft of the Rules

With the draft Rules, the Study Team made a continuous efforts to explain and discuss with DTCA, MOC and MOL on the regulatory system to be enforced by DTCA. In particular, DTCA was promoted to have a better understanding of rules till the opening of the first line structured by 5 regulatory tools, namely i) licensing, ii) fare fixation, iii) technical authorization, iv) reporting, and v) inspection. DTCA and the legal expert successfully reviewed and refined the draft rules sentence by sentence with the attendance of the Team.

In drafting the rules,

- The Team paid full attention to the difference of administrative procedures in Bangladesh and Japan and highly adjusted to meet the local requirements, e.g. renewal of license.
- The Team carefully proposed the choice of "application - approval" and "notification - acknowledgement", i.e. the licensee shall obtain approval from the regulatory authority under technical authorization (as this is mandated in the Act), while the licensee shall just notify the Safety Management System (as any delays in the procedure is unacceptable for the timely opening of the Metrorail system).

The entire structure of the rules is illustrated in the following figure.

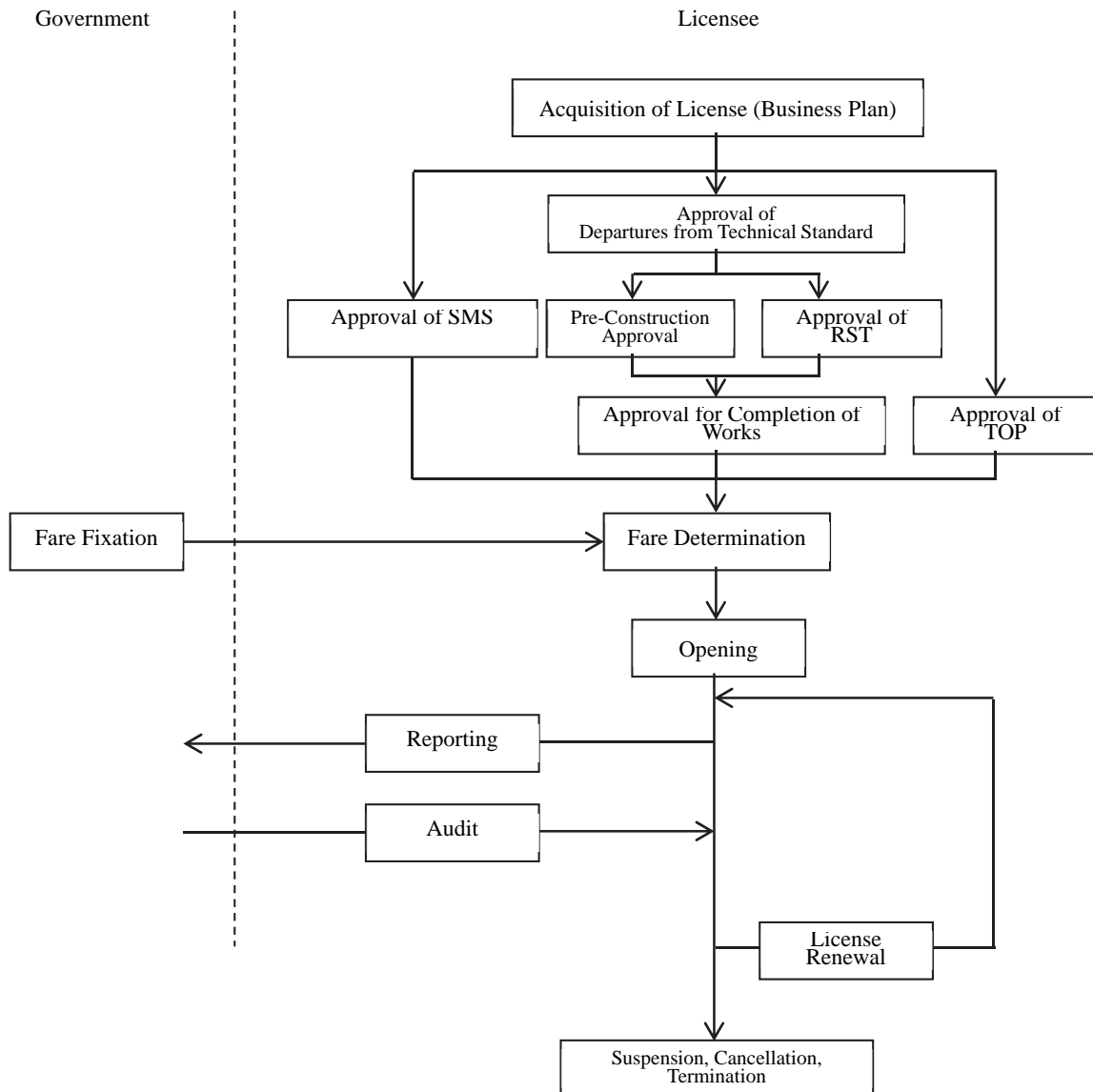


Figure 5.1 Regulatory Procedures according to the Draft Rules

The draft rules are summarized as follows:

5.4.1 Chapter 1 (Preliminary)

Section 1 : Short title

- These rules may be called the Metrorail Rules, 2015.

Section 2: Definition

- This section specifies the definition of words used in these rules.

5.4.2 Chapter 2 (Licence)

Section 3: Formation of Selection Committee

- The Selection Committee, headed by the ED of DTCA, shall scrutinize the application of licence.

Section 4: Application for a licence

- This section specifies statements in the application forms and documents to be attached.

Section 5: Procedures to examine the application for a license

- This section specifies procedures to examine the application for a license.

Section 6: Recommendation by the Selection Committee

- DTCA shall send the application to the Selection Committee. The Selection Committee shall within 60 working days shall submit the recommendation of the government regarding granting or rejecting licence.

Section 7: Issue of licence

- This section specifies the areas of considerations for the Committee to grant license.
- If the decision is taken to grant license, the Government shall within 90 working days issue license. If the decision is taken to reject license, the Government shall inform it to the applicant stating the reason.
- Period of license shall, in principle, be 25 years.

Section 8: Cause of Disqualification

- This section specifies the causes for disqualification in obtaining license.

Section 9: Amendment of condition of licence

- The Government may specify and amend the conditions of lance (such as period, scope of Metrorail business, name-address etc.).
- This section specifies the procedures to amend license.

Section 10: Application for amendment

- This section specifies the items that shall be stated in the application for amendment of the condition of the license.

Section 11: Transfer of licence

- License shall not be transferred at least 10 years after obtaining.
- This section specifies items that shall be stated in the application forms for transfer of license and documents to be attached.
- This section specifies procedures for transfer of license, including examination and recommendation by the Selection Committee.

Section 12: Suspension or cancelation of licence

- This section specifies criteria for DTCA to report to the Selection Committee for suspension or cancelation of license.
- This section specifies procedures for suspension and cancelation of license, including examination and recommendation by the Selection Committee.

Section 13: Notification for suspension by operator

- When the licensee intends to suspend the whole or part of Metrorail operation, he/she shall notify DTCA at least 30 days before. The period of the suspension shall not exceed 1 year.
- The licensee shall notify DTCA when the Metrorail operation is resumed.

Section 14: Notification for cancelation by operator

- The licensee should continue Metrorail operation till his license is cancelled.
- Any licensee, who intends to cancel the whole or part of Metrorail operation, shall submit to DTCA an application at least 1 year before.
- This section specifies procedures for cancelation of license, including consultations with local government, examination and recommendation by the Selection Committee.

Section 15: Application for renewal of licence

- Application for renewal shall be made 90 days before the expiry date.
- This section specifies the application forms, fees, and the additional charge for failing to renew a license within the period.

Section 16: Renewal of licence

- The provision of Rule 5 to 7 shall be applicable for processing the application for renewal of license.

Section 17: Licence fee

- This section specifies the obligation to deposit Taka 200,000000 as licence fee.

Section 18: Licence re-issue fee

- This section specifies the obligation to deposit 2% of the licence fee as licence re-issue fee.

Section 19: Re-fundability of licence

- If the licence application is disallowed, DTCA shall be liable to refund the fee.

Section 20: Licence preservation and display

- This section specifies the obligation of the Government to preserve original licence and the licensee to preserve its copy.
- Also, this section specifies the procedure in the event the licence is ruined or damaged.

Section 21: Type of Metrorail System

- This section specifies the type of Metrorail system as ordinary Metrorail system, suspended transit system, straddled transit system, guide-rail transit system, levitation transit system and any other urban mass transit systems.

Section 22: Salient features of Metrorail System

- This section defines salient features of Metrorail system, which shall include single or double track, propulsion system, and gauge.

Section 23: Necessary documents regarding financial ability

- This section specifies necessary documents regarding financial ability of the applicant that shall be attached to the application forms.

Section 24: Route alignment drawing

- Route alignment drawing including horizontal and vertical alignment drawings along with specification of schedule 1 shall be attached to the application forms.

Section 25: Order to improve Metrorail business

- DTCA may order the licensee to improve Metrorail business in consideration of the recommendations of the report by an inspector.
- This section specifies the areas of improvement that DTCA may order.

5.4.3 Chapter 3 (Right to Entry)

Section 26: Restriction to right to entry

- This section restrict the right to entry of the licensee, which include permission of DTCA, pre-notification to the owner and compensation for the loss to the owner who suffered the loss.

5.4.4 Chapter 4 (Technical Authorization)

Section 27: Permission for departure from technical standards

- The applicant shall apply to DTCA and obtain prior approval for any departure from technical standards due to unavoidable reasons.

Section 28: Approval of construction plan of Metrorail system

- Any licensee shall, prior to the commencement of construction works, obtain approval of construction plan from DTCA.
- DTCA shall approve the application within no more than 90 days if the construction plan has conformity with the business plan and technical standards.

Section 29: Metrorail System

- Metrorail system shall include infrastructures and tracks, stations, depots and maintenance facilities, operation safety facilities, substation and other facilities, and electric line facilities.

- Section 30:** Application for approval of construction plan
- This section specifies the items that shall be stated in the applications forms and documents and drawings to be attached for approval of construction plan.
- Section 31:** Construction plan
- The construction plan shall include the items listed in Schedule 2 by type of Metrorail facility and any difference in items by section or location of Metrorail route shall be separately.
- Section 32:** Track alignment drawing
- The track alignment drawings shall be the horizontal and vertical drawings with the specifications of Schedule 3.
- Section 33:** Deviation of construction plan
- The licensee shall take approval of DTCA to alter the construction plan.
 - The licensee shall inform DTCA about the occurrence of any minor deviation through notice.
- Section 34:** Application for deviation from approved construction plan
- This section specifies the items that shall be stated in the application forms and documents and drawings to be attached for alterations of the approved construction plan
- Section 35:** Notification of minor deviation of construction plan
- The minor deviation shall be as such listed in Schedule 4 by type of Metrorail facility.
 - Provision of Rule 34 shall apply to the notification.
- Section 36:** Approval of completion of construction works
- Any licensee to complete the construction works shall, prior to the period specified in Rule 38, obtain approval of DTCA.
- Section 37:** The report of the Inspector and authorization of the Authority
- This section specifies areas of inspection by the Inspector.
 - DTCA shall, upon confirmation of the conformity and appropriateness to use Metrorail facility or open it to Metrorail service, approve the completion of construction works.
- Section 38:** Inspection areas and period
- This section specifies areas and period of completion inspection by type of Metrorail facility.
- Section 39:** Application for approval of completion of construction works
- This section specifies the items that shall be stated in the application forms for approval of completion of construction works.
- Section 40:** Preparation for taking inspection
- Any licensee to take inspection on completion of works shall make necessary preparations as instructed by DTCA.
- Section 41:** Approval of construction plan for alteration of existing Metrorail facility
- Any licensee to alter existing Metrorail facility shall prepare a construction plan relating to the said alteration and obtain approval of DTCA prior to the commencement of such works.
 - Any licensee to make any of the minor alteration of existing Metrorail facility shall notify the Authority to that effect.
- Section 42:** Application for approval of construction plan for alteration of existing Metrorail facility
- This section specifies the items that shall be stated in the application forms for approval of construction plan for alteration of existing Metrorail facility.
- Section 43:** Notification of construction plan for minor alternation of existing Metrorail facility

- The minor alteration of existing Metrorail facility shall be as such listed in Schedule 4 by type of Metrorail facility.
- Section 44:** Approval of completion of revised Metrorail facility
 - Any licensee to complete construction works for any alteration of Metrorail facility listed in the Schedule 5 shall obtain approval of DTCA.
- Section 45:** Approval of structure of rolling stock
 - Any licensee to use rolling stock for delivering Metrorail service shall obtain approval of structure of rolling stock from DTCA prior to the commencement of use.
- Section 46:** Manner of giving approval of structure of rolling stock
 - DTCA shall assess the application through the documents and drawings submitted by the licensee.
- Section 47:** Application for approval of structure of rolling stock
 - This section specifies the items that shall be stated in the application forms and documents and drawings to be attached for approval of structure of rolling stock.
- Section 48:** Application for approval of alteration of structure or device of rolling stock
 - This section specifies the items that shall be stated in the application forms and documents and drawings to be attached for approval of alteration of structure or device of rolling stock.
- Section 49:** Notification of alteration of structure or device of rolling stock
 - The minor alteration shall be as such listed in Schedule 7 by type of rolling stock device.
 - This section specifies the items that must be stated in the notification of minor alteration.
- Section 50:** Approval of train operation plan
 - Any licensee to deliver Metrorail service shall, prior to the commencement of Metrorail service, obtain approval of train operation plan or deviation of the same.
- Section 51:** Application for approval of train operation plan
 - This section specifies the items that shall be stated in the application forms and documents and drawings to be attached for approval of train operation plan.
- Section 52:** Determination of safety management system
 - Any licensee shall determine the Safety Management System and notify DTCA in writing and the same shall apply for any deviation of the System.
 - Safety Management System shall prescribe the items listed in the Schedule 9.
 - If the Safety management System does not conform to the requirements, DTCA may order the licensee to improve the System.
 - The licensee shall appoint Safety Manager and Operations Manager. The licensee shall pay due attention to the opinions of them in performing their duties.
 - DTCA may order the licensee to dismiss Safety Manager or Operations Manager, provided that he/she neglected their duties and hindered safety of transportation.
- Section 53:** Application for determination of Safety Management System
 - This section specifies the items that shall be stated in the application forms and documents and drawings to be attached for approval of safety management system.
 - This section specifies procedures to alter the Safety Management System.
- Section 54:** Qualifications of Safety Manager
 - This section specifies the qualifications of Safety Manager.
- Section 55:** Qualifications of Operations Manager
 - This section specifies the qualifications of Operations Manager.
- Section 56:** Appointment and dismissal of Safety Manager and Operations Manager.

- This section specifies the procedures for appointment and dismissal of Safety Manager and Operations Manager.

Section 57: Driver Instruction Manager

- This section specifies the obligation of the licensee to appoint Driver Instruction Manager and requirement of making best efforts to maintain qualifications of train drivers.

5.4.5 Chapter 5 (Fare)

Section 58: Qualification of members of Fare Assessment Committee

- This section specifies the qualification of members of Fare Assessment Committee, except ED of DTCA.

Section 59: Recommendation of the Fare Assessment Committee

- The Committee shall at least once a year review the rate of existing highest and lowest fare.
- This section specifies areas of considerations in review of fare.
- This section specifies categories of highest and lowest fare rate.
- The Committee shall take its decision in accordance with the opinion the the majority of its members.

Section 60: Determination of fare

- The Government shall send to DTCA his/her directives about the highest and lowest fare rate according to the recommendation of the Committee
- DTCA shall determine the normal fare based on the directives from the Government.

Section 61: Fare collection etc.

- Licensee may introduce fare products between the highest and lowest range determined by DTCA.
- Only the licensee or authorized person can collect fare from the passengers.

Section 62: Application for review of fare

- The licensee may apply for fare review to the Fare Assessment Committee if it is necessary due to the radical inflation or price hike of commodity, etc.

5.4.6 Chapter 6 (Appeal etc.)

Section 63: Appellate Authority

- For the purpose of appeal by the aggrieved person under Section 24 of the Metrorail Act, the Government shall constitute an Appellate Authority having 5 members.

Section 64: Appeal

- This section specifies the documents to submit for appeal.

Section 65: Procedure followed by Appellate Authority

- This section specifies the procedures followed by Appellate Authority.

Section 66: Procedure during Appeal Hearing

- This section specifies the procedures during Appeal Hearing.

5.5 Procedures and Anticipated Schedule for Institution of the Rules

5.5.1 Procedures and Progress

General administrative procedures for institution of the Rules and the progress as of July 2015 are illustrated as follows:

Table 5.4 Procedures and Progress for Institution of Rules

General Administrative Procedures for Institution of Rules (source: MOL)	Progress
- Preparation of the draft Rule by DTCA	Since April 2014
- Endorsement by MOC (practically by the Deputy Secretary)	April 2015
- Review by MOL, preliminary examination, preparation of the enhanced draft	In progress
- Notification of the result of examination to MOC	In progress
- Submission of the draft to the Prime Minister	Not started
- Approval by the President	Not started
- Finalization by MOL and verdict	Not started
- Submission to MOL, official announcement in national gazette	Not started

5.5.2 Analysis of Schedule according to the Progress of MRT Project

With respect to the project schedule, i) basic designs by GC, ii) application of license by DMTC, iii) assessment of license application by the Selection Committee, iv) granting license by MOC, v) acceptance of Safety Management System on civil works, vi) approval for commencement of depot civil works, v) commencement of depot civil works, is on the critical path.

In order to avoid any delay in the project, licensing rules must be instituted prior to the expected period of commencement of depot civil works. The CP-1 contract, which is currently under pre-qualification stage as of July 2015, requires at least further 7 months (preparation by bidders: 1 month, evaluation of proposal, selection of contractor, signing: 6 months) to start construction. Therefore, the rules should become functional within the 7 months period. This assumes that all the application documents for license, safety management system and necessary documents for pre-construction approval are prepared in the same timeline.

In summary,

- The rule must be put in place and the assessment must be completed within 7 months from the time now (July 2015).
- According to the provision of the draft rules, assessment of licensing application and granting license shall be within 60 days and within 90 days, respectively. In fact, 3 months period would be sufficient to finish all the procedures, i.e. 20 days for assessment of license application, 30 days for granting license, and 30 days for pre-construction approval.
- Given the above assumption, the Metrorail Rules (pre-opening procedures) must become functional by November 2015.

5.5.3 Action Plan toward Institution

The Team proposes the action plan toward institution as follows.

Table 5.5 Action Plan toward Institution

	Action	In charge	Due
1.	Review by MOL, preparation of the enhanced draft	MOL, MOC	August 2015
2.	Submission to the PM Office and approval by the PM	DTCA	September 2015
3.	Finalization by MOL and verdict	MOL	October 2015
4.	Official announcement in national gazette	MOC	October 2015

At the same time as the above procedures, DMTC should prepare licensing application. The following figure shows the procedures of granting license for the MRT project.

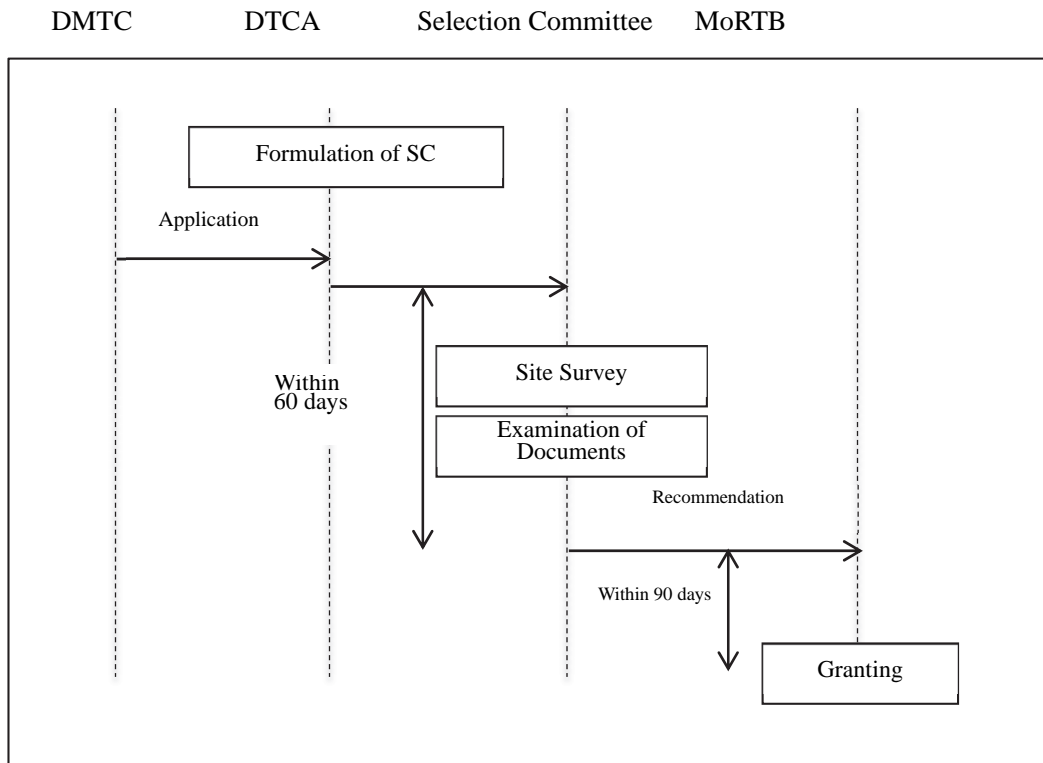


Figure 5.2 Procedures for Application and Granting Licence for MRT Project

5.6 Engagement of Local Consultant

The Team had intensive discussions with the local consultant after preparing the first draft of the Metrorail Rules. The consultant focused on having better understanding of the entire procedures prescribed under the draft rules as this is the first attempt to build regulatory systems for Metrorail in Bangladesh. Through the attendance to the presentation and coordination meetings with the Authority, the consultant gained knowledge about the regulatory regimes.

The consultant was assigned with the works for enhancement of the English draft and translation to Bengali since 2014. Also, he attended countless meetings with DTCA for review and revises the said draft. The Team will, from time to time in close liaison with the consultant, respond to the comments and requests from MOL and MOC.

Chapter6 Policy for Developing Technical Standards Required for Establishing MRT Line 6

6.1 Basic Policy for Development of Technical Standards

The situation with respect to developing Technical Standards was acknowledged at the stage when the first on-site study was completed. Regarding future Technical Standards development work, the various issues will be studied based on the terms and policies below.

6.1.1 Position of Technical Standards in the Legal System

Institutional Building Assistance for Dhaka Urban Transport Network Development in Bangladesh (Dhaka IBA) made proposals regarding the framework for the basic organizational system and development of laws. These proposals included the following:

- DTCA will be the MRT supervisory institution and receive support from an organization support system as a regulatory and supervisory institution.
- The DMTC must be supervised and an MRT with a high level of safety, security, and convenience must be achieved.
- The planning and regulatory/supervisory systems must be clearly defined in the related articles.

In line with this legal framework, Metrorail Technical Standards are to be prepared as examination Standards for the DTCA, which is the managing and supervisory institution.

6.1.2 Characteristics of Technical Standards

All matters concerning Metrorail structures and operations, including not only Technical Standards but also verification procedures, shall be set down in the provisions and sub-provisions of the Metrorail Act. Technical Standards in the sub-provisions are being created in order to emphasize the characteristics of Line 6.

Accordingly, given that related institutions in Bangladesh lack extensive technical expertise, the scope of the content and items covered by the Act's provisions was narrowed down, specified, and simplified as much as possible in order to facilitate moving forward with various procedures for MRT Line 6, taking into account the characteristics that the line should have.

6.1.3 Relationship to Japanese Technical Standards

Railway Technical Standards in Japan are comprised of the following:

- A “Ministerial Ordinance” stipulating obligatory performance requirements
- “Interpretation Standards” stipulating specific, quantified reference criteria which are non-binding, with no performance requirements.
- “Commentaries” that indicate reference documents, actual calculation examples, how to deal with special cases, etc.

In principle, all railway operators must observe the Ministerial Ordinance. Meanwhile, each operator must establish its own “Implementation Standards” (detailed Standards that reflect their actual individual circumstances while falling within the range of performance requirements), using the Interpretation Standards, Commentaries, etc., as reference, which are submitted to the supervisory agency in advance to confirm that they comply with the Ministerial Ordinance.

Since the Technical Standards for Dhaka MRT are to be established specifically as Standards for MRT Line 6, it was decided to create them by excerpting sections from the Japanese Ministerial Ordinance, Interpretation Standards, and Commentaries which are necessary for the construction of Line 6. Given this, there are a high proportion of mandatory regulations that include specific numbers. Despite this, however, it is also necessary to take into account the

view that, since the line may be developed with support from various other countries, the Standards have to be versatile.

Therefore, when it came to considering the nature of the Technical Standards that will form the basis of Dhaka MRT technology, the work was pursued by keeping in mind the aforementioned factors while determining the following:

- The extent to which specific numbers and methods should be incorporated as mandatory regulations
- The portion of the regulations which should be discretionary and flexible in light of global railway technology development trends

	Japan	Bangladesh	(R)-Regulator (O)-Operator
	Railway Business Act, Railway Operation Act	Metrorail Act	
MLIT (R)	Ministrial Ordinance (uncluding technical standard)	Metrorail Rules	MoRTB
		Technical Standard (Directive)	DTCA (R)
Operators (O)	Implementation standards	Implementation standards	DMTC (O)
	Manuals	Manuals	

Figure 6.1 Regulatory Framework

6.1.4 Organizational Structure of DTCA

Based on the results of the first on-site investigation:

- At present, the DTCA's adaptive capability is limited with respect to MRT Technical Standards, structural regulations, etc., while its technical capability to perform management, supervision, and reviews of planning, design, construction, operation, and maintenance is completely non-existent.
- It is clear that it will not be easy to establish a review system for the impending Line 6 project.
- As a solution, it will be essential to have the support (proposed by the IBA) of an organizational support system when it comes to implementing the Technical Standards to be established as a part of the legal system. It will be necessary for this support to be maintained until workers with the required technical skills have been developed in the DTCA and DMTC.

If this issue is not handled correctly, it could lead to inappropriate interference with the DTCA, which has strong decision-making power with respect to the nature of the Dhaka MRT, which may cause confusion.

6.1.5 Relationship with Other Future Railways

Technical Standards will be established as Standards specifically for Line 6 to be constructed in the immediate future. However, for matters relating to integration into a future MRT railway network, it was thought that some consideration should be given to applicability to subsequent railways, unification of Standards, etc. (e.g. common safety measures for fire

prevention, etc., ensuring the possibility of through-train operation, streamlining operations through shared use of factories).

In addition, advance consideration has been given to undergrounding underground installation, which will inevitably occur at connection points with other railways in future.

6.1.6 Consistency with Existing Laws and Regulations

Consistency with related existing laws and regulations, such as those relating to electricity, building Standards, fire prevention, environment, urban planning, etc., must be confirmed. On the other hand, since Dhaka MRT is a transport system which is fundamentally different from the existing Bangladesh Railway when it comes to electrification, use of CTC, etc., it is not necessary to seek technical and operational consistency with the existing Railway Act of Bangladesh.

6.1.7 Applicability of Japanese Technology

When formulating Technical Standards, as much consideration as possible will be given to facilitating the introduction of Japanese technology for items for which it is logical or necessary to do so. In particular, the applicability (scope and degree) of Japanese technology whose introduction has been agreed for the yen-loan-financed MRT Line 6 project to the Dhaka transport system will be taken into account. For example, consideration will be given to promoting the introduction of the contactless IC card format (in technological collaboration with JICA), lightweight rolling stock, etc.

6.2 Composition of Each Sector

6.2.1 System for Technical Standards

Railway transport safety and so forth is ensured when the following are integrated through overall management by railway operators: employees possess the required knowledge and skills, facilities and rolling stock possess the required features, and operations are handled in the required manner. For this reason, the national Technical Standards have been formulated based on the belief that it is logical to indicate the required features and operating instructions for various facilities as part of a single, integrated system.

In establishing Technical Standards for Dhaka MRT, it was decided to proceed by following the Japanese system for Technical Standards.

6.2.2 Railway Structures

6.2.2.1 Basic Principle

In designing railway structures, it is necessary to ensure that structures and parts are sufficiently safe with respect to the loads in effect during construction and use, and that trains can be run safely and comfortably. Moreover, consideration should be given to ease of construction, having sufficient durability in accordance with the design lifetime, ease of maintenance work, and environmental friendliness. Matters to be considered when designing railway structures were stipulated based on these criteria.

6.2.2.2 Composition of Technical Standards

In terms of materials relating to Technical Standards for railway facilities in Bangladesh, the Way & Works Manual by Bangladesh Railway is available. This is a guideline for performing maintenance work on railway facilities and describes maintenance-related reference values for railroad tracks, etc. Bangladesh does not have its own design Standards for railway structures. In recent railway bridge constructions, the American Association of State Highway and Transportation Officials (AASHTO) design Standards have mainly been applied. There are also projects which have used the British Standard (BS).

With regard to the construction and maintenance of road bridges in Bangladesh, the Roads and Highways Department (RHD) and Local Government Engineering Department (LGED) are the supervisory authorities for bridges on major arteries such as national highways and bridges on local roads, respectively. For long bridges exceeding 1,500m in length, the Bangladesh Bridge Authority (BBA) is in charge. While the RHD stipulates design Standards (Bridge Design Standards for Roads and Highways Department) for bridges and culverts, the principles and methods are based on AASHTO, and the loads and combination of loads used in design are based on AASHTO and the Indian Railway Code (IRC).

6.2.2.3 Design of Structures

1) Design Standards

In recent large-scale road bridge projects such as the Padma Multipurpose Bridge, internationally recognized design Standards such as AASHTO and BS have been applied. Preparatory Survey Report Phase 2 of this project reports the findings of examination based on Japan's Design Standards for Railway Structures and Commentary.

The Technical Standards for this project explain that internationally recognized design Standards should be applied, and in particular, the Design Standards for Railway Structures and Commentary applied in design and construction of railway structures in Japan may be used.

2) Earthquake-resistant design

According to RHD's design Standards for bridges and culverts, seismic load is based on AASHTO, while the regional coefficients to be applied should be those stipulated in the Bangladesh National Building Code (BNBC). In addition, the detailed design of the Padma Multipurpose Bridge was based on AASHTO Bridge Design Specifications, 4th Edition (2007), and verification methods were designated according to the seismic scale.

The most suitable verification methods will need to be selected in the detailed design phase. At the present time, the Technical Standards indicate that the approach to seismic load is based on the BNBC.

3) Design load

The train load used in design will be determined based on the trains and rolling stock to be used in the relevant sections. However, since MRT Line 6 is exclusively for trains and the size of rolling stock is planned to be within 16 t of axle load, a load case of "M-16" was indicated in the Technical Standards.

4) Design lifetime

In the detailed design of Padma Multipurpose Bridge, the design lifetime of the main structure is set as 100 years. The lifetime for parts is 40 years for bearings, 25 years for joining tools, and 20 years for the coating of the main structure.

The Technical Standards indicate that the design lifetime of structures should be determined in view of the duration of service required for the structure, environmental conditions, etc.

5) Bearings

Bearings are important parts which affect the bridge's overall safety and durability. The Technical Standards indicate that in order to maintain proper functioning, regular inspection and maintenance work are essential and consideration must be given to the actual site conditions, including bearing replacement work.

6) Environmental friendliness

In Bangladesh, the Ministry of Environment and Forest (MOEF) enacted the Environmental Conservation Act in 1995 and issued The Environmental Conservation Rules in 1997. The relevant laws and regulations are summarized below.

a) Bangladesh Environmental Conservation Act

Established in 1995, this act replaced the Environmental Protection Act of 1989. It was formulated by the MOEF and comprises 21 articles covering basic areas of environmental conservation. It stipulates that issuing environmental guidelines accompanying environmental impact assessments is important. Furthermore, it stipulates that no factory may be established or undertaken without obtaining an Environment Clearance Certificate (ECC) issued by the environmental agency (Article 12).

b) The Environmental Conservation Rules

These rules are a 1997 revision of the Environmental Conservation Act, which stipulates environmental Standards for issues such as air pollution, water pollution, industrial drainage, exhaust, noise, and odors. In some categories, submission of business plans, environmental impact assessments and environmental management plans are mandatory. Also, under these rules, all new industries, activities, and projects are classified into categories (Green, Orange A, Orange B, and Red) according to the degree of environmental impact and the location, and an environmental impact study is required based on the guidelines for each category. Environment Clearance Certificates are issued based on submission of the project outline, study report, permit from the local Government, etc.

c) The Environmental Court Law

Enacted in 2000, this specifically stipulates matters regarding environmental pollution trials. Six environmental courts were established nationwide and granted the authority to enter sites and conduct investigations. It explicitly states that air pollution is the most serious environmental issue.

For the MRT project, it will of course be necessary to have procedures based on the aforementioned law and regulations. Going forward, in order for MRT to be developed as a key transportation system, the Technical Standards explain environmental considerations from the viewpoint of ensuring harmony with the environment along the tracks.

7) Cable ducts

The Technical Standards indicate that for the purpose of functional track deployment, the installation of ducts for laying out electric cables shall be considered.

8) Drainage facilities

The Technical Standards describe drainage of rainwater on the tracks in order to maintain the functioning and soundness of tracks and structures.

9) Flooding countermeasures

The Technical Standards indicate that flooding countermeasures shall be considered for embankment areas such as depots and approach sections in order to avoid damage to railroad tracks due to submergence.

MRT Line 6 is planned for the western district of Dhaka, where flooding countermeasures such as banks and drainage pumps are being undertaken. The ground elevation of the planned route is 5 to 8 m above sea level, while the height of banks around the planned depot site is 8.5m above sea level, although in Preparatory Survey Report Phase 2, the height of embankments at the depot site was planned to be the same as that of the banks.

10) Disaster prevention facilities

In order to protect railroad tracks from disasters and the like, prevention facilities are to be installed as needed in order to protect train operations from falling rocks, etc. in cutting sections, at tunnel mouths, and other locations where there is a risk of damage to the tracks.

11) Protection of areas beneath bridges, etc.

In the case of open-floor bridges, facilities must be installed to ensure that pedestrians under the bridge are not injured by falling rocks in the vicinity of rail fastenings, abutments, etc. In addition, protective facilities to prevent being struck by cars, ships, etc. are stipulated.

12) Evacuation facilities

Railroad tracks must be designed to allow safe evacuation of passengers in the event of accidents and other emergency situations. Passengers should be allowed to evacuate by walking on the railroad tracks if the structure allows them to evacuate quickly and safely via that route. However, if the structure does not allow such evacuation, some other kind of evacuation facilities should be installed.

6.2.2.4 Maintenance of Structures

1) Inspection of newly constructed structures and trial operation

The Technical Standards explain inspection and trial operation, based on the understanding that these should be conducted to confirm that the structure allows safe operation of trains and that the initial inspection conducted for newly constructed or renovated/replaced structures will provide the initial values for managing future maintenance of deformation, etc.

The method for the initial inspection and so forth should be based on the Maintenance Standards for Railway Structures (hereafter referred to as “Maintenance Standards”).

2) Monitoring of main lines

Railroad tracks serve to support trains and provide space for operation, and conditions that enable safe operation of trains must always be maintained. The conditions of railroad tracks are constantly changing due to the operation of trains, aging, the trackside environment, and so forth. It is necessary to comprehend the overall maintenance status of structures, changes in the trackside environment, etc. through periodic track inspection patrols.

3) Periodic inspection of structures

Structures that may suffer damage, wear, deterioration, etc. due to train operation, aging, and so forth must be inspected periodically to carefully ensure safety performance and the like. Based on the results of these periodic inspections, it is important to proactively prevent accidents and malfunctions from happening by carrying out repairs/reinforcements when necessary. It is also important to determine a suitable interval for periodic inspections in light of the structure’s nature and other circumstances and conduct them regularly. The Technical Standards stipulate the inspection cycle.

Periodic inspection of structures should be conducted according to the structure type and conditions, based on the Maintenance Standards.

4) Records

In order to maintain and manage railway structures properly, thorough maintenance management plans must be drawn up based on records of inspection, renovation, reconstruction,

etc. and maintenance management work based on these plans must be conducted without fail. Moreover, these records will also serve as important reference documents when making maintenance management plans for other similar railway structures. For this reason, whenever initial inspections, periodic inspections, renovations, rebuilding, or repairs are conducted, it is important to keep records of relevant information such as the execution date, work details (location and degree), results (measures taken), etc. in the inspection registry or in digital media such as the maintenance management system in a format that facilitates reference and save them in an appropriate manner. The items to be recorded are based on the Maintenance Standards.

6.2.3 Tracks

6.2.3.1 Basic Principle

The basic requirements for normal railway tracks are: they can guide rolling stock in the designated direction; they can tolerate the anticipated load of rolling stock; they do not have any deformations which may affect safe operation of trains; and they do not require complicated maintenance work, etc. Their scale varies according to the purpose of passenger transportation on the railway. Since Dhaka MRT Line 6 is inner-city transportation, passengers must be transported to their destination rapidly via safe and stable operation. It is necessary to indicate basic Standards for track structures that can satisfy these requirements.

6.2.3.2 Composition of Technical Standards

The main essential items comprising basic track structures are as follows:

1) Gauge

General Standards such as narrow gauge, standard gauge, and broad gauge exist.

Standard gauge (1,435mm) has been specified for MRT Line 6.

2) Track alignment

Railroad tracks are laid by incorporating horizontal curves or vertical curves depending on the terrain. In order to construct railroad tracks that enable safe train operation in light of the design maximum speed, size of rolling stock, etc., for trains operating on the track, it is necessary to set minimum limits for curves. These limits are regulated according to items 3 to 10 below.

3) Track radius

The minimum curve radius was specified as 400 m.

4) Straight line between curves

Taking into account the operational safety of trains, it was specified that the length of one rolling stock is necessary.

5) Length of circular curves

As with straight lines between curves, it was specified that the length of one rolling stock is necessary.

6) Cant

A limit in order to ensure the safety of trains passing through curves was specified.

7) Slack

A limit on widening the gauge was specified so that trains will pass through curves smoothly.

8) Transition curves

Curve requirements were specified for the purpose of ensuring a safe, comfortable transition when rolling stock moves from straight lines to curves.

9) Gradient

A limit was specified based on conditions such as rolling stock performance, station facilities, etc.

10) Vertical curves

The installation curve radius is restricted based on safety and passenger comfort at gradient transition points.

11) Formation level width

A minimum track width was stipulated to ensure safe train operation, space that does not interfere with track maintenance work, and sufficient passage for evacuation in the event of unexpected incidents.

12) Distance between track centers

A distance between track centers was stipulated that enables trains to pass each other safely.

13) Tracks

Structures that enable rolling stock to operate safely were stipulated.

14) Turnouts

Structures and installation locations were stipulated that enable rolling stock to move safely to other tracks.

15) Guard rails

Installation of guard rails in locations where serious damage may be anticipated if a train derailed or the like was stipulated.

16) Rolling stock overruns prevention

Installations in locations that will not cause damage in the event of rolling stock overrun were stipulated.

17) Preventing entry onto tracks and protecting tracks

Installation of facilities that prevent the general public from entering onto the tracks was stipulated.

18) Evacuation facilities, etc.

Facilities for the purpose of ensuring evacuation routes for passengers in the event of an accident were stipulated.

19) Track signage

Installation of track signage required for ensuring track maintenance, management, and safe operation was stipulated.

20) Crossings with other tracks

It was stipulated that level crossings with other tracks shall be prohibited.

21) Crossings with roads

It was stipulated that level crossings between tracks and roads shall be prohibited.

22) Road crossings

Should crossings be installed, the requirements and facilities for crossings between roads and tracks were stipulated.

The minimum required items for track structure Standards are as described above, and going forward, they shall be set down as provisions and finalized through discussion with the DTCA and GC.

6.2.4 Buildings

6.2.4.1 Basic Principle

1) Applicability of existing Bangladesh laws

Through presentations on station architecture for urban railways, we provided our counterparts at the DTCA with a deeper understanding of structures and facilities for elevated railway stations in particular, and as a result of talks held on the applicability of existing building-related Bangladeshi laws, the following was decided:

The Bangladesh National Building Code exists as a legal standard for buildings in Bangladesh; however, it is intended for general buildings and has not been incorporated into existing Bangladesh Railway (BR) stations. Nevertheless, some items related to fire prevention, barrier-free facilities, etc. should be implemented in the architecture of new urban railway structures. On the other hand, while a Railways Act for BR exists, it mainly deals with facility maintenance and does not include any items that should be implemented in the construction of new urban railway stations.

2) Station building development

As part of talks with the DTCA, future development of a station building, presumably in the Uttara district, was discussed. During the discussion, it was indicated that in the case of developing a station building above a road site, development will be possible through authorization discussions with road administrators, but in the case of developing a station building on privately owned land, compliance with the existing Bangladesh National Building Code will be required. As it was the DTCA that raised the presumed development of this station building, it was decided to include it in the Technical Standards.

3) Basic items in proposed Standards

As basic items in the Standards, station facilities and passenger passageways must be able to withstand anticipated loads and not impair safe rolling stock operation and passenger usage. In addition, stations need to be constructed by taking into account the number of boarding/disembarking passengers.

4) Composition of proposed Standards

Article 26 (“Buildings”) in Japan’s Ministerial Ordinance to Provide for Technical Standards for Railways was designed to largely overlap with the existing Building Standards Act in Article 26. However, in discussions with the DTCA, it was found that, in general, structures termed as “buildings” are liable to be thought of as regular buildings rather than stations. As a result, the Standards relating to buildings in the present case will place the emphasis on station facilities.

6.2.4.2 Composition of Technical Standards

1) Design Standards

Regarding railway station facilities, as mentioned above, items related to fire prevention, barrier-free facilities, etc. in the existing Bangladesh National Building Code should be complied with. However, for structures relating to newly constructed urban railway stations, the basic Technical Standards shall be followed rather than the existing Code for the purpose of building architecture.

2) Station facilities

Station facilities are: platforms, facilities for passenger circulation (passageways, concourses, stairs, passenger overpasses, elevators, escalators, etc.), customer service facilities (gates), waiting facilities (ticket offices, waiting rooms), business facilities (station facilities), toilets, lighting fixtures, and information facilities (guidance signs, location signs, information signs, regulation signs, etc.).

3) Platforms

Platform installation Standards have been established that pay sufficient attention to safety and passenger circulation.

4) Passenger passageways

Standards have been established with respect to installing passenger passageways and stairs (minimum width, height, etc.) that pay sufficient attention to safety and passenger circulation.

5) Barrier-free facilities

In Japan, the Act on Promotion of Smooth Transportation, etc. of Elderly Persons, Disabled Persons, etc. (Barrier-Free Act) has been enacted, but in Bangladesh there is no such law relating to barrier-free facilities, although there are some soft provisions relating to barrier-free facilities in the Bangladesh National Building Code.

Accordingly, in order to promote urban transport usage by people with restricted mobility, including the elderly, barrier-free facilities are included as one of the items in the Technical Standards, which stipulate the minimum installation Standards.

6) Railway stations established inside buildings

Giving advance consideration to future urban development plans, Standards were specified that assume the establishment of railway stations inside commercial and residential development buildings constructed on privately owned land by railway companies and the like.

In principle, it is stipulated that railway and development building structures shall be separate and that railway structures shall comply with the present Standards while development building structures shall comply with the existing Bangladesh National Building Code Standards.

6.2.5 Stations

6.2.5.1 Basic Principle

Stations play an essential role in passenger transportation as railway connection points. Stations must be able to handle the passenger volume for the section, be able to function appropriately and be fully equipped with the facilities required to handle trains/rolling stock, and be suited to the train operating conditions.

Stations are required to have facilities necessary for handling passengers, facilities providing useful information for passengers, and so forth. Safe transportation services that anyone can easily use are desired.

Station facilities include: railroad tracks with an effective length for stopping trains based on the length of operating trains; bookstores; platforms; passenger passageways; machinery and equipment such as escalators and elevators; information displays and guiding signs; and other related electrical equipment. Recently in Japan, there have notably been many incidents of passengers falling from the platform onto the tracks, so consideration must be given to ensuring passenger safety by incorporating facilities that will prevent this, disabled-friendly facilities, etc.

Stations also include depots (rail yards), etc., which should have sufficient capacity to accommodate the number of rolling stock used in the section, and it is necessary to install sufficient inspection and repair facilities for inspection and repair work conducted in the depot.

6.2.5.2 Composition of Technical Standards

Station-related items are as follows:

1) Track layout at stations

The Technical Standards will stipulate the layout and length of railroad tracks required for train arrivals, departures, and waiting.

2) Station facilities

The Technical Standards will stipulate the installation of platforms, passenger circulation facilities, customer service facilities, waiting facilities, and business facilities.

3) Platforms

Platforms are spaces along the tracks where passengers board and disembark from trains. The Technical Standards will stipulate the height and width, the locations of platform roofs and pillars, stairways, the need to install stairways and so forth as part of passenger passageways, and the distance of each facility from the platform edge.

4) Passenger passageways, etc.

The Technical Standards will stipulate a minimum passageway width regardless of passenger circulation volume.

5) Depots, etc.

The Technical Standards will stipulate the installation of rolling stock storage tracks such as rail yards and tracks for conducting inspections and repairs.

6) Main line turnouts

The Technical Standards will stipulate that turnouts to other tracks are prohibited between stations.

The minimum required facilities for station construction will be set down as provisions, discussed with the DTCA and GC, and modified in view of the DTCA's opinions to create the final Technical Standards.

6.2.6 Electricity/Power Transformation

6.2.6.1 Basic Principle

In principle, with regard to Technical Standards that will be applied to MRT Line 6, Japanese railway electrical facility Technical Standards was followed, while respecting the basic plan in the Feasibility Study (F/S). Furthermore, assuming that recent IT and new technology will be introduced to MRT Line 6 in the future, consideration has been given to establishing technically flexible Standards that will not hinder their introduction. In parts where the introduction of new technologies, etc. is assumed, it was decided to specify performance Standards without specific descriptions. Also, with regard to materials used for railways, there has been remarkable progress in research and development in recent years, with more high-quality, high-performance materials continuing to appear. For this reason, only material features will be stipulated in the Standards, rather than specific descriptions.

6.2.6.2 Composition of Technical Standards

These Technical Standards have been prepared by referring to the Ministerial Ordinance from Japan's MLIT, and specific figures to be applied to MRT Line 6 were prepared by extracting figures from the Interpretation Standards.

Railways are required to ensure transportation with a high level of safety and stability at all times. Similarly, a high level of reliability is demanded of for electrical facilities as well. Railway electrical facilities are comprised of circuit facilities, substation facilities, distribution facilities, signaling facilities, and communications facilities.

The main items for electrical Technical Standards are as follows:

- 1) Key details of facilities such as trolley wires
 - a) Feeding system

There are two types of feeding systems: AC and DC. Based on the basic plan in the MRT Line 6 F/S, a DC feeding system will be used. The standard trolley wire voltage will be 1,500V.

- b) Messenger wire system

Of the many available types of messenger wire system, it has been assumed that the simple catenary system will be employed for MRT Line 6, based on the basic plan in the F/S. The simple catenary overhead line system is the standard system worldwide.

It has been stipulated that there shall be no risk of electrification or fire due to these facilities. Also, the deviation and gradient of trolley wires will be stipulated in accordance with train speeds so that current can be collected without separating lines.

- (c) Lightning damage prevention measures

The Technical Standards will stipulate necessary measures for preventing or minimizing lightning damage to trolley wires and feeder lines.

- 2) Key details of facilities such as substations

The purpose of this provision includes preventing electrical accidents occurring due to outsiders entering substations. The capacity volume of transformers used for train operations should be sufficient to bear the expected loads. These Standards will not stipulate figures for capacity, as they depend on the circumstances of the railway operator section and other factors.

- a) Measures to keep out outsiders

In order to prevent outsiders from entering premises such as substations, the Standards will stipulate that they shall be under constant supervision.

- b) Fire prevention/extinguishing facilities

The Standards will stipulate the installation in substations of devices that can protect equipment and trolley wires in the event that abnormalities such as earth faults, excess current,

or machine temperature rises occur and the provision of fire extinguishing equipment to prevent the spread of fire to the surrounding area in the event that a fire occurs.

3) Key details of electrical equipment, switchboards, etc.

The Technical Standards will stipulate that electrical equipment, switchboards, and other similar equipment must be installed so that electrification and fire do not occur.

a) Facilities for equipment

The Technical Standards will stipulate that service lines and wiring must be installed in accordance with the site conditions, installation method, and voltage so that they will not pose a risk of electrification and fire or interfere with other transportation or facilities.

b) Equipment

In order to protect trolley wires and equipment, and to separate them in the event that a breakdown occurs, circuit breakers and switches shall be installed in the required locations.

c) Electrical equipment

For complicated circuits like trolley wires which are supported by many insulators, it is difficult to stipulate capacity in the same way as for other lines. Thus, these lines shall be insulation resistant.

In particular, the Technical Standards will stipulate that the electrical corrosion of supports and other metal fixtures should be prevented by restricting leakage of current flowing out from DC trolley wires to the earth.

d) Grounding of electrical facilities

The Technical Standards will stipulate that, in places where electrical facilities are necessary, effective grounding must be implemented to prevent electrification and fire due to increases in electric potential during abnormal situations, entry of high voltage, etc. to protect electrical facilities, and so forth.

6.2.7 Signaling/Communications/OCC

6.2.7.1 Basic Principle

It is assumed that a cab signal system and Automatic Train Control system (ATC) will be introduced for MRT Line 6. Since the introduction of a signal system incorporating new technologies is possible for MRT Line 6, only the cab signal system will be stipulated. Japanese railway electrical facility Technical Standards will again be applied for signaling and communications facilities, and based on the assumption that recent IT and new technologies will be incorporated into MRT Line 6 in future, consideration has been given to establishing technically flexible Standards that will not hinder their introduction.

6.2.7.2 Key Details of Signal/Safety Equipment

1) Signal equipment

Since it is assumed that a cab signal system and Automatic Train Control system (ATC) will be introduced for MRT Line 6, the Technical Standards will stipulate the conditions for sending stop signals to cab signal devices.

It is stipulated that whatever type of signal system is used, it must indicate stop signals for the purpose of ensuring safety.

2) Safety communication equipment

The Technical Standards will stipulate that safety communication equipment for dedicated lines should be installed between electricity control locations and train control locations, between electricity control locations and substations, and between train control locations and stations.

3) Crossing safety equipment

The Technical Standards will stipulate that safety communication equipment must be able to warn crossing pedestrians of danger from trains approaching and to block passage via crossing streets in order to ensure the safety of crossing pedestrians, train operations, etc.

4) Control facilities

The Technical Standards will stipulate the installation of systems to record train operation status at the Operational Control Center (OCC) as well as the main items to record.

6.2.8 Rolling Stock

6.2.8.1 Basic Principle

These Technical Standards shall be the Technical Standards applied to the rolling stock (EMU) that will be used for MRT Line 6, and they shall take into consideration the specifications of lightweight rolling stock, whose use has been agreed upon.

The present Technical Standards shall be based on those parts of Japan's Ministerial Ordinance and Interpretation Standards for railway Technical Standards which cover rolling stock structure and safety for urban railways; the natural conditions in Dhaka and other social conditions, such as the power supply situation, shall also be taken into consideration.

6.2.8.2 Rolling Stock Structure

1) Rolling stock gauge

The rolling stock gauge is the limit of car body cross-section size that rolling stock must comply with. These Technical Standards will specify a rolling stock gauge that is suitable for the Dhaka MRT.

2) Weight of rolling stock, etc.

The load applied to tracks and structures by rolling stock must not exceed their capacities. In these Technical Standards, the aim is to specify the axle load for the maximum payload. STRASYA, a standard system for urban railways specified in 2004, sets the axle load as 14t or less.

However, since 14t may not be enough when control cars (Mc cars) are incorporated into trains, these Technical Standards will specify 16t or less.

3) Stability

Rolling stock must be able to ensure safe and stable train operation for track maintenance and other anticipated operating requirements. Moreover, rolling stock must not overturn when passing curves or coming to a halt. Matters relating to stability will be stipulated based on descriptions in the Ministerial Ordinance and Interpretation Standards.

4) Rolling stock running equipment, etc.

Rolling stock running equipment, etc., is required to not damage tracks, to be able to pass the minimum-radius curve in the section without impediment, to have sufficient capacity to withstand impact from the tracks, to be able to eliminate obstacles on top of the rails, and to be sufficiently robust and strong to ensure safe and stable train operation. Matters relating to running equipment, etc., will be stipulated based on descriptions in the Ministerial Ordinance and Interpretation Standards.

5) Traction power generation devices

“Traction power generation devices” is a collective term for devices that generate traction power for train operation, transmit the generated power, directly control the amount of generated power, and so forth. Traction power generation devices must be suitable for the facilities and able to withstand train operations. In addition, it is required that electrical facilities for rolling stock electrical circuits pose no risk of electrification or fire due to contact and that there is no threat to signal equipment or other electrical facilities for electrical circuits due to malfunctions caused by induction operations. Matters relating to traction power generation

devices will also be stipulated based on descriptions in the Ministerial Ordinance and Interpretation Standards.

6) Braking devices

Rolling stock must be equipped with braking devices able to slow down or stop it without fail. Braking devices must also fulfill requirements such as working automatically when coupled rolling stock is separated. Installation of security brakes that can perform braking even if service brakes malfunction is obligatory as well. Matters regarding braking devices will be stipulated based on the description in the Ministerial Ordinance and Interpretation Standards.

7) Structure of car bodies

Rolling stock car bodies must be sufficiently strong, rigid, and durable to withstand operation at the loads anticipated during normal operation. In Japan's Technical Standards, the strength required for the car body is based on the assumption of normal train operations, and in the case of the Dhaka MRT as well, due to the installation of safety facilities such as ATC, the risk of collision is expected to be extremely low, so it is assumed that there will be no head-on collisions or the like, as in the Japanese Standards. Furthermore, if platform doors are not installed, facilities to prevent passengers from falling from the coupling sections of rolling stock must be installed.

8) Structure of driver's cabin

Operations in the driver's cabin must not be disturbed by the passengers in passenger cars, and the cabin must be equipped with any doors required to prevent interference with train operations. The structure of the driver's cabin will be stipulated based on the descriptions in Ministerial Ordinance and Interpretation Standards.

9) Structure of passenger cars

Japan's Ordinance stipulates windows, ventilation, lighting, passageways, standing areas, seating areas, and toilets as required features of passenger compartment structures. Since installation of toilets in Dhaka MRT cars is considered unnecessary, this will be excluded, while air-conditioning equipment will be added since it is considered necessary.

10) Structure of doors for boarding/disembarking passengers

Train doors must be able to ensure safe and smooth boarding/disembarkation of passengers and be equipped with automatic door closing devices. The structure of train doors will be stipulated based on the descriptions in the Ministerial Ordinance and Interpretation Standards.

11) Structure of gangway entrances and gangways

Passenger cars must be equipped with gangway entrances and gangways that enable passengers to pass safely and smoothly. Furthermore, trains that operate in sections where the facility conditions do not allow evacuation from the sides in case of emergency must be able to secure evacuation through the front of the first car and rear of the last car. MRT Line 6 will have elevated sections, and if evacuation from the sides is difficult due to its elevated structure, the rolling stock needs to be equipped with gangway entrances at the front and rear ends.

12) Structure of emergency exits

Rolling stock that cannot easily be exited by passengers in the event of an emergency must be equipped with emergency exits that ensure easy and certain egress, and it must be easy for the crew to confirm whether they are open or closed. For MRT Line 6, since several train doors are to be installed on each rolling stock, it is not necessary to install separate emergency doors.

13) Coupling devices

Coupling devices must be sufficiently robust and strong, able to tolerate vibrations, impacts, etc., and able to couple rolling stock together without fail. Matters regarding coupling

devices will be stipulated based on the descriptions in the Ministerial Ordinance and Interpretation Standards.

14) Driver's cab facilities

Driver's cabs used for operating rolling stock must be equipped with the facilities necessary for train operations such as power controls and brake controls. In addition, they must be equipped with devices that can stop the train automatically if the driver operating a power car becomes incapable of operating it. However, this does not apply to rolling stock which it is assumed will have two or more crew members in the same cab or rolling stock to be operated by automatic train operation devices, automatic train control devices, or automatic train stop devices (must be a device which does not allow operation exceeding the speed limit at any time) in sections with underground or elevated structures. Matters regarding driver's cab facilities will be stipulated based on the descriptions in the Ministerial Ordinance and Interpretation Standards.

15) Internal pressure vessels and other pressure supply sources and accessories

Internal pressure vessels and other pressure supply sources and accessories are required to prevent abnormal pressure increases, deterioration of functions due to moisture, etc., and damage from vibrations or impacts. Related matters will be stipulated based on the descriptions in the Ministerial Ordinance and Interpretation Standards. In Japan, in addition to the Ministerial Ordinance, the Industrial Safety and Health Act apply to matters relating to rolling stock internal pressure vessels. The existing Bangladeshi laws concerning this matter will be investigated.

16) Rolling stock accessory devices

Rolling stock must be equipped with accessory devices such as sign devices, communication devices, whistles, public announcement devices, emergency alarm devices, emergency stopping devices, and signal lamps. Standards for these devices will be stipulated based on the descriptions in the Ministerial Ordinance and Interpretation Standards.

17) Rolling stock signage

Required signage must be provided on rolling stock in order to enable identification and so forth.

18) Rolling stock fire countermeasures

In Japan, the present Standards for rolling stock fire countermeasures have been arrived at after reinforcing and expanding them multiple times based on lessons learned from past railway fire incidents. Fire countermeasures are intended to prevent fires breaking out on rolling stock, prevent fire spreading if it does break out through fireproofing of rolling stock, and reduce damages and injuries by securing evacuation routes, etc. in the event of fire. The Bangladesh Standards will be stipulated based on the descriptions in the Ministerial Ordinance and Interpretation Standards. While the entire MRT Line 6 track will be elevated, Standards equivalent to those for Japanese subway cars, etc. will be applied, taking into account that rolling stock may be used on both the MRT and other lines, including underground sections, in the future, as well as the fact that it could be a potential target during hartals (general strikes). Currently, in Japan, Standards equivalent to subway Standards are applied even for rolling stock operating only in above ground sections.

19) Functioning of equipment during power failures

Equipment that is necessary to ensure safe operation and passenger safety must function for a certain period of time even when the main power supply is cut off. Functioning of this equipment when the power supply from trolley wires is cut off is to be obtained from storage batteries for a certain period of time; however, it may be necessary to take the power supply situation in Dhaka into consideration.

20) Rolling stock facilities for single-person operation of trains

Rolling stock which is operated by a single driver or without a driver needs to be equipped with additional facilities to further ensure passenger safety. Standards regarding this

matter will be stipulated based on the descriptions in the Ministerial Ordinance and Interpretation Standards.

21) Equipment to record train operation conditions

In order to improve railway safety, when accidents occur, it is necessary to analyze the causes and background factors in detail, and establish measures based on this analysis to prevent their recurrence. Since the JR West Fukuchiyama Line derailment accident that occurred on April 25, 2005, installation of equipment to record the train operation conditions required clarifying the circumstances of accidents, etc. has been mandatory in Japan, and its installation will also be obligatory for Dhaka's MRT.

6.2.8.3 Rolling Stock Maintenance

In addition to the fundamental principle that rolling stock must not be used unless it is capable of safe operation, Japan's Ministerial Ordinance stipulates matters concerning inspections and trial operations of newly manufactured rolling stock, train inspections, periodic rolling stock inspections, and recording of inspections. Furthermore, inspection types and intervals are decided and announced based on the Ministerial Ordinance. The minimum requirements for Dhaka MRT rolling stock Technical Standards will be stipulated based on the Ministerial Ordinance and Interpretation Standards, while the details will depend on operators' implementation Standards.

6.2.9 Automatic Fare Collection System

6.2.9.1 Basic Principle

In Japan, no specific Technical Standards for automatic fare collection (AFC) are stipulated by the Ministerial Ordinance, and the major railway operators follow the Congress of Japan Railway Cybernetics standard (CJRC standard) established by Congress of Japan Railway Cybernetics. Since the Dhaka AFC system needs to be compatible with buses, BRT, etc., minimum requirements from this standpoint will be included in the Technical Standards.

6.2.9.2 Composition of Technical Standards

1) Introduction of AFC

The Technical Standards will stipulate that railway operators shall incorporate AFC in order to collect fares without fail. It will also be stipulated that contactless IC cards must be used as tickets in the AFC system and that tokens with built-in contactless IC chips may be used for single-journey tickets. In addition, it will be stipulated that tickets must be compatible with IC card tickets for AFC systems that are being used or are planned to be used by public transportation systems other than MRT Line 6. Other matters to be stipulated include the consideration of weather conditions such as temperature and humidity and passenger safety and convenience.

2) Services provided via AFC system

In view of the situation in Dhaka, AFC system tickets should enable use of single-journey tickets, one-day tickets, commuter passes, and stored fare cards at the very least. Moreover, it shall be possible to issue some tickets as personalized cards. Furthermore, in consideration of the environmental footprint, the Technical Standards will stipulate that anonymous IC cards should be recyclable.

3) Key equipment for AFC system

The minimum key equipment required for the AFC system will be stipulated in the Technical Standards.

4) Number of AFC machines at stations

The Technical Standards will stipulate that an appropriate number of AFC machines should be installed in accordance with the number of passengers and the machines' processing capacity. In addition, they shall also stipulate matters concerning wheelchair-accessible passageways at each station.

5) Standards applied to AFC system

The required Standards for introducing AFC will be stipulated in the Technical Standards, taking into account its track record in Japan and the circumstances in Dhaka. Specifically, it will be specified that the AFC shall comply with ISO/IEC 15408 card security verification and ISO/IEC 18092 or ISO/IEC14443.

6) Unique card ID numbers

In view of circumstances in Dhaka, it will be stipulated in the Technical Standards that unique ID numbers are to be given to IC cards for purposes such as security and taking measures if cards are damaged, and these numbers will be inscribed on the cards.

7) Verification of information in cards

It will be stipulated in the Technical Standards that it will be possible to verify information in cards with ticket machines, automatic fare adjustment machines, and station staff terminals.

8) Monitoring

It will be stipulated in the Technical Standards that a system will be installed that monitors the conditions of AFC machines in real time in order to facilitate verifying their status, malfunctions, etc.

9) Emergency mode

All automatic ticket gates will be equipped with an emergency mode that enables passengers to pass through them without tickets while the gates are open. Additionally, in consideration of the frequent blackouts in Dhaka, the Technical Standards will stipulate that switching to emergency mode shall be possible even during blackouts.

10) Data transmission

In view of circumstances in Dhaka, the Technical Standards will stipulate that a high-security encryption method will be employed.

11) Data retention

For AFC, it is necessary to take measures to prevent data damage or loss. The Technical Standards will stipulate measures relating to countermeasures for blackouts or other power problems as well as the data retention period.

12) Hardware

In view of circumstances in Dhaka, the Technical Standards will stipulate that issues such as vandalism, improper conduct, etc., shall be considered.

13) Bills and coins

The Standards will clearly indicate that ticket vending machines and automatic fare adjustment machines shall accept Bangladeshi bills and coins and must be equipped with counterfeit money detecting functions. They will also stipulate that measures shall be taken to prevent improper conduct by station staff, etc.

14) Contactless IC cards

The Technical Standards will stipulate the main specifications for contactless IC cards (size, material, etc.) based on their track record in Japan.

15) High-security cards

High-security cards will be introduced for one-day tickets, commuter passes, and stored fare cards. Furthermore, in terms of preventing improper use, the Technical Standards will clearly specify the use of contactless IC chips with at least ISO/IEC15408EAL4+ certification, as well as stipulating the minimum required specifications for ensuring the processing capacity.

16) Medium-security cards

Medium-security cards (or tokens) will be used for single-journey tickets. The Technical Standards will stipulate the minimum required specifications in terms of preventing improper use.

17) Ticket vending machines

The Technical Standards will stipulate the minimum required specifications for ticket vending machines.

18) Automatic ticket gates

The Technical Standards will specify that two types of width shall be considered for automatic ticket gates: the standard width and wheelchair-accessible width. They will also stipulate the minimum required specifications for automatic ticket gates.

19) Station staff terminals

The Technical Standards will stipulate the minimum required specifications for station staff terminals.

(20) Central servers

The Technical Standards will stipulate the minimum required specifications for central servers.

6.2.9.3 Progress Status

We explained the basic principles of AFC Technical Standards and outlined the Technical Standards at the Technical Meeting with the DTCA. In particular, we focused on the

specifications for contactless IC cards and automatic ticket gates. Furthermore, during this visit, we prepared draft AFC Technical Standards and submitted them to the DTCA. We will discuss the details of each item on our next visit.

Since radio waves will be used for transmitting data between contactless IC cards and automatic ticket gates, we investigated the local telecommunication laws and obtained a document entitled “National Frequency Allocation Plan v3-1.” According to this law, it may be possible to use the current frequency to be used for data transmission between contactless IC cards and passenger gates as stipulated by ISO/IEC.

Furthermore, during our visit, we held a meeting with the GC and confirmed that contactless IC cards will be incorporated into AFC, that they will comply with ISO/IEC15408 with respect to card security certification, and that data transmission between cards and antennae will comply with ISO/IEC18092 or ISO/IEC14443.

Stipulating compliance with ISO/IEC18092 or ISO/IEC14443 means potential IC cards include Type A and Type B as well as Felica, but as a result of other specifications, it may be difficult to accommodate cards other than Felica.

6.2.10 Operation/Transportation Plan

6.2.10.1 Basic Idea of Operation Department

Among the items in the Technical Standards system, the operation department supervised matters relating to staff and handling of operations with a view to ensuring the safety and stability of railway operations.

6.2.10.2 Staff

Train operating systems are comprised of “people” called staff and “things” including facilities such as tracks, operation safety facilities such as ATC, and rolling stock, with the railway management involving effective use of the “things” by the “people.”

Therefore, in order for the system to function properly and safely, it was stipulated that there is a need to train and educate station staff, including those who perform maintenance of facilities, train protection equipment, and rolling stock, with regard to the required knowledge and skills.

In particular, in cases where staff are directly engaged in train operation (drivers, etc.), since physical or mental inaptitude for the task or lack of knowledge and skills could directly or indirectly cause accidents, it was stipulated that such staff must have the aptitude, knowledge, and skills required to perform the work.

Fig. 6.2 shows the overall safety system with respect to the relation between “people” and “things.”

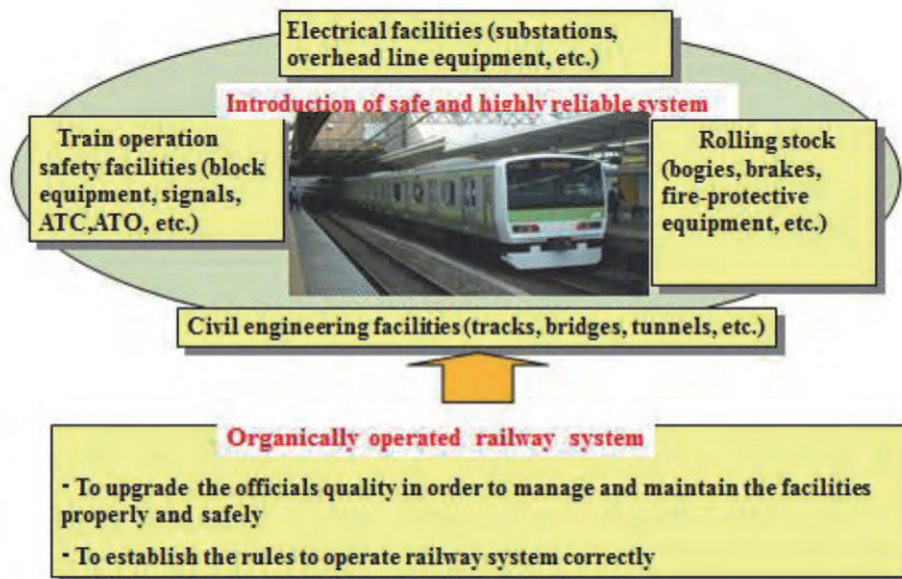


Figure 6.2 Overall Safety Management Systems for Relations between “People” and “Things”

6.2.10.3 Train Operation

Basic items relating to train operation were stipulated:

1) Train composition

The number of coupled rolling stock shall not exceed the platform length. Since the train length determines the train composition and operation interval, based on the anticipated transportation demand, it will be necessary to hold suitable discussions between the

transportation side and those responsible for station facilities on the required length of platforms.

When operating trains, we considered that it was essential from a safety perspective for continuous brakes to be functional for all coupled rolling stock, so verifying the proper functioning of these brakes is a priority. Since there may be occasions when some brakes do not function due to malfunctions and so forth, the handling of such abnormal cases was also stipulated.

2) Train operation

Stations are places where train operations and shunting are conducted, according to the specific intentions and decisions of personnel in charge of overall operating activities, such as coupling of trains, arrivals and departures, passing, or shunting. In contrast, in the various areas between stations, safety is ensured by having rolling stock whose conditions meet the requirements for running trains safely and on schedule and through performing operations in accordance with the railway's specific system such as conducting operations by means of a block system. Since it is therefore necessary to clarify the boundary between station and non-station areas, it was decided to specify this.

Since it is also necessary to clarify the operating direction of trains for the purpose of setting up ground installations and for ground maintenance worker safety, the operating direction was also stipulated. As traffic drives on the left side of the road in Bangladesh, it was decided to take local customs into account and have trains run on the left side as well.

Other basic items relating to operations such as train driving positions and handling of unavoidable pushing/backward operations during train operation were also stipulated.

3) Track closures

Tracks will be closed for construction or work that will, or could, interfere with train or rolling stock operation, and the procedures for track closures were stipulated.

4) Rolling stock shunting

With regard to rolling stock shunting, staff shall communicate their intentions by means of signs and signals, and the method was stipulated.

Since there are occasions when shunting have to be executed outside of stations, the requirements were stipulated. Furthermore, since the installation of turnouts that are required to physically restrict trains' speed and conducting operations based on decisions of the staff are common, speeds during shunting were also stipulated.

5) Rolling stock storage

When storing rolling stock, since there is a risk of unforeseen accidents occurring due to its movement, it was stipulated that movement of rolling stock shall be prevented while it is stored.

6) Ensuring train safety

The most important thing in train operation is to prevent a train colliding with the train ahead of it. A block system is employed for this purpose.

There are various kinds of block systems, from systems like the tablet system that allow only one train between stations to systems like automatic block sections that divide the area between stations into multiple blocks, but ultimately, ensuring safety relies on the driver's judgment, and there have been cases in which drivers misunderstanding signals has caused serious accidents. In order to prevent such handling errors by drivers, the ATC system was developed as a system that mechanically links ground operating conditions to train operation controls, and it has been introduced in high-speed, high-volume, high-density operating sections in large cities.

Since it is planned to introduce ATC for Dhaka MRT Line 6, it was stipulated that ATC will be the normal operating method.

When there is no conductor and operations are to be performed by the driver only, the driver will perform the relevant operating tasks for the train, so it was deemed necessary to

introduce an Auto Automatic Train Operation (ATO) system, facilities to ensure the safety of passengers at embarkation/disembarkation points, and equipment that enables communication with stations and the control center in the event of an emergency.

Fig. 6.3 shows an overview of the ATC system for ensuring train safety.

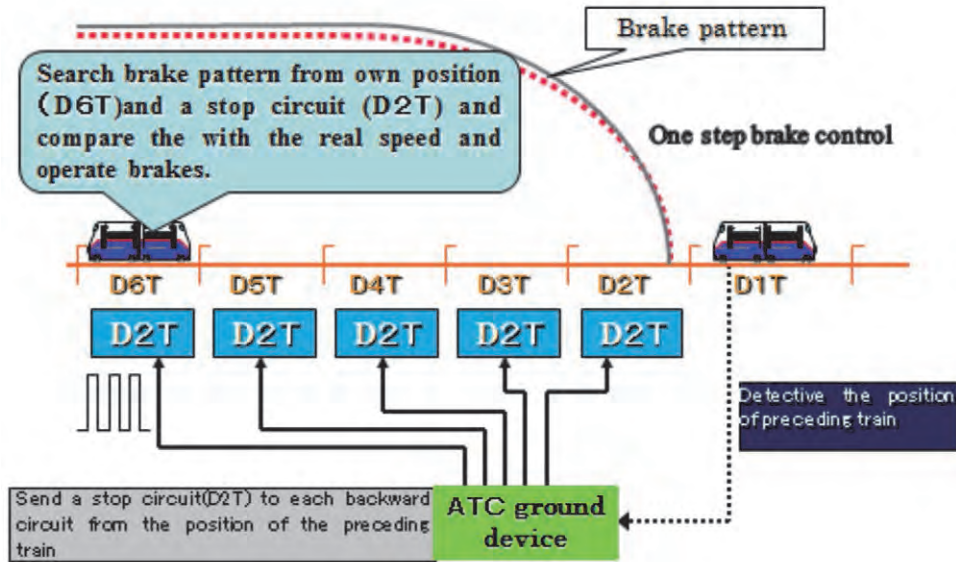


Figure 6.3 Overview of ATC Equipment Operation

Here is a brief explanation of Fig.6.3:

- ① D6T, D5T, etc. indicate the downline track circuit number.
- ② D2T being displayed under D6T, etc. means that since the preceding train is stopped at D1T, a signal is being sent from the ATC ground signal device to the following train informing it that D2T is the track circuit for stopping.
- ③ The following train receives the signal to stop at D2T and generates a braking pattern control shown by the black line.
- ④ The actual speed of the following train is indicated with the red dotted line, and when the red dotted line crosses the black line, the brake will be activated automatically and the train will stop.

It is planned to introduce an ATC system to ensure the safety of trains and areas between trains; however, should the system fail and haphazard transportation be carried out, this could lead to transportation chaos or accidents, so restoring the system shall be considered a fundamental priority. However, when continuing operations cannot be avoided, it is necessary to ensure other safety measures to replace the ATC system. An alternative system for ensuring safety which replaces the normal safety system is called a “substitute block system.”

This system has the same basic mechanism as the block system: it prevents collisions between trains by allowing only one train to occupy the space between station A and station B. The substitute block system differs depending on the block system that is normally used. Since it is planned that MRT Line 6 will incorporate ATC and also CTC for track section control, introducing a substitute block system focused on commands was considered.

Fig. 6.4 shows an example of operating when implementing a command-type system. This example shows a case where double-track operation is possible, but use of the ATC system is no longer possible on one of either the up line or down line (the down line in this example).

With this method, the CTC traffic dispatcher operates trains one by one by using equipment displaying their operating status and a train radio, while verifying that there are no trains between the stations executing the substitute block system.

Down line substitute block system (command-type) implementation

• Example of train X departing

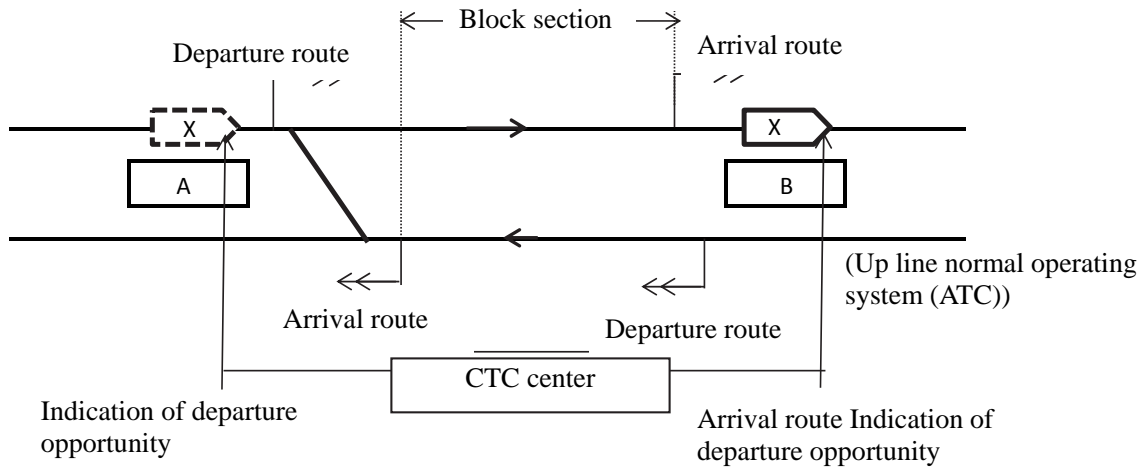


Figure 6.4 Example of Command-Type System Execution

Fig. 6.4 assumes that double-track operation is possible but ATC operation is not possible on the down line due to a malfunction.

- ① The section between station A and station B is one block section (to be occupied by one train).
- ② The CTC traffic dispatcher, using the train operation display panel, train schedule display, train radio, etc. at the CTC center, confirms that there is no train between station A and station B.
- ③ After confirming that the station A route is open, the dispatcher instructs the driver of train X to proceed to the next station, B.
- ④ The driver of train X reports the train's arrival at station B to the traffic dispatcher upon arriving. When operating several trains using the same substitute block system, train safety should be ensured by following the same procedure.

(7) Running speed

It was stipulated that running speed must be determined by taking into account special circumstances such as curves, turnouts, gradient, and the structure of trolley wires, in addition to the maximum running speed for the section.

6.2.10.4 Railway Signals

It was decided that railway-related signaling shall be as follows:

1) Railway signals

This was stipulated as the collective term for signals, signs, and indicators.

2) Cab signals

ATC is to be incorporated as a system to control the interval between trains. In accordance with this, cab signals will be introduced in the driver's cab and the system and so forth were stipulated.

Since the introduction of the ATC system means that starting signals and home signals will not be installed at stations, home indicators and starting indicators will be installed instead.

3) Hand signals

Types and indication methods were stipulated for hand signals.

4) Special signals

Means of providing prompt protection for urban trains were considered, and there will be three types of special signals for protecting trains in abnormal situations: flare signals, flashing light signals, and audible signals.

5) Signs

Conductors shall provide departure signs for urban railway trains, and a provision to that effect was stipulated.

Since it is possible that trains may not have conductors aboard, the method by which drivers will handle such cases was also stipulated.

6) Indicators

It was decided that display methods for train indicators, contact wire terminal indicators, and train stop markers would be stipulated.

6.2.10.5 Measures for Accidents, etc.

1) Warnings in the event of bad weather

It was stipulated that there is expected to be a method of handling track patrols, operating restrictions such as suspension of trains, etc. when there is a risk of damage due to rain, earthquakes, etc.

2) Stopping arrangements to protect trains

Arrangements for stopping trains if the need arises to rapidly stop trains due to track damage or other reasons were stipulated.

3) Measures for fire outbreaks in underground stations, etc.

Although Dhaka MRT Line 6 is not planned to run underground at this time, matters relating to risk prevention measures for trains, passenger safety and prompt evacuation in case of fires at underground stations and so forth were stipulated based on the assumption that underground railway sections may be constructed in the future.

6.2.11 Underground Facilities

6.2.11.1 Basic Principles

1) Possibility of underground tunnels

At the present stage, Dhaka MRT Line 6 is to be an entirely elevated railway and no underground tunnel construction is planned. However, there are those at the DTCA who are of the opinion that since the National Stadium and Bangladesh Bank near the end of the railway are in a commercial district, it will likely be difficult to construct an elevated structure there, and furthermore, it will be difficult to extend the line unless the land is purchased since no roads exist, which means it is possible that underground tunnels could be possible in the future due to changes in the track plan.

While this opinion exists, the basic plan for MRT Line 6 completed by the GC (General Consultants) contracted by the DMTC is based on an elevated railway. However, there is a strong possibility that extension plans for MRT Line 6 or plans for other future lines will include underground urban railway tunnels, with a view to maintaining the urban landscape or existing traffic routes, as in other major Asian cities.

Based on this, in preparing the Technical Standards, it was decided to include Standards predicated on the use of underground tunnels.

2) Necessity of underground facilities

Although there are underground road crossings in Bangladesh, there are no large-scale underground tunnels used by many people such as passageways or railway tunnels. Therefore, through a presentation to the DTCA, we explained typical construction methods for underground tunnels, including the station cut and cover method and station-to-station shield tunnel method, as well as encouraging more in-depth understanding of the importance of facilities that should be provided in underground facilities, especially fire prevention measures, as part of the explanation of the advantages and disadvantages of underground railways versus elevated railways.

3) Adoption of Japanese Standards

The most important facilities for the safety of passengers and railway staff in underground tunnels are passenger evacuation facilities, firefighting equipment, and smoke ventilation equipment.

With regard to the approach to installation of these facilities, there is significant variation in Standards. The Standards often adopted for overseas underground railway construction are the National Fire Protection Association (NFPA) Standards, which have been adopted for Bangkok's MRTA Chaloem Ratchamong-khon and others. Both the Japanese Standards and NFPA Standards have their merits and demerits, but adoption of the NFPA Standards is liable to lead to larger stations and make it more difficult to pursue commercial development in unused underground spaces, while also requiring larger tunnel evacuation and ventilation facilities.

From a technological (including safety) and economic standpoint, we recommended the adoption of the Japanese Standards for future underground lines to be used in Dhaka. In particular, in cases where two lines financed by different donors connect at one underground station, it is essential to adopt the same fire protection Standards to ensure safe, prompt evacuation of passengers.

4) Basic items in proposed Standards

The basic items in the proposed Standards follow Japan's Ministerial Ordinance and Interpretation Standards. They will stipulate that tunnels shall be able to withstand anticipated loads, that they shall be free from any impediments to safe rolling stock operation due to deviation of structures caused by trains' load, impact, etc., and that ventilation facilities shall be installed in accordance with the required ventilation air volume while flood prevention facilities and drainage equipment shall be installed in accordance with the required drainage volume.

6.2.11.2 Composition of Technical Standards

1) Design Standards

In principle, the Design Standards for Railway Structures and Commentary (Cut and Cover Tunnel) and Design Standards for Railway Structures and Commentary (Shield Tunnel) will be applied.

2) Flooding prevention

Based on the flooding experienced in Bangkok, Thailand, in 2011, the three locations where floodwaters enter underground tunnels are underground station entrances, ventilation shaft air holes, and U-type structure approach sections between underground structures and elevated or ground-level structures.

Accordingly, it is necessary to design structures so that these three locations are above the projected flood water level. Meanwhile, it is necessary to install water protection panels in underground station entrances that have to be partially open and above-ground elevator entrances.

3) Smoke exhausts facilities

Smoke exhaust facilities will be installed in underground stations and tunnels between stations to provide ventilation for normal train operations as well as a fire countermeasure, using a mechanical or automatic ventilation system. The required ventilation air volume shall be calculated based on the commentary for Article 29 of the Ministerial Ordinance.

In addition, it was stipulated that smoke barriers and emergency power shall be secured.

4) Evacuation guidance facilities in stations and between stations

In order to ensure passenger and railway staff safety in the event of an accident (including fire), it was stipulated that installation of evacuation guidance facilities is essential, that stations shall have at least two evacuation routes in different directions, and that lighting, guidance lights, and indicators equipped with emergency power will be installed at stations and between stations.

5) Fire extinguishing facilities

Fire extinguishers, indoor fire hydrants, sprinklers with hose connections or water supply ports, and connected water supply pipes were stipulated as fire extinguishing facilities.

6) Fireproofing of buildings, etc.

In terms of fire prevention facilities, it was stipulated that fireproof materials shall be used for structures' construction materials, interior materials, furnishings, etc., and also that fire prevention measures will be taken to prevent fires from spreading between substations, distribution stations, machine rooms, etc. where fire is a possibility and other rooms.

7) Disaster prevention control centers

Disaster prevention control centers (equipped with lighting equipment with emergency power) must be set up at stations for collecting information, communicating and transmitting orders, making announcements to passengers, and monitoring/controlling fire shutters, etc. In addition, these centers must be staffed at all times.

8) Alarm equipment

In terms of fire prevention facilities, automatic fire alarm systems equipped with emergency power shall be installed at stations and receivers shall be set up in disaster prevention control centers while sensors shall be set up in rooms, kiosks, substations, distribution stations, machine rooms, and other locations.

9) Notification equipment

Communication equipment equipped with emergency power enabling communication between disaster prevention control centers at stations and the fire department, police, operation command center, electric power command center, various locations within the station, and related adjacent buildings shall be installed. In addition, it was stipulated that communication equipment shall be installed within tunnels between stations at intervals of 250 m or less.

10) Fire doors

In terms of fire prevention facilities at stations, it was stipulated that fire doors or fire shutters shall be installed in areas that need to be divided into sections, and fire shutters shall have a two-stage structure aimed at preventing circulation of smoke.

11) Flood prevention facilities

Based on the aforementioned flood prevention measures, it is recommended that structures be designed so that tunnels will not be flooded to a dangerous level, and consideration should be given to water-stopping iron doors or the like that will contain water infiltration in U-shaped structural sections traveling from elevated or ground-level sections to underground sections in particular.

12) Drainage equipment

In underground structures, it is difficult to completely prevent leakage of groundwater. As a result, it was stipulated that drainage facilities commensurate with the anticipated amount of leaked water shall be installed.

13) Other facilities

Breathing apparatus and dedicated ventilation equipment for underground substations were stipulated as other facilities.

14) Manuals, etc.

It was stipulated that manuals relating to actions to be taken by staff in the event of a fire, education, training, and cooperation with the fire department shall be developed.

6.3 Comparison with Other Countries

We traveled to Thailand and India to conduct on-site surveys of their respective MRT (Mass Rapid Transit) and subway (Delhi Metro) systems, conducting interviews with their research departments and observing their railway facilities. Their Technical Standards are handled as described below.

6.3.1 Railway Structures

1) Approval process relating to Technical Standards

1. Thailand MRT project

The procedure for Thailand's MRT project is that the Office of Transport Planning (OTP) first prepares a master plan and then receives approval from the Cabinet. The Mass Rapid Transit Authority of Thailand (MRTA) seeks approval for the project from the Cabinet based on the approximate budget and F/S results derived from the master plan. The Government does not stipulate Technical Standards for railways, and there is therefore no approval and licensing system. Moreover, specifications such as alignment are determined based on the MRTA's judgment, with approval from the Cabinet or the like not being required. For example, Standards and reference values related to alignment, such as the minimum curve radius, are established in the bid document at the time of bidding after examining the figures proposed by the consultant at the basic design stage for each line. Technical expertise is accumulated through the reviews conducted for each line, which will presumably lead to the formation of distinct MRT line Technical Standards in future.

2. India's Delhi Metro Line

In terms of stipulating railway specifications in India, the Ministry of Railways has established the Indian Railways Schedule of Dimensions, which specifies technical values for specifications for alignment and the like. With regard to Technical Standards for the Delhi Metro Line, the Delhi Metro has established its own Schedule of Dimensions for Standard Gauge (1435 mm), which stipulates reference values for specifications related to alignment. For constructions, the main specifications have been approved by Indian Railway.

2) Key items relating to railway structure design Standards

1. Thailand MRT project

The bid document for the MRT Blue Line stipulates items relating to the design and construction of civil engineering structures:

- Service life of structures
- Design maximum speed
- Specified precipitation amount for drainage facilities
- Flood probability when designing flood prevention facilities
- Design Standards to be applied in design
- Underground water level
- Painting cycle for steel structures
- Loads and load combinations to be used in design
- Displacement of structures
- Width and overhead clearance for passageways, concourses, etc.

2. India's Hyderabad Metrorail

For the Hyderabad Metro*, the local Government (Government of Andhra Pradesh) has stipulated a Manual of Specification and Standards that indicates reference values for specifications related to alignment, etc. as well as stipulating Technical Standards for railway structures:

- Design Standards to be applied in design
- Types of elevated structures
- Loads and load combinations to be used in design
- Curvature and camber

- Concrete cracking
- Minimum thickness of materials
- Deflection and displacement
- Bearings
- Pier protection (from impacts of cars and ships)
- Material strength (rebar, concrete, etc.)
- Elevators, escalators, stairs, etc.

*The Hyderabad Metro under construction in Hyderabad, a city in south-central India, is planned to comprise entirely elevated railways, with three lines covering a total of 72 km with 66 stations. The first section of 7 km was scheduled to start operation at the end of 2014, and the other sections by 2017.

3) Barrier-free facilities on the Delhi Metro Line

Stations on the Delhi Metro Line are equipped with elevators and escalators, with ample passenger information signs and so forth as well. In India, there are Government-stipulated guidelines relating to the installation of barrier-free facilities. However, the guidelines do not mandate the installation of elevators, etc. in stations. Station facilities are planned independently by the Delhi Metro based on the guidelines.

4) Railway facility specifications, etc.

1. Data for urban railway structure facilities in countries adjacent to Thailand and India is shown in Table 6.1.

2. Design Standards (codes) applied to designs and specifications for railway structures in countries adjacent to India and Thailand are shown in Table 6.2.

The sources are as shown below (see tables for details):

- Bangkok Blue Line: based on design specification in bid document.
- Hyderabad Metro: based on design manual published by local Government.
- Singapore MRT: based on design Standards published by Land Transport Authority.

Vietnam MRT: based on design Standards (TCVN8585 Vietnam Standards).

Table 6.1 Key Data for Urban Railways in Neighbour Countries

	Bangkok Blue Line	India Hyderabad Metro	Singapore MRT	Vietnam MRT
Gauge	1,435mm	1,435mm	1,435mm	1,435mm
Design speed	80km/h	80km/h	—	130km/h
Curve radius (Minimum)	Mainline:300m Absolute 200m Depot:100m	Mainline: 400m Absolute 120m Platform area: 1000m	Mainline: 500m Absolute 400m Depot: 190m	Mainline: 160m Depot: 100m
Length of pure circular arc between transitions (Minimum)	25m Preferred 50m Absolute 17m	25m	50m Absolute 20m	Length of rolling stock
Length of straight track between the ends of the curves (Minimum)	25m Preferred 50m Absolute 17m	25m Preferred 40m	50m Absolute 20m	Mainline: Length of rolling stock Side track: 5m
Gradients (Maximum)	Mainline: 3.0% Absolute 4.5% Station area: level	Mainline: 2.0% Absolute 4.0% Station area:0.1%	Mainline:2.5% Absolute3.0% Station area: level	Mainline: 3.5% Stabling area: 4.5% Station area: 0.5% (No coupling and decoupling) 1.0%
Distance between two track centers (Minimum)	4.4m	Ballasted track: 3.65m Ballast-less: 3.60m	No encroaching into each structure gauge	Rolling stock gauge +600mm (Rolling stock having a structure that prevents a passenger from extending any part of body out of the window) Rolling stock gauge +400mm
Train loading	Vehicle length: 23.5m Distance of wheel axle to fix bogie: 2.30m Axle load: 175kN	The United Kingdom highways Agency Departmental Standard BD 37/01 (BS 5400)	The United Kingdom highways Agency Departmental Standard BD 37/01 (BS 5400)	Vehicle length : 20.0m Distance of wheel axle to fix bogie : 2.10m Axle load : 16t
Side platform width (Minimum)	To any objections: 4.25m To any continuous wall: 3.25m	Requirements of NFPA 130	—	At ends: 1.5m At center: 2.0m Preferred: 5.0m
Central platform width (Minimum)	(Each side of platform) To any objections: 4.25m To any continuous wall: 3.25m	Requirements of NFPA 130	—	At ends: 2.0m At center: 3.0m Preferred: 7.0m
Platform clear width from nosing	To any objections: 4.25m To any continuous wall: 3.25m	Requirements of NFPA 130	—	To any objections: 1.5m To any continuous wall: 1.0m
Platform nosing above rail level	1,100mm	1,100mm	—	1,100mm

*Source of reference

- **Bangkok Blue Line**

MRT BLUE LINE EXTENSION PROJECT contract documents

Between “Mass Rapid Transport Authority of Thailand” and “Italian-Thai Development Public Company Limited”

CONTRACT 1: UNDERGROUND CIVIL WORKS

VOLUME 5 OUTLINE DESIGN SPECIFICATION

- **India Hyderabad Metro**

Elevated Mass Rapid Transit System through Public Private Partnership

‘MANUAL OF SPECIFICATIONS AND STANDARDS’ issued by Government of Andhra Pradesh

- **Singapore MRT**

‘CIVIL DESIGN CRITERIA FOR ROAD AND RAIL TRANSIT SYSTEMS’ issued by Land Transport Authority

- **Vietnam MRT**

TCVN8585: 2010/BGTVT (national Standards of Vietnam issued by the Vietnam Standard and Quality Institute)

‘Urban railway Standards for Mass Rapid Transit (MRT) - General technical requirements’

Table 6.2 Design Standards Applied to Design of Civil Structures in Neighbour Countries

Standard publications or Standard Codes of practice (Design and loading requirements for the civil structures)
Codes, Standards and specifications applicable for design of the components of the Rail System

Thai Bangkok Blue Line <i>Source: Specification in contract document</i>	India Hyderabad Metro <i>Source: MANUAL OF SPECIFICATIONS AND STANDARDS</i>	Singapore MRT <i>Source: CIVIL DESIGN CRITERIA FOR ROAD AND RAIL TRANSIT SYSTEMS</i>	Vietnam MRT <i>Source: Design Standards list of Phase I stage in Hanoi Line-1</i>
AASHTO American Association of State Highway and Transportation Officials	AASHTO American Association of State Highway and Transportation Officials	AASHTO American Association of State Highway and Transportation Officials	AASHTO American Association of State Highway and Transportation Officials
AREA American Railway Engineering Association	AREA American Railway Engineering Association		
ASTM American Society of Testing and Materials	ASTM American Society of Testing and Materials		ASTM American Society for Testing and Materials
BS British Standard	BS British Standard	BS British Standard	
EN Euro Norm	EN European Norm		EN Euro Norm
ASCE American Society of Civil Engineers	ASCE American Society of Civil Engineers		
CEB-FIP Comite Euro-International du Beton (CEB) and Federation International de la Precontrainte (FIP)	CEB-FIP Comite Euro-International du Beton (CEB) and Federation International de la Precontrainte (FIP)		
UIC The Union International des Chemins de Fer	UIC The Union International des Chemins de Fer	UIC The Union International des Chemins de Fer	
JIS Japanese Industrial Standards			JIS Japanese Industrial Standards
IBC International Building Code	IBC International Building Code		
	ISO International Standards Organization		ISO International Standards Organization
ACI American Concrete Institute	IRS Indian Railway Standards	SS Singapore Standard	Japanese Standards Design Standards for Railway Structures Vietnamese Standards 22TCN, 14TCN, TCVN, TCXD, TCXDVN, etc.
AISC American Institute of Steel Construction	IRC Indian Roads Congress		
ASBI American Segmental Bridge Institute	IS Indian Standard		
EIT Engineering Institute of Thailand	IEC International Electro technical Commission		
NAVFAC US Naval Facilities Engineering Command	NFPA National Fire Protection Association 'Standards for Fixed Guide-way Transit and Passenger Rail Systems'		
PCI Pre-stressed Concrete Institute	Indian Standard Hand Book on Steel Sections		
TIS Thai Industrial Standards	Indian Railways Manual on Design and Construction of pile foundations		
	The Persons with Disabilities Act		
	NBC National Building Code (of India)		
	ADA Americans with Disabilities Act		
	ADAAG ADA Accessibility Guidelines for Buildings and Facilities		
	Guidelines and space standard for Barrier free Built Environment for Disabled and Elderly Persons		
	BIS Bureau of Indian Standards		
	ANSI American National Standards Institute		
	AAMA American Architectural Manufactures Association		

Chapter7 Formulation of Technical Standard Relating to Train Driver Certification

7.1 Approach to Formulation

Japanese driver certification is a national license. The reason is that there are many licensees in Japan and driver certification is allowed to convert into other licensee. However, in Dhaka MRT where only one licensee exists at present at least and it is not thought drivers convert into the other licensee for the time being, it is not necessary to make the driver's certification the national license. Licensee should educate drivers and authorize certifications with responsibility. In France or Thailand, driver's certification is not made the national license, but it is being operated without problems actually.

Therefore, after having confirmed the above-mentioned policy in DTCA, it was decided that driver's certification was prescribed in Metrorail General Rules, 2015 (Schedule 9: Contents of Safety Management System) that was described in Chapter 4.

The current proposed Metrorail General Rules, 2015 has Safety Management System proposed by operators and stipulate that operators must stipulate items that should be followed in order to ensure safe transportation. One regulation covers items relating to certifications of drivers and other persons engaged in essential train operation-related tasks.

Train operation-related tasks notably include the need for drivers to operate trains carrying many passengers and to take rapid decisions on their own and respond promptly when abnormal situations arise. As a result, the proposed Metrorail General Rules, 2015 shall ensure that railway operators improve drivers' credentials and provide safe transportation by stipulating specific requirements that must be met for items relating to drivers' certifications.

On stipulating specific requirements, at the present that the sphere of business of driver does not become clear, to apply to the duties of the driver in future even if the sphere of business of the driver became anything, this technical standard is made minimum concise contents.

7.2 Positioning of Qualifications

For Dhaka's MRT, since it is planned to introduce an advanced safety system and there will be a single operator, licensee will use its own Standards for certification rather than the Government specifying train handling Standards. However, so that train operating safety will not be compromised, it prescribes driver's certification in Metrorail Rules, as a required item to describe in safety management system to submit to DTCA and a setup will be used whereby licensee implements the Standards under the control of the DTCA.

7.3 Essentials

7.3.1 Items indicated for Safety Management System

The following items are described in safety management system.

Licensee should establish it with responsibility, so that licensee can perform the education that is enough for drivers and authorize the certification to drivers. However, when it is before operating of MRT business, licensee must do drivers' training under the situation that there are not drivers' training facilities and not lecturers. Therefore it is necessary to consider drivers' training in other countries. When drivers' training is carried out in other country, the following items should be described including the education of other country.

- 1) Location, seating capacity and dimensions of land and building of training facility. (In attached floor plan)
- 2) Course curriculum
- 3) Test items, testing/inspection methods and acceptance criteria
- 4) Format of the driver's certification and delivery method

5) Method of management of persons to whom a driver's certification was authorized

7.3.2 Certification restrictions

- 1) Certifications are restricted to individuals corresponding to either of the following:
 - High school (science group) graduates aged 18 to 30
 - Persons having driver's certifications from another railway companies or having similar certifications

7.3.3 Certification testing

- 1) Aptitude Test
 - Physical and mental ability test
- 2) Knowledge Test
 - Laws and ordinance on operating motive power cars
 - Structure and function of motive power car
 - Motive power car operations theory
 - Emergency measures
- 3) Skills Test
 - Driving operations
 - Braking operations
 - Handling of equipment other than brakes
 - Measures in case of an emergency

7.3.4 Issuing of certificates

- 1) Items indicated on certificate
 - Name, date of birth, and gender
 - Date of issued certification
 - A person who has conditionally passed the tests for driver's certification

7.3.5 Suspension or rescission of certification

- 1) Operation of train while under the influence of alcohol or banned drugs
- 2) Other malicious behavior

Chapter8 Making of application and approval procedure Manual based on the Metrorail rules

8.1 Purpose of making

For a construction start of MRT6 line, DMTC needs to carry out the procedures of Licensing, Safety Management System and Construction Plan based on Metrorail Act, 2015 and Metrorail General Rules, 2015. Metrorail General Rules, 2015 is going to be approved soon, but Study Team directly cannot carry out review and approval support that DTCA performs after various application and submission because this investigation is finished in August, 2015. Therefore it will be supported by making a manual that become the indicator in case of procedure.

8.2 Discussion with organizations concerned

In making, Study Team made much account of that procedures are finished smoothly, so Study Team repeated discussion with GC and IDC which supported DMTC of application and submission side as well as discussion with DTCA of review and approval side. In addition, toward application of licensing necessary immediately, Study Team coordinated role allotment of GC and IDC.

8.3 Summary of Manual (Attached document 6)

(1) Flow chart of the procedure

Various procedures such as Licensing, Safety Management System and Construction Plan based on Metrorail Act, 2015 and Metrorail General Rules, 2015 are explained visually by flow chart and make it easy to be understood.

(2) Procedure of Licensing

The purpose, outline of the procedure, Selection Committee and documents necessary for application are explained in regard to Licensing based on Metrorail Act, 2015 and Metrorail General Rules, 2015. Furthermore, the check list for DMTC and DTCA both sides to confirm that the procedure and the contents are satisfied is attached.

(3) Procedure of Safety Management System

The purpose, outline of the procedure, documents necessary for application and the contents are explained in regard to Safety Management System based on Metrorail Act, 2015 and Metrorail General Rules, 2015. Furthermore, the check list for DMTC and DTCA both sides to confirm that the procedure and the contents are satisfied is attached.

(4) Procedure of Construction Plan

Outline of the procedure, documents necessary for application and Completion Inspection of construction works are explained in regard to Construction Plan based on Metrorail Act, 2015 and Metrorail General Rules, 2015.

Furthermore, the check list for DMTC and DTCA both sides to confirm that the procedure and the contents are satisfied is attached.

(Only as for the necessary part of a rail yard that must level the land immediately)

8.4 Holding of the presentation meeting in respect of Manual (Attached document 7)

The presentation meeting in respect of Manual was held in DTCA meeting room on July 27, 2015, and Study Team member explained. The person concerned of DTCA and DMTC attended at the presentation meeting, and the person in charge of GC and IDC attended at it, too.

Chapter9 Formulating a Road Map and Work Plan for Developing Laws and Regulations Required for Dhaka MRT Project

The objectives of this study are supporting the approval of Metrorail Act, supporting the formulation of Technical Standards for Metrorail, preparing a Road Map for development of laws and rules required for the Metrorail project and proposing development activities for rules required for the development of subsequent phases.

The content of the Metrorail Act has been simplified from the original proposal, and basic items such as authorization of project or construction applications, setting of fares, and equipment function inspections have been removed from the act, and will be governed by separately stipulated Metrorail Rules. As a result, provisions for licensing , construction authorization, fare setting, etc., that were initially to be stipulated in the Metrorail Act scheduled to be formulated in subsequent phases will be considered part of the Metrorail Rules (procedures before beginning operation). It is therefore necessary to legislate these together with the Metrorail Act. At present, discussions in the Bangladesh government are now underway for approval of final draft.

Legislation relating to obtaining certificate of train driver is also decided to prepare in this study.

Moreover, the Technical Standards for Metrorail in Bangladesh had approved by the DTCA board in May 2015 as directive.

In addition, with regard to project auditing rules, accident reporting rules, project reporting rules, and project accounting rules, it would be required to be developed as part of the Metrorail Rules (procedures after beginning operation) at least two to three years before beginning operation.

The relationship between the MRT project and relevant laws and rules is shown in the Road Map in Fig. 9.1 and The Work Plan for the relevant laws and rules in conjunction with the current project schedule is shown in Table 9.1

The abbreviations in Fig. 9.1 and Table 9.1 are as follows:

DTCA: Dhaka Transport Coordination Authority

DMTC: Dhaka Mass Transit Company

IDC: Institutional Development Consultant

GC: General Consultant

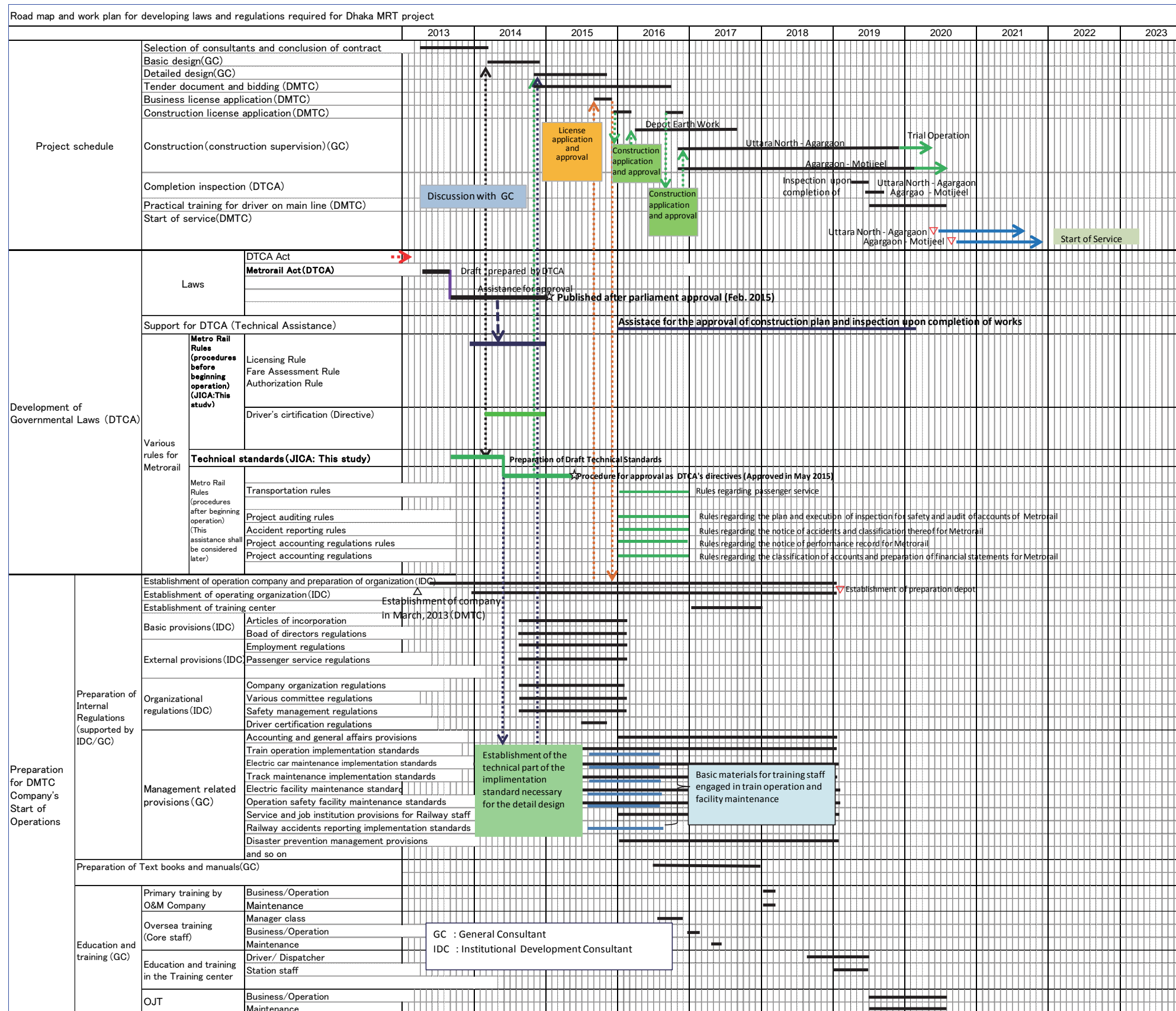


Figure 9.1 Road Map

Table 9.1 Work Plan for Development of Laws Required for Metrorail Project (Proposed)

Laws and Regulations			Party Responsible for Formulation	Formulation Period	Support	Remarks	
Development of Governmental Laws and Rules	Law	Metrorail Act	DTCA	May 2015 (Published)	JICA(This study)		
	Rules	Metrorail Rules (procedures before beginning operation)	DTCA	August 2015	JICA(This study)		
	Directives	Technical Standards	DTCA	May 2015 (Approved)	JICA(This study)	Already reflected to the design of MRT Line6	
		Train driver's certificate	DTCA	2015	JICA(This study)		
	Rules	Metrorail Rules (procedures after beginning operation)	Transportation rules	DTCA	2016	JICA (This assistance shall be considered later)	Rules regarding the passenger service
			Business auditing rules				Rules regarding the plan and execution of inspection for safety and audit of accounts of Metrorail
			Accident reporting rules				Rules regarding the report of accidents and classification thereof for Metrorail
			Business reporting rules				Rules regarding the report of performance record for Metrorail
			Business accounting rules				Rules regarding the classification of accounts and preparation of financial statements for Metrorail
	Preparation for DMTC Company's Start of Operations	Basic regulations	Articles of incorporation	DMTC	2015	IDC	
Board of directors regulations			2016				
External regulations		Employment regulations	DMTC	2016	IDC	Internal regulations regarding the employment condition of staff	
		Passenger service regulations		2016		Internal regulations regarding the passenger service	
Organizational regulations		Company organization regulations	DMTC	2016	IDC	Internal regulations regarding the company organization and assignment of work	
		Various committee regulations		2016		Internal regulations regarding the setting up committee	
		Safety management regulations		2016		Internal regulations regarding the safety management	
		Driver certification regulations		2016		Internal regulations regarding the certification of the train driver	
Management-related regulations		Accounting and general affairs provisions	DMTC	2016-17	GC		
		Various system implementation Standards		2015		Internal regulations regarding the structure and maintenance of facilities and rolling stock and regarding the train operation	
		Disaster prevention management provisions		2019		Internal regulations regarding the disaster prevention	

Chapter 10 Results of This Study and Future Assistance

10.1 Overall status

As the situation in Bangladesh turned unstable from December 2013 to January 2014 and from January 2015 to February due to the confrontation between the ruling and opposition parties, the study team was forced to postpone or cancel some of the planned work in Bangladesh and the duration of this study was extended from the initial schedule.

At present, Metrorail Rules has not been approved yet but is expected to be approved soon since it is in the final stage. On the other hand, the Metrorail Act passed the Parliament on January 26, 2015 and was approved by the President and published by the official gazette on February 2. Technical Standards for the Metrorail has also been approved by the DTCA as the directive on May 28, 2015 as a directive. Therefore it can be said that the most of the objectives of this study have been achieved.

10.2 Work Progress Status

10.2.1 Assistance for Metrorail Act approval

The Metrorail Act was drafted under prior study by JICA, but the approval procedure was stalled. After the launch of this study, the draft, which was re-revised based on comments from JICA, the study team, etc. and inter-ministerial coordination, was presented to the intra-Governmental approval process and was reviewed by MOL after Cabinet approval on April 29, 2014. After revisions were made by the MOL, Cabinet approval was given again on November 10, 2014 and the draft bill was sent for a Parliamentary approval on November 30. After discussion at the committee in the Cabinet, the draft bill was enacted by the Parliament on January 26, 2015 and was approved by the President and published by the official gazette on February 2, 2015.

10.2.2 Status of institution of Metrorail Rules framed under the Metrorail Act

Since the early establishment of the Metrorail Rules stipulating procedures to be taken before starting operations, such as business license approval, fare fixation, approval of construction plan, etc., were confirmed to be needed, the study team prepared the draft Metrorail Rules and put to the approval process. It is expected to be approved soon since it is in the final stage.

10.2.3 Assistance for formulation of Technical Standards

The Technical Standards is regarded as “Directive” in the Metrorail Act. Although it is directive, the Technical Standards has the legal force by the provision of Metrorail Act. These Standards had approved by DTCA board on May 28, 2015.

10.2.4 Progress on development of the directive for train driver certification

The draft of directive for train driver certification prepared by the study team was submitted to the DTCA. This directive needs to be approved by DTCA board.

10.2.5 Supporting business license screening

As stipulated in the Metrorail Act, DMTC needs to obtain a license to conduct Metrorail business. Specific procedures for issuing license are to be stipulated in the Metrorail Rules under the Metrorail Act. DMTC will submit the application for obtaining business license as soon as the Metrorail Rules are established and then, DTCA will start screening for issuance. The study team has prepared the manual for these procedures and explained to DTCA, DMTC and other relevant organizations in the presentation meeting held on July 27, 2015.

10.2.6 Status of assistance for procedures for approval of construction plan and of the safety management system

As stipulated in the Metrorail Rules, procedures for approval of construction plan and of the safety management system are required to commence construction work. As the first stage of construction, the earth work in depot is planned to start at the beginning of 2016 in MRT Line6 project. Therefore the study team has prepared manuals for the approval of construction plan of the depot earth work and of safety management system, and explained them to DTCA, DMTC and other relevant organizations in the same meeting mentioned above.

10.3 Future technical assistance

10.3.1 Need for future assistance for DTCA

Under this study, we assisted DTCA till the formulation of Metrorail Rules that will be needed before starting operations and the preparation of manuals for the procedure for approvals of construction plan of depot earth work and of the safety management system.

Afterwards, DTCA will have to formulate Metrorail Rules that will be needed after starting operations, obtain approval for main civil construction work and installation of E&M system, and conduct final inspections of civil work, E&M system and rolling stock. After starting operations, DTCA staff will have to audit as an inspector.

It seems to be difficult for DTCA which have no experience in Metrorail to perform these tasks. Thus, it is assumed that providing continuous technical assistance to DTCA and capacity-building for DTCA staffs are indispensable.

10.3.2 Assistance schedule

Details of technical assistance required before the commencement of operation of MRT Line 6 after this study and their timings are shown in Table 10.1.

Table 10.1 Details of Technical Assistance and Timing (plan)

Assistance	Items	Timing
Formulation of Metro Rail Rules (procedures after commencement of operations)	Rules required after the commencement of operation such as Transportation rules, Project auditing rules, Accident reporting rules	2016
Approval of construction plan	Approval for construction plan of civil works, installation of E&M system Approval of safety management system	2016
Inspections upon completion of construction works	Inspection upon completion of civil works, installation of E&M system and rolling stock	2018-2020

Relations between the schedule of construction, the timing of approval of construction plan and inspections upon completion of works, and the schedule of assistance are shown in Figure 10.1.

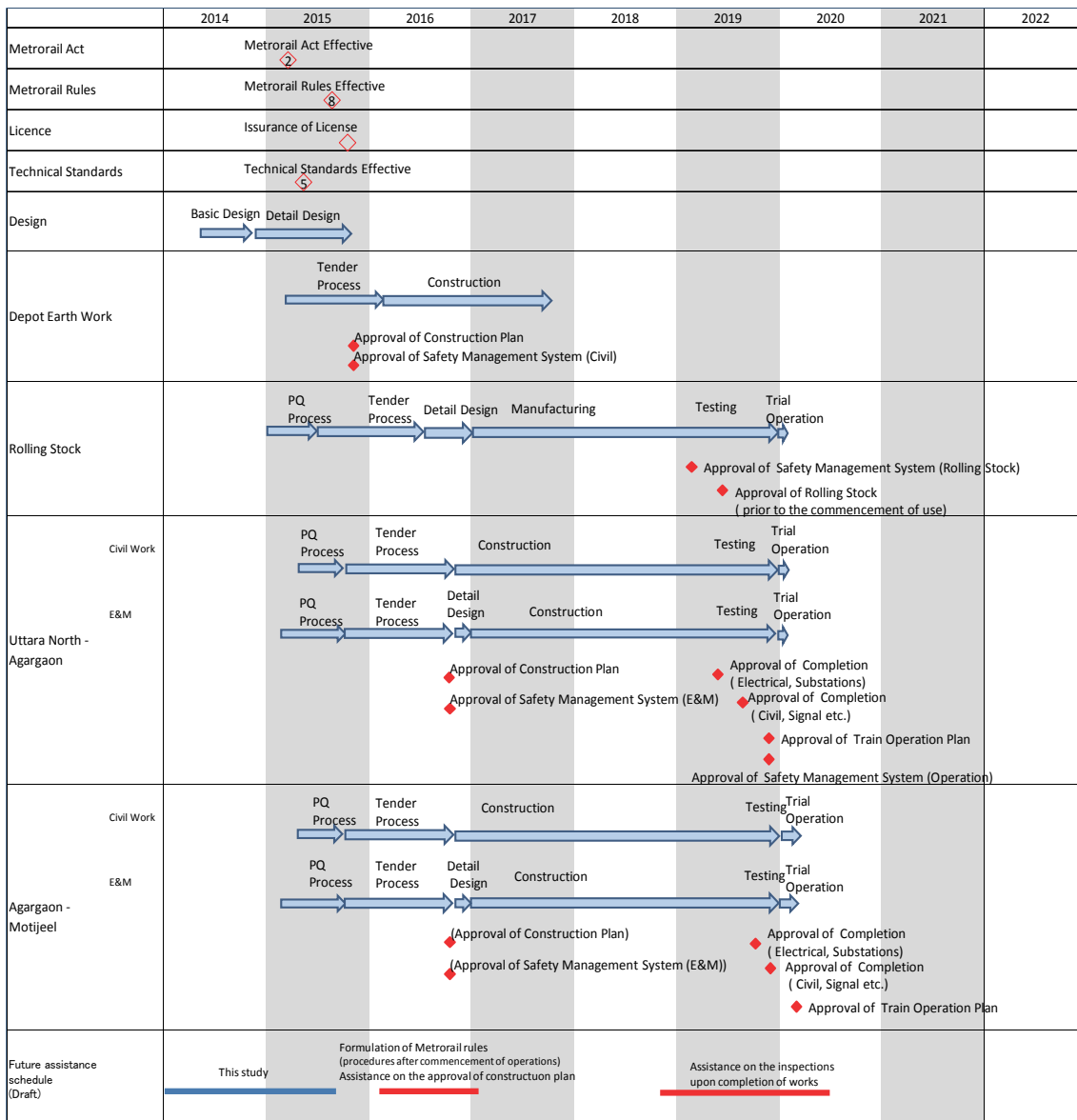


Figure 10.1 Timing of Approval of Construction Plan, Inspections upon completion and Assistance Schedule (plan)

10.3.3 Proposal for next assistance

As mentioned above, it is assumed that the next assistance for the formulation of Metrorail Rules (procedures after commencement of operation) and the approval for construction plan will be needed in 2016. Proposal for the next assistance by the study team is attached as Appendix 9.

Appendix 1

Metrorail Act
(English translate by JST)

Note

This Metrorail Act is translate by JST from Bengali to English.
JST has not responsibility of this Metro Act English version.

Metrorail Act, 2015

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A Bill to provide for the construction, operation, maintenance and control of the Metrorail with the objective of ensuring better mass rapid transit for people with minimum expenses and make provision related thereto

Bill

Whereas it is expedient to provide for the construction, operation, maintenance and control of the Metrorail with the objective of ensuring better mass rapid transit for people with minimum expenses and make provision related thereto;

It is hereby enacted as follows:-

First Chapter

Preliminary

1. Short title, Commencement and Application.-(1) This Act may be called the Metrorail Act, 2015.

(2) This Act shall come into force -

(a) immediately at the first phase in the districts of Dhaka, Narayangonj, Munshigonj, Manikgonj, Gazipur, and Norshindi; and

(b) at the second phase in the districts other than the districts mentioned in clause (a) on such date as the Government may, by notification in the official Gazette, appoint.

2. Definition.-In this Act, unless there is anything repugnant in the subject or context,-

(1) "Appellate Authority" means an appellate authority formed under section 24.

(2) "Commissioner" means concerned Divisional Commissioner and also Additional Divisional Commissioner shall be included;

- (3) "Authority" means the Authority established under section 4 of the Dhaka Transport Coordination Authority Act, 2012 (Act No. 8 of 2012);
- (4) "Objective against public interest" means the objective to gain financial benefit in the form of compensation or in any other form by any act or action done or taken with a view to resisting, obstructing or delaying the construction, operation, maintenance, development and implementation of Metrorail;
- (5) "Activities against public interest" means with the objective of obstructing, disrupting and delaying the construction, operation, maintenance, development and implementation of Metrorail doing activities against public interest or taking measures and trying to get compensation or taking financial benefit in other way beyond law or rules;
- (6) "Emergency Service Providing Organization" means local administration, local police authority, local health service providing authority, Fire Service, ambulance service, electricity, gas, water, optical fiber, telephone line and sewerage and drainage service providing organization;
- (7) "Deputy Commissioner" means the Deputy Commissioner as defined in section 2(b) of the Acquisition and Requisition of Immovable Property Ordinance, 1982 (Ord. II of 1982);
- (8) "Executive Director" means the Executive Director appointed under section 12 of the Dhaka Transport Coordination Authority Act, 2012 (Act No.8 of 2012);
- (9) "Inspector" means Inspector appointed under section 21;
- (10) "Regulation" means regulations framed under this Act;
- (11) "Criminal Procedure Code" means the Code of Criminal Procedure, 1898 (Act V of 1898);
- (12) "Rules" means rules framed under this Act;

(13) "Person" means any person or organization, company, partnership business, firm or it includes any other national or foreign organization;

(14) "Land Acquisition Act" means Acquisition and Requisition of Immovable Property Ordinance, 1982 (Ord. II of 1982);

(15) "Metrorail" means town based rail system where there shall be a dedicated right of way with underground, elevated or at grade rail track and includes all establishment, machineries, apparatus, equipment and related matters thereto situated under, on or above the right of way;

(16) "Metrorail Area" means the land and infrastructure used for the construction, operation, maintenance and development of Metrorail and necessary area under, on or above the land and infrastructure for the use of machineries and apparatus;

(17) "License" means license issued under this Act for construction, operation, maintenance or development of a Metrorail system;

(18) "Licensee" means a licensed person under this Act for construction, operation, maintenance or development of a Metrorail system;

3. Act to override.-The Provisions of this Act shall have effect notwithstanding anything contained in any other law for the time being in force.

Second Chapter

Acquisition of land, ETC

4. Acquisition of Land for Implementation of Metrorail.-Subject to other provisions of this Act, where the acquisition of any land is required for construction or operation or maintenance or control of Metrorail or matters relevant thereto, it shall be deemed to be necessary for the public interest and such land may be acquired as per requirement of the Authority in accordance with the provisions of the Land Acquisition Act.

5. Special Provision.-(1) A person shall not be entitled to any compensation for construction or under construction house-home or other kind of establishment with the objective against the public interest on the land acquired for establishment or operation of the Metrorail system or other structure to be constructed for the said purpose or classification of any house-home or any other kind of establishment or land has been changed with the same objective.

(2) In determining compensation under section 8 of the Land Acquisition Act, if the Deputy Commissioner is satisfied in this regard that any house-home or other establishment constructed or under construction with the objective against public interest on the land acquired for construction or operation or maintenance or control or related matter thereto of Metrorail or classification of any homestead or establishment or land has been changed with the same objective in such a case, he shall not consider the change of such house-home or establishment for awarding compensation under the said section and shall reject the claim, if any, for such compensation.

(3) Any person aggrieved for rejection of any claim under sub-section (2), may prefer an appeal before the Commissioner within 7 (seven) days from such order of rejection.

(4) The Commissioner shall investigate the matter of appeal within 5 (five) days from the date of receiving the petition of appeal under sub-section (3) and thereafter giving the appellant an opportunity of being heard shall give his decision within 5 (five) days.

(5) The decision of the Commissioner under sub-section (4) shall be final.

(6) If the appeal is rejected by the decision under sub-section (4), in that case the appellant shall remove the concerned house-home or establishment at his own cost and responsibility within 24 (twenty four) hours from the communication of such order, otherwise the Deputy Commissioner, for the purpose of removing shall sell the homestead or establishment by public auction and deposit the sell proceed in the treasury.

(7) If the claimant does not prefer any appeal against the order of the Deputy Commissioner under sub-section (2) within the time provided under sub-section (3) in that case, within the next 24 (twenty four) hours after that time he shall remove the concerned house-home or establishment, otherwise the Deputy Commissioner shall take the step under sub-section (6).

(8) The compensation shall be paid publicly within 60 (sixty) days on receiving the money from the requiring body under this Act at the concerned Union Council or Office of the Councilor as per the schedule declared previously by the Deputy Commissioner

(9) In case of change of classification of any land acquired for construction or operation and control of Metrorail or matter related thereto, by cutting earth or in any other manner with dishonest intention, if any damage caused for such change, the Deputy Commissioner may realize appropriate compensation from the owner of the concerned land for such damage, in the manner prescribed by rules.

(10) At the stage of serving notice under section 3 of the Land Acquisition Act, the video picture of the land under acquirement taken and preserved by the Deputy Commissioner, shall be deemed to be taken and preserved to fulfill the objective of this Act and the compensation shall be paid after determining on the basis of such video picture.

(11) No court shall accept any case or petition against any order or proceedings under this chapter, and no court shall pass any order of injunction against any proceedings taken or to be taken under this section or under the power of this section.

6. Overriding Effect of Section 5.-Notwithstanding anything contained contrary in the Land Acquisition Act, rules framed thereunder or any law or rules in force for the time being, the special provision of section 5 shall remain in force to acquire land for the purpose of construction of establishment or using land otherwise for construction or operation or maintenance or control of Metrorail.

Third Chapter

License, ETC.

7. Requirement of License for Construction and Operation of Metrorail.-No person shall without license construct, develop or operate Metrorail or provide Metrorail service or establish or operate any machinery for that purpose.

8. Application for License, Renewal of License, etc.-All relevant matters including application for license, renewal of license, preservation and display of license, suspension and cancellation of license under this Act shall be prescribed by rules.

9. Issuance of License, etc.-(1) Government shall issue license according to the recommendation of the Selection Committee constituted under section 11 in the manner, for the term and condition prescribed by rules and subject to payment of fee:

Provided that, no license fee shall be required for the license of construction, operation of Metrorail or construction and operation of any establishment thereof by the Government or operated under the management or control of the Government.

10. Transfer of License.-(1) Subject to the provision of sub-section (2), a license shall be transferable on the prior approval of Government.

(2) In case of license obtained through transfer under sub-section (1) the obligations of licensee, term of license, condition and procedure and relevant matters shall be prescribed by rules.

11. Selection Committee.-(1) For the purpose of issuing license under this Act, the Government shall constitute a Selection Committee headed by the Executive Director with not more than 6 (six) officers from the Authority and the Government.

(2) Duty and functions of the Selection Committee shall be prescribed by rules.

(3) The Government may issue, renew, suspend or cancel the license in considering the recommendation of the Selection Committee constituted under sub-section (1).

12. Construction, Operation and Maintenance of Metrorail on the basis of Public Private Partnership.-Subject to other provisions of this Act, Metrorail may be constructed, operated and maintained on the basis of public private partnership.

Fourth Chapter

Right to Entry, ETC.

13. Right to Entry.-Subject to the restrictions prescribed by rules, a licensee or any person or representative or employee empowered in writing by him, may enter under, in, upon or over the land or establishment adjacent to the Metrorail area, with machinery and equipment for accomplishing any other activities including construction, operation, maintenance and development of Metrorail.

14. Restriction on Stopping Civic Facilities, etc. without Prior Approval.-Licensee shall not suspend, remove or transfer civic facilities without prior approval of emergency service providing organization for the purpose of conducting any other activities including constructing, developing, operating Metrorail or constructing any establishment thereof in the Metrorail area.

Fifth Chapter

Technical Standards

15. Compliance to Technical Standards, etc.-(1) Licensee shall have to take approval from the Authority for all technical matters including infrastructural facilities and establishment of rolling stock of Metrorail, maintenance and safety management thereof.

(2) Construction, establishment of rolling stock, operation, maintenance, safety management and facilities of Metrorail shall be as per the directives regarding technical standards issued time to time by the Authority.

(3) Licensee shall have to take written permission from the Authority, in case any change is required of the standards determined by the Authority under sub-section (2).

16. Submission of Report to the Authority.-(1) In order to ensure safety of Metrorail, the licensee shall submit report in this regard to the Authority in the manner and time prescribed by rules.

(2) The Authority may issue directives time to time on the basis of the report under sub-section (1) and licensee shall observe such directives if issued in the said manner.

Sixth Chapter

Fare, ETC.

17. Fare Assessment.-The Authority shall determine fare to be provided by passengers for Metrorail Service on getting directives time to time from Government.

18. Fare Assessment Committee.-(1) The Government shall for the purpose of determining fare to be provided by passengers for Metrorail service under section 17, constitute a 7 (seven)

member committee headed by the Executive Director to be named as Fare Assessment Committee.

(2) The Fare Assessment Committee shall recommend to the Authority the highest and lowest fare rate considering the Metrorail operation cost and financial ability of public.

(3) The qualification of the members of the Fare Assessment Committee and process of fare assessment shall be determined by rules.

19. Publication of Fare related Information.-(1) The Authority shall cause to be published information relating to passenger transit fare on its website and widely circulated daily newspaper.

(2) Licensee shall cause to be displayed and preserved the table of passenger transit fare determined by the Authority in an easily conspicuous place at Metrorail stations and in Metrorail coach.

(3) Licensee shall not collect more fare from a passenger than the fare determined by the Authority.

20. Reservation of Seat.-In every coach of Metrorail there shall be a fixed number of seat reserved determined by the Authority for war wounded freedom fighter, disabled, women, children and old.

Seventh Chapter

Inspector and Appellate Authority, ETC.

21. Appointment of Inspector. -The Authority may, for the purposes of this Act, appoint by general or special order, any of its officers as an Inspector.

22. Power of Inspector.-(1) In order to implement the provisions of this Act the Inspector may enter any place of Metrorail area for the purpose of examining term of Metrorail license, quality of machinery and equipment, safety system and standard of passenger service.

(2) During inspection an Inspector may collect photocopy on perusal of any register, file, deeds, report-return and other documents or licensee and in case of need question the licensee.

(3) The Inspector shall submit a report to the Authority with specific recommendation on completion of each inspection.

(4) The Authority may on review of the recommendations obtained under sub-section (3) may take necessary action against the licensee under this Act.

23. Providing assistance to the Inspector.-Where an Inspector for the purpose of implementing the provisions of this Act, enters any place of the Metrorail area, the licensee or any person engaged by licensee at the said place shall, furnish all information required by, and render all reasonable assistance to, the Inspector so that the Inspector can perform his duty appropriately.

24. Appeal, Formation of Appellate Authority, etc.-(1) On being aggrieved for the order given under sub-section (4) of section 22, Licensee may appeal to the Government within 7 (seven) days from the date of issuing the said order.

(2) The Government, for the purposes of this Act, by notification in the official gazette, shall constitute an Appellate Authority consisting 5 (Five) members by method determined by the rules.

(3) Appellate Authority shall dispose the appeal within 30 (thirty) days of receiving the appeal under sub-section (4) of section 22 of this Act.

(4) Filing and disposal method of the appeal shall be determined by the rules.

Eighth Chapter

Compensation and Insurance for Damage caused by Accident, ETC.

25. Awarding Compensation.-If any person becomes injured or suffers damage or died due to an accident arising out of operation of Metrorail, the licensee shall be liable to pay compensation to him or his family as the case may be, in the manner and amount to be prescribed by rules.

26. Medical Treatment of Injured Person, etc.-(1) If any person becomes injured due to an accident arising out of operation of Metrorail in that case the licensee shall cause him to be sent to the nearest medical center or hospital to ensure his fast aid.

(2) In the case where the licensee does not provide medical treatment to the injured person under sub-section (1) in that case he will be able to get treatment on his own accord and the licensee shall be liable to pay the cost of such treatment in the manner and amount to be prescribed by regulations.

27. Report on Fatal Accident.-The licensee shall forthwith inform the emergency service providing organizations about the fatal accident arises out of Metrorail operation and submit report to the Authority regarding the said accident.

28. Compulsory Insurance for Metrorail and Passenger.-(1) In the case of Metrorail operation, every licensee, shall cause insurance for Metrorail and all passengers of it and third party.

(2) In case of occurrence of any accident, the licensee shall within 90 (Ninety) days from the claim, on realizing the compensation money from the concerned company at its own effort and responsibility handover to the victim of accident or to his family as the case may be.

29. Compensation of Third Party for Accident of Metrorail.-If any damage caused due to the accident of Metrorail to the person, establishment and property other than Metrorail or its passengers under this Act, the licensee shall within 90 (Ninety) days from raising the claim by

the concerned person or the owner of the establishment or property, on realizing the compensation from the concerned company provide to the said person or owner of the establishment or property.

Ninth Chapter

Offences and Penalties

30. Penalty for Construction, Operation, Development and Operation of Metrorail.-If any person construct, develop or operate Metrorail or provide Metrorail service without license or establish or operate any machinery for that purpose in that case, the said action of the said person shall be an offence and for that he shall be liable to be punished with sentence of imprisonment up to 10 (ten) years or with fine up to TK 1 (one) crore or with both.

31. Penalty for Transfer of License.-If any person transfers license without prior approval of the Government, in that case his such action shall be an offence and for that he shall be liable to be punished with sentence of imprisonment up to 10 (ten) years or fine up to taka 1 (one) crore, or with both.

32. Penalty for Obstructing Right to Entry.-If any person illegally obstruct the licensee or person empowered by him or representative or employee from entering adjacent land and underground of an establishment, surface and above and inside the establishment of Metrorail area with machinery and equipment for conducting any activities including construction, development and maintenance of Metrorail, in that case the said action of the said person shall be an offence and for that, he shall be liable to be punished with sentence of imprisonment up to 2 (two) years or fine up to taka 2 (two) lacs, or with both.

33. Penalty for Creating Obstruction on Metrorail Construction, Development, Operation and Performing any other Activities including Maintenance.-(1) If a person without lawful reason deliberately resist or create any obstruction in performing any activity including construction, development, operation and maintenance of Metrorail, in that case the said action

of the said person shall be an offence, and for which he shall be liable to be punished with imprisonment up to 1 (one) year or fine up to 5 (five) lacs or with both.

34. Penalty for Unauthorized Trespass to the Restricted Area of Metrorail.-If any person trespasses into the restricted area of Metrorail without authorization and after entering into that place stay there on being requested by a person in charge for leaving that place or any subordinate to him, in that case the said action of the said person shall be an offence, and for which he shall be liable to be punished with imprisonment up to 1 (one) year or fine up to 5 (five) lacs or with both.

35. Penalty for Impeding Safety of Metrorail and its Passengers.-If any person accomplishes any action for which the safety of Metrorail or its passengers impedes or likely to be impeded, in that case the said action of the said person shall be an offence, and for which he shall be liable to be punished with imprisonment up to 5 (five) years or fine up to 50 (fifty) lacs or with both.

36. Penalty for Selling Metrorail Ticket or Pass without Authorization or Distorting or Counterfeiting ticket or pass.-If any person sells Metrorail ticket or pass without authorization or distorts or counterfeits ticket or pass in that case the said action of the said person shall be an offence, and for which he shall be liable to be punished with imprisonment up to 10 (ten) years or fine up to 1 (one) crore or with both.

37. Penalty for Abuse of Metrorail or its Machinery by Employee.-If any employee of the licensee uses Metrorail or its Machinery in such a way for which the safety of Metrorail or its passengers may be or likely to be hampered, and during his duty uses the Metrorail or its machinery in such a way, the power of which was not given to him in that case the said action of the said person shall be an offence, and for which he shall be liable to be punished with imprisonment up to one (one) year or fine up to 5 (five) lacs or with both.

38. Obstructing Inspector in Performing Duty or Providing False or Misleading Information.-If any person creates obstruction in performing duty of the Inspector or provide false or misleading information in that case the said action of the said person shall be an offence,

and for which he shall be liable to be punished with imprisonment up to 2 (two) years or fine up to 10 (Ten) lacs or with both.

39. Penalty for not Causing Insurance.-If any licensee doesn't make any insurance for licensee or its passengers or for third party, in that case the said action of the said person shall be an offence, and for which he shall be liable to be punished with imprisonment up to 10 (ten) year or fine up to 10 (Ten) crores or with both.

40. Penalty of travelling by Metrorail without ticket or a valid pass, etc.-If any person travels without ticket or a valid pass or more than approved distance by Metrorail or adopt any trick to avoid fare, in that case the said action of the said person shall be an offence, and for which he shall be liable to be punished with fine amounting up to 10 (ten) times of the Metrorail transport fare and in case of default of payment of that fine shall be liable for imprisonment up to 6 (six) months.

41. Penalty for not Following Technical Standards.-(1) If licensee construct Metrorail or establish, operate, maintain and perform safety management of rolling stock without the approval from the Authority or without following the directives regarding technical standards issued by the Authority, that shall be an offence and for which he shall be liable to be punished with imprisonment up to 5 (Five) years or fine up to 50 (Fifty) lacs or with both.

42. Penalty for Commission of Offence by the Licensee.-Where an offence under this Act has been committed by a licensee, every officer and employee of the licensee, who has the direct affiliation with the offence committed, shall be deemed to have committed the offence and for which he shall be liable to be punished subject to other provisions of this Act, unless he proves that the offence is committed beyond his knowledge or he has exercised all due diligence to prevent the commission of such offence.

43. Penalty for Abatement, Instigation and Conspiracy of Committing Offence.-Any person if abates or instigates or makes conspiracy to commit an offence under this Act, and if such

offence is committed due to such abatement, instigation or conspiracy, in that case, such abettor, instigator or conspirator shall be punishable with the sentence provided for the offence.

44. Penalty for Recommitting Offence.-If any person on being convicted and sentenced for any offence stated in this Act, commits the same offence again, in that case he shall be liable to be sentenced double of the highest punishment fixed for that offence.

45. Cognizance of Offence.-Notwithstanding anything contained in the Criminal Procedure Code, no court shall take cognizance of any case under this Act or rules, without the written report by the Authority or an officer or Inspector duly empowered by it.

46. Application of the Criminal Procedure.-Subject to the not being inconsistent with the provisions of this Act, for the investigation, trial, appeal and other related matters under this Act or rules, the Criminal Procedure Code shall be applicable.

47. Jurisdiction of Mobile Court.-Notwithstanding anything contrary in other sections of this Act, the offences under sections 32, 33, 34, 37, 38 and 40 of this Act may be tried after incorporating in the schedule of the Mobile Court Act, 2009 (Act no. 59 of 2009).

Tenth Chapter

Miscellaneous

48. Delegation of Powers.- The Government may delegate any power or duty under this Act, on specific condition to the Executive Director or to any of its or Authority's officers.

49. Power to make Rules.-The Government may for carrying out the purposes of this Act, by notification in the official gazette, make rules.

50. Power to make Regulations.-The Authority, with pre-approval from the Government, may for carrying out the purposes of this Act, by notification in the official gazette, make regulations consistent with this Act or rules.

51. Publication of English translated text.-(1) Government shall, after the commencement of this Act, by notification in the official Gazette, publish an authentic English translation of this Act.

(2) In the case of any conflict between this Act and the English text, this Act shall prevail.

Statement of object and reason

Appendix 2

Metrorail Rules

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF ROAD TRANSPORT AND BRIDGE
ROADS TRANSPORT AND HIGHWAYS DEPARTMENT
NOTIFICATION

Date, the ----- May, 2015

No. S.R.O –L/2015- In exercise of the powers conferred by section 49 of the Metrorail Act, 2015 (Act No. 01 of 2015) the Government makes the following rules, namely:-

Chapter I
Preliminary

1. **Short title.**- These rules may be called the Metrorail General Rules, 2015.
2. **Definitions.**- In these rules, unless the context otherwise requires,-
 - (a) “Law” means Metrorail Act, 2015 (Act No. 01 of 2015);
 - (b) “License” means license defined under section 2 (17) of the Act;
 - (c) “Propulsion system” means in case of electrically- driven system, whether the power is provided with direct current (DC) or

alternate current (AC), and standard voltage of the power distribution;

(d) “Gauge” means the shortest distance between rail heads when measured within 16 mm from rail head surfaces;

(e) “Planned route” means beginning and end of the route and primary locations on the route;

(f) “Authority” means the Authority defined under section 2 (3) of the Act;

(g) “Authority’s Standards” means the technical standards issued by the Authority as specified in sub-section (2) of section 15 of the Act;

(h) “Conventional Metrorail Transit System” means a rail based electrified rapid transit system running on a dedicated right of way with rail track;

(i) “Minor Alteration” means relatively small alteration or revision of-

(1) Construction plan;

(2) Metrorail facility being used for Metrorail operation; or

(3) Rolling stock authorized by the Authority as prescribed in rules 47, 48 and 49 respectively;

(j) “ATP (Automatic Train Protection)” means a train protection system installed in the rolling in order to prevent collisions through a driver failure to observe the signal and speed restrictions.

- (K) “ATC (Automatic Train Control)” means a train protection system for Metrorail that involves some sort of speed control mechanism in response to external inputs;
- (l) “ATO (Automatic Train Operation)” means an operational safety enhancement device used to help automate operations of trains;
- (m) “Selection Committee” means the committee as specified in sub-section (1) of section 11 of the Act;
- (n) “Fare Assessment Committee” means the Fare Assessment Committee as specified in sub-section (1) of section 18 of the Act;
- (o) “Fare Products” means any fare scheme for enabling certain users, as may be specified by the licensee, to travel by Metrorail at discount fare;
- (p) “Track alignment drawing” means the track alignment drawing specified in rule 24;
- (q) “Exceptionally-authorized specification” means the approved standard under sub-rule (2) of rule 27.
- (r) “Rolling stock” means electric cars for passenger transportation and special kinds of cars (which means track testing cars, electric testing cars, accident relief cars and cars with other special structures or equipment) that are used for the railways business.
- (s) “Suspended Transit System” means a monorail system using wheels to run on a single elevated rail with the vehicles (rolling stock) suspended below;

(t) “Straddled Transit System” means a monorail system using wheels to run on a single rail with the vehicles (rolling stock) straddling a narrow guide way;

(u) “Levitation Transit System” means a transit system with the vehicles being levitated by electromagnets, etc. and propelled by a linear motor;

(v) “Guide-rail Transit System” means a transit system with rubber-tired vehicles (rolling stock) running along a guide way;

Chapter II

License

- 3. Formation of Selection Committee.-** For the purpose of issuing and renewal of license under sub-section (1) of section 11 of Act, the Government by Gazette notification, shall constitute following Selection Committee headed by the Executive Director with not more than 6 (six) officers from the Authority and the Government-
- (a) Executive Director, Dhaka Transport Co-ordination Authority (DTCA), who shall also be the Chairman of this Selection Committee;
 - (b) An officer of Joint-Secretary status from Roads and Highway department;
 - (c) An officer of Joint-Secretary status from Finance department;
 - (d) Additional Chief Engineer (Mechanical/Civil) from Roads and Highway department;
 - (e) An officer of Deputy-Secretary status from Legislative and Parliament Department;
 - (f) An officer from Railway who has minimum status as a Deputy-Secretary or Director;
 - (g) An officer from Authority who has minimum status as a Deputy-Secretary or Director and he shall also be the member secretary of the Selection Committee:

However, nothing in this rules shall obstruct from nominating any 6 (six) officers from the Authority and the Government as member of the Selection Committee.

4. **Application for license.**-(1) An applicant shall apply to the Authority for obtaining license by stating the following-

- (a) name and address of the applicant and his representative
- (b) detailed description of the area where the applicant is to establish, develop, operate Metrorail system or conducting any construction activity of that system;
- (c) scope of Metrorail business;
- (d) desired period of operation as may be in the license under sub-section (3) of rule 7;
- (e) business plan that specifies-
 - (i) type of Metrorail system specified in rule 21;
 - (ii) salient features of Metrorail system specified in rule 22;
 - (iii) maximum design speed;
 - (iv) designed transportation capability per day; and
 - (v) station locations and names.

(2) The following documents shall be attached with the application for license, namely:-

- (a) necessary documents regarding financial ability of the business for establishment, development, operation of Metrorail system and conducting any construction activity of that system specified in rule 23;
 - (b) planned schedule to open Metrorail service to public;
 - (c) proposed route alignment as specified in rule 24;
 - (d) a copy of approved Environmental Impact Assessment (EIA) report, if necessary;
 - (e) documents which describe that the applicant does not meet cause of disqualification specified rule 8;
 - (f) type and brief outlines of other by-business, if any; and
 - (g) a copy of the bank draft or pay order of the prescribed license fee for application of license
- (3) The following documents shall be attached with the application for license if the applicant is a legal person, namely:-
- (a) a copy of the certificate of incorporation regarding registration of the applicant;
 - (b) a copy of the up to date trade license; and
 - (c) a copy of the national identity card of the directors of the applicant.

- (4) The following documents shall be attached with the application for license if the applicant is a person who will form a new legal person, namely:-
- (a) a copy of the Memorandum of Association or the Articles of the Association;
 - (b) a list of the members of the association; and
 - (c) a copy of the national identity card of the Directors of the association.
- (5) The following documents shall be attached with the application for license if the applicant is a person except sub-section (4), namely:-
- (a) a list of the immovable and movable properties of the applicant; and
 - (b) a copy of the national identity card of the applicant.
- (6) The Authority may direct the applicant to submit other necessary documents in addition to the documents specified in sub-section (2) and sub-section (3)-(5) on the basis of requirement.
- (7) An applicant shall apply to the Authority for obtaining license according to license application form 'A'

5. Procedures to examine the application for a license.-(1) When an application is submitted following the provisions of the rules 4, the Authority shall send the application to the Selection Committee to scrutinize the information mentioned in and documents attached to the application.

(2) The Selection Committee shall within 60 (sixty) working days inspect the place mentioned in the application on obtaining the application under sub-rule (1) and on scrutinizing the information and documents obtained and inquiring in details shall submit the recommendation to the Government regarding granting license and the Government on considering the recommendation, this rules and relevant matters shall give decision to grant or reject the license.

6. Recommendation by The Selection Committee.-(1) Recommendation under sub-rule (2) of rule 5 submitted by the Selection Committee shall consider the following-

- (a) financial standing of the business plan;
- (b) safety of transportation;
- (c) adequacy of environmental safeguard;
- (d) adequacy of the business plan on any other matters to soundly operate Metrorail service;

(e) ability to maintain an adequate and satisfactory Metrorail service;

(f) the applicant is not disqualified for the causes specified in rule 8.

(2) Clause (a) of sub-section (1) may be omitted if the applicant intends to limit the operation period under sub-section (3) of rule 7.

7. Issue of License.- (1) If decision is taken under sub-section (2) of rule 5 to grant license the Government shall within 90 (ninety) working days issue license in favour of the applicant or if the decision is taken to reject the license, shall inform it to the applicant stating reason.

(2) The Government shall issue license according to form “B” on the basis of route and scope of Metrorail business.

(3) Period of license shall be 25 (twenty five) years. But the Government may issue license by specifying the period not more than 25 years in the license to meet the temporary needs of the Metrorail service.

8. Cause of Disqualification.- The causes for disqualification in obtaining license are as follows:-

- (a) any company or person whose license has been cancelled and 2 (two) years have not been elapsed from the date of such cancellation; or
- (b) any company whose any member of board of directors or officer falls or any person who falls under any of the following disqualifications:-
 - (i) has been, on conviction for a criminal offence involving moral turpitude, sentenced to imprisonment for a term of not less than two years, unless a period of five years has elapsed since his release;
 - (ii) is an undischarged insolvent.

9. Amendment of condition of license.- (1) Any condition consistent with the provisions of the Act and rules shall be mentioned by the Government in the license and additional conditions also may be attached on a special situation.

(2) On written application of the licensee, the Government may amend the conditions of license such as, period, scope of Metrorail business, name-address etc.

(3) On obtaining the application under sub-rule (2), the Government shall examine the application on the points of view under rule 6 and decide the amendment of the condition of license granted or non-granted. If the decision of granting amendment is accepted, the

Government shall issue license amended to the licensee within 90 (ninety) working days.

10. Application for amendment.- (1) An application for amendment of the condition of the license shall be submitted to the Government stating in the application-

- (a) name and address of the applicant
- (b) proposed alteration (the difference between before and after such alteration(s) shall be illustrated); and
- (c) the reason to alteration.

(2) On any change in business plan, concerning documents specified in sub-section (2) of rule 4 shall be included with the application under sub-section (1).

11. Transfer of license.-(1) Application for the transfer of License shall not submitted if 10 (ten) years not passed from the date of License issued.

(2) The applicants who intend to transfer or to receive license, pursuant to section 10 of the Act, shall submit to the Authority an application with signatures of all concerned parties, which specifies-

- (a) name and address of the applicant and his representative of all concerned parties;
- (b) the route of the license to be transferred;

- (c) price to transfer of license;
- (d) desired date to transfer of license; and
- (e) reasons for transfer of license.

(3) Following documents shall be attached to the application under sub rule (2):-

- (a) a draft copy of the contract to the license to be transferred;
- (b) detail explanation of the price to transfer of license, total amount of funds to pay the price and financing programme; and
- (c) documents specified in clauses (e) and (f) of sub-section (2) and sub-section (3), (4) or (5) of rule 4, if the acceptor does not have a license of Metrorail business.

(4) The Authority on receiving the application for transfer of license under sub-rule (2) shall send it to the Selection Committee for assessment and if, in the opinion of the Selection Committee, the acceptor satisfied the requirements specified in rule 6, the Selection Committee shall submit recommendation to the Government to that effect and upon receipt of the recommendation, the Government shall permit the transfer of license.

12. Suspension or cancelation of license.-(1) The Authority may report to the Selection committee for suspension of Metrorail operation by setting the period or to rescind the license if the licensee falls under any of the following-

- (a) If the Authority approve cancelation of Metrorail operation upon receipt of application form the licensee pursuant to rule 14;
- (b) If the licensee violates the orders of the Authority under rule 25 or the dispositions in exercise of these orders, or the conditions attached to the license or the approval;
- (c) If the licensee fails to perform the matters to which the license or approval was granted without a justifiable ground;
- (d) If the licensee falls under any of the disqualifications specified in rule 8;

(2) On getting the report under sub-rule (1), if the Selection committee seems that it is reasonable that the license should be suspended or cancelled in such a case it shall submit recommendation to the Government to this effect and on getting such recommendation the Government shall suspend or cancel the license.

13. Notification for suspension by operator.- (1) When the licensee intends to suspend the whole or part of Metrorail operation, he/she shall notify the Authority minimum 30 (Thirty) days before.

(2) The period of the suspension sub-rule (1) shall not exceed 1 (one) year.

(3) The Licensee shall receive pre-approval of restart of the Metrorail operation canceled under sub-rule (1) by notifying the Authority the date of restart and the Authority can grant pre-approval of restart of Metrorail operation by prescribed process subject to Act and this Rules.

14. Notification for cancelation by operator.-(1) The licensee should continue Metrorail operation till his license is canceled.

(2) Any licensee who intends to cancel the whole or part of Metrorail operation, shall submit to the Authority an application which specifies-

(a) name and address of the applicant;

(b) the route and the scope of Metrorail operation to terminate and reasons behind the termination; and

(c) desired date of cancelation.

(3) The Authority shall consider the opinions of local Governments concerned and interested persons with respect to securing the

convenience of the public in the event of cancellation under sub-rule (2).

(4) The Authority shall send to the Selection Committee the application received under sub-rule (2) and the opinions collected under sub-rule (3) and If, in the opinion of the Selection Committee, there is no risk of impairment for the convenience of public, the Selection committee shall submit recommendation to the Government to that effect and upon receipt of such recommendation, the Government shall notify the date of cancellation to the licensee in advance and cancel the license on the specified date.

15. Application for renewal of License- (1) Prior to 90 (ninety) days of the expiry of the period of license specified in sub-section (3) of rule 7 application for renewal shall be made to the Authority with the fee undersub-rule (3) in Form 'C'

(2) The following documents shall be included with application for renewal of license, such as;-

(a) revenues and expenditures for the existing period and renewal period of license with the basis of such estimate;

(b) cash flow for the existing period and renewal period of license;

- (c) copy of existing license;
- (d) update trade license copy; and
- (e) copy of bank draft or pay order of determined renewal fee.

(3) Subject to the provision of the Act, the application for renewal shall not be accepted unless bank draft or pay order receipt has not been attached with the application on reimbursement 5% or in applicable case 10% license fee specified in rule 17 through bank draft or pay order from any Authority's favored scheduled bank.

(4) Failing to renew a license within the period specified in the license an application can be submitted within 3 (three) months from the expiry of the period by paying 10% of the license fee.

16. Renewal of license.-(1) The provision of rule 5 to 7 shall be applicable for processing the application for renewal of license.

(2) The Government shall be vested with the power to issue a renewed license under rule 7.

17. License fee.- Subject to the provision of the Act, no application for establishment, operation and maintenance of Metrorail be accepted unless bank draft or pay order receipt has not been attached with the

application on reimbursement taka 2,000,000,000 (two hundred crore) as license fee through bank draft or pay order from any Authority's favored scheduled bank.

18. License Re-issue Fee.-The application for under sub-section (3) of Rule 20, re-issue of license shall not be accepted unless treasury receipt has not been attached with the application on reimbursement 2% of the license fee specified in Rule 17 through bank draft or pay order from any Authority's favored scheduled bank.

19. Re-fundability of License Fee, Renewal Fee, Re-issue Fee.- If the application for license or renewal or re-issue under rule 15(3) or rule 17 or rule 18 respectively is disallowed, the Authority in a prescribed process, shall be liable to refund the money deposited for the Authority by bank draft or pay order corresponding to that application within 3 (three) months from the date of disallowance.

However, no interest of dividend attained from that money shall be offered.

20. License Preservation and Display.- (1) The Government shall preserve a printed version of the license issued by it and any person or authority may inspect or obtain a photocopy of the version by paying Taka 500 (Five Hundred).

(2) Licensee shall properly preserve the license and notify the Government immediately if by any reason license get lost, ruined or damaged.

(3) After notifying the Government immediately regarding the ruined or damaged license under sub-section (2), Licensee shall apply to the Government for Reissue of License according to the application form 'D'.

(4) The licensee shall hang a binding copy of the License on the wall of his Board room of Head office and shall be bound to show the original copy of the License to Executive Director or any person authorized by him or inspector.

21. Type of Metrorail System.-Type of Metrorail system shall include-

- a) Ordinary Metrorail system (running on rail track);
- b) Suspended transit system;
- c) Straddled transit system;
- d) Guide-rail transit system;
- e) Levitation transit system; and
- f) Any other urban mass transit systems.

22. Salient Features of Metrorail System.-Salient features of Metrorail system shall include-

- (a) single or double track;

(b) propulsion system; and

(c) gauge.

23. Necessary Documents Regarding Financial Ability.-Necessary documents regarding financial ability shall include -

- (a) an estimate of revenues and expenditures with the basis of such estimate;
- (b) an estimate of construction costs;
- (c) total amount of funds, financing programmes, and procurement of land and properties required to initiate construction;
- (d) an estimate of cash flow;
- (e) a balance sheet of the preceding fiscal year;

24. Route Alignment Drawing.-Route alignment drawing shall include vertical alignment drawings along with specification of schedule 1.

25. Order to improve Metrorail business.- If , in the opinion of the Authority, the licensee fails or likely to fail to operate adequate, safe and satisfactory Metrorail system and service, upon consideration of the recommendations of the report by an inspector,the Authority may order-

- (a) adjustment of fares;
- (b) alteration of train operation schemes;

- (c) improvement of the construction method of Metrorail facilities, structure of Metrorail facilities or rolling stocks, or the operation of trains;
- (d) to make measures to secure safety and smooth transportation of passengers;
- (e) to upgrade insurance to cover any losses and damages associated with Metrorail service.

Chapter III

Right to Entry

26. Restriction to right to entry.-(1) the restrictions under section 13 of the Act shall include -

- (a) permission of the Authority;
- (b) pre-notification to the owner; and
- (c) compensation for the loss to the owner who suffered the loss.

(2) A licensee who intends to obtain the permission under clause (a) of sub-section (1) shall submit to the Authority an application including—

- (a) name and address of the applicant;
- (b) detail descriptions of the area where the applicant intends to enter; and

- (c) activities that the applicant intends to do in the area
- (3) The Authority may permit right to entry of the applicant if he/she recognizes that it is necessary for the applicant to enter the area described in sub-section (2) to accomplish activities of Metrorail business described under clause (c) of that sub-section.
 - (4) The loss to be compensated under clause (c) of sub-section (1) shall be the loss which originates from the permitted activities carried out in the related land and establishment.
 - (5) The compensation for the loss under clause (c) of sub-section (1) shall be determined by negotiation between the parties. In the case an agreement is not made through the negotiation or the negotiation is not feasible, any of the parties may apply for a ruling by the Authority.
 - (6) When the Authority received an application for a ruling by one party pursuant to sub-section (5), he/she shall notify the other party of to that effect and give the said party an opportunity to submit a written answer, by designating the period for submission.
 - (7) When the Authority made a ruling of sub-section (5), he/she shall notify the parties of to that effect without delay.
 - (8) In the case of a ruling ordering the compensation, the ruling shall set forth the amount of compensation and the time and method of the payment.

- (9) The party that is not satisfied with the amount of compensation in the ruling referred to in sub-section (5) may, within 30 (thirty) days from the date when the party is notified of the ruling, file an appeal to the Government.
- (10) The Government shall form an Appellate committee consisting 3 (three) members for the settlement of the appeal filed under sub-section (9) and this Appellate committee shall decide the process of appeal hearing.
- (11) Appellate committee can install or change the Authority's decision and decision of Appellate committee shall be conclusive regarding compensation.

Chapter IV
TECHNICAL APPROVAL

27. Permission for Alteration from Authority's Standards.-(1) Any licensee to obtain the permission specified in sub-section (3) of section 15 of the Act shall submit the application to the Authority specifying the following items:

- (a) name and address of the applicant;
- (b) subject and areas of alteration;
- (c) reasons for such alteration; and
- (d) surety regarding that the alteration shall not impair safety.

(2) The Authority shall give the permission to the applicant if the alteration from Authority's Standards stated in the application is unpreventable.

28. Approval of construction plan of Metrorail Facility.-(1) Any licensee shall, prior to the commencement of construction works of Metrorail facility, obtain approval of construction plan of Metrorail facility from the Authority.

(2) Any licensee to obtain approval under sub-rule (1) shall submit applications specified in rule 30 to the Authority.

(3) The Authority shall approve the application under sub- rule (2) within no more than 90 (ninety) working days if the construction plan has conformity with the business plan and Authority's Standards or Exceptionally-authorized specification.

29. Metrorail Facility.-Metrorail Facility shall include-

- (a) infrastructures and tracks;
- (b) stations;
- (c) depots and maintenance system;
- (d) operation safety facilities;
- (e) substation and other facilities; and
- (f) electric line facilities.

30. Application for approval of construction plan.-(1) Application form for approval of construction plan shall include -

- (a) name and address of the applicant;
- (b) beginning and end of the section to execute construction works;
- (c) construction plan specified in rule 31;

(2) Application forms under sub-rule (1) shall enclose the following documents and drawings -

- (a) the documents and drawings as listed in the Schedule 2 by type of Metrorail facility;
- (b) track alignment drawings and soil profile drawings for track works;
- (c) cost estimate;
- (d) Date of commencement and completion of construction;
- (e) agreement or acceptance to allow the Metrorail transit facility to cross or connect with the interfaced Metrorail or other railways.

(3) Any licensee to apply for approval of construction plan may submit the applications separately to the Authority, provided, however, the applicant shall –

- (a) indicate all the items listed in sub-rule(1);
- (b) describe the reasons to separate the applications;
- (c) enclose the documents and drawings as specified in sub-rule (2), and;
- (d) enclose the documents and drawings showing brief outlines of the remaining construction works.

31. Construction plan.–The construction plan shall include the items listed in Schedule 2 by type of Metrorail facility and any difference in

items by section or location of Metrorail route shall be reported separately.

32. Track alignment drawing.- The track alignment drawings shall be the following two with the specifications of Schedule 3:

- (a) Horizontal drawings; and
- (b) Vertical drawings.

33. Alteration of construction plan.-(1) Except the case of minor alteration, the licensee shall take approval of the Authority to alter the construction plan of Metrorail facility and in such a case the provisions of sub-rule (3) of rule 28 shall apply.

(2) The licensee shall inform the Authority about the occurrence of any minor alteration through notice.

34. Application for Alteration of construction plan.-(1) Any licensee to alter the approved construction plan shall submit the application to the Authority which shall specify –

- (a) name and address of the applicant;
- (b) proposed alteration; and
- (c) reasons for such alteration.

(2) Application under sub-rule (1) shall enclose the documents and drawings specified in sub-rule (2) of rule 30 with necessary revision to fit the alteration in the construction plan of Metrorail facility.

35. Notification of minor alteration of construction plan.-(1) The minor alteration as specified in sub-rule (1) of Rule 33 shall be as such listed in Schedule 4 by type of Metrorail Facility.

(2) Any licensee to make minor alteration under sub-rule (1) shall submit notification to the Authority which shall specify -

- (a) name and address of the applicant; and
- (b) Proposed alteration.

(3) Provisions of sub-rule (2) of rule 34 shall apply to the notification under sub-rule (1).

36. Approval of completion of construction works.- (1) Any licensee to complete the construction works shall, prior to the period specified in rule 38, obtain approval of the Authority.

(2) Any licensee to obtain approval under sub-rule (1) shall submit applications specified in rule 39 to the Authority.

(3) The Authority on receiving application under sub-rule (2) shall appoint an Inspector under section 21 of the Act and direct him to inspect under section 22 of the Act.

37. The report of the Inspector and approval of the Authority.-(1)

The Inspector shall submit report to the Authority specifying the following:

- (a) conformity to the approved construction plan;
- (b) conformity to Authority's Standards or Exceptionally-authorized specification; and
- (c) matter prescribed in clause (d) of sub-rule (1) of rule 27.

(2) The Authority shall, upon confirmation of the conformity as specified in sub-rule (1) and appropriateness to use Metrorail facility or open it to Metrorail service, approve the completion of construction works.

38. Inspection areas and period.-On completion of works inspection of Metrorail facility shall be undertaken in which areas and period specified as follows:

- (a) In case of substations and auxiliary facilities except for transformers of power receiving and switching stations located out of Metrorail area and electric line facilities except for power transmission lines located out of Metrorail area— before power-on;

(b) In case of Metrorail facility other than substations and auxiliary facilities described in clause (a) – before upon commencement of use for Metrorail service.

39. Application for Approval of completion of construction works.-

Application form for approval of completion of construction works shall include -

- (a) name and address of the applicant;
- (b) Metrorail Facility to be inspected;
- (c) completion date of construction works of Metrorail facility;
- (d) desired date of taking inspection;
- (e) power-on date of Metrorail facility as specified in clause (a) of rule 38; and
- (f) commencement date of using Metrorail facility for Metrorail service as specified in clause(b) of rule 38.

40. Preparation for taking inspection.-Any licensee to take inspection on completion of works of Metrorail facility shall make necessary preparations as instructed by the Authority.

41. Approval of construction plan for alteration of existing Metrorail facility.-(1) Except in the case of minor alteration, any licensee to alter existing Metrorail facility shall prepare a construction

plan relating to the said alteration pursuant to the following provisions, and obtain approval of the Authority prior to the commencement of such works.

(2) Any licensee to make any of the minor alteration of existing Metrorail facility shall notify the Authority to that effect.

(3) The Authority shall, upon confirmation of the conformity to the Business Plan of the licensee and Authority's Standards or exceptionally-authorized specification, approve the construction plan.

(4) The provision from rules 33 to 35 shall apply to the approval of the alterations of the construction plan which has already been approved or notified pursuant to sub-rule (1) to (3).

42. Application for approval of construction plan for alteration of existing Metrorail facility.-(1) Any licensee to apply for approval of the construction plan for alteration of existing Metrorail facility shall submit the application to the Authority which shall specify -

- (a) name and address of the applicant;
- (b) construction plan for alteration of existing Metrorail facility;
- and
- (c) reasons for such alteration.

(2) The application specified in sub-rule (1) shall enclose the documents and drawings subject to necessary alteration as specified under sub-rule (2) of rule 30.

(3) Any licensee to apply for approval of construction plan for alteration of existing Metrorail facility may submit the applications separately to the Authority, provided, however, the applicant shall –

- (a) indicate all the items listed in sub-rule (1);
- (b) describe the reasons to separate the applications;
- (c) enclose the documents and drawings as specified in sub-rule (2), and;
- (d) enclose the documents and drawings showing brief outlines of the remaining construction works.

(4) The construction plans specified in sub-rule (1) shall include the items listed in Schedule 2 by type of Metrorail facility and any difference in items by section or location of Metrorail route shall be reported separately.

43. Notification of minor alteration of existing Metrorail facility-(1)

The minor alteration as specified in sub-rule (1) of Rule 41 shall be as such listed in Schedule 4 by type of Metrorail Facility.

(2) Any licensee to make minor alteration under sub-rule (1) shall submit notification to the Authority which shall specify -

- (a) name and address of the applicant;
- (b) proposed alteration, documents and drawings (or documents for any demolition) of Metrorail facility shall illustrate the difference between before and after such alteration.

(3) Provisions of sub-rule (2) of rule 34 shall apply to the notification under sub-rule (1)

44. Approval of completion of alternation of existing Metrorail facility.-(1) Any licensee to complete construction works for any alteration of Metrorail facility listed in the Schedule 5 shall, prior to the period specified in rule 38, obtain approval of the Authority.

(2) Any licensee to obtain approval under sub-rule (1) shall submit applications specified in rule 39 to the Authority.

(3) The Authority shall, upon receipt of the application under sub-rule (2), assess and in an appropriate case approve it.

(4) Provisions of sub-rule (3) of rules 36, rule 37 and rule 40 shall apply to assessment specified in sub-rule (3).

45. Approval of structure of rolling stock.-(1) Any licensee to use rolling stock for delivering Metrorail service shall obtain approval of structure of rolling stock from Authority prior to the commencement of use.

(2) The Authority shall, upon confirmation of conformity to Authority's Standards or exceptionally-authorized specification, approve structure of rolling stock.

(3) The licensee to alter structure or device of rolling stock for delivering Metrorail service that was once approved under sub-rule (1) shall obtain approval from the Authority, except for the case of minor alteration as specified in rule 49.

(4) The licensee to make any minor alteration to the rolling stock under sub-rule (3) shall notify the Authority in advance.

46. Manner of giving approval of structure of rolling stock.-(1) The licensee shall apply to the Authority for approval of Rolling Stock and the Authority shall assess the application through the documents and drawings submitted by the licensee.

(2) The Authority shall approve the application under sub-rule (1).

(a) Movement the route of Rolling Stock as per section; and

(b) Separately different structures and devices of Rolling Stock under clause (c) of sub-section (1) of Rule 47.

47. Application for approval of structure of rolling stock.-(1) Except in the cases of sub-rules (2), any licensee to obtain approval of structure

of rolling stock shall submit the application to the Authority which shall specify -

- (a) name and address of the applicant;
- (b) section of route to use the rolling stock;
- (c) type and code of rolling stock; and
- (d) structure and device by type of rolling stock facility stated in the Schedule 6.

(2) Any licensee to obtain approval under sub-rule (3) of Rule 45 for the use of once approved rolling stock in a different section of route for delivering Metrorail service shall submit the application to the Authority which shall specify -

- (a) name and address of the applicant;
- (b) section of route to use the rolling stock;
- (c) type and code of rolling stock; and
- (d) proposed alteration in structure or device, if any (illustrating the difference before and after such alteration in the documents and drawings).

(3) The application under sub-rule (1) and (2) shall attach the following documents and drawings:

- (a) drawing indicating the relationship between the floor of rolling stock or boarding steps and the platform;

- (b) drawing indicating the relationship between wheels and turnout;
- (c) calculation sheet of braking efficiency in case of new or alteration; and
- (d) document and drawing indicating the relationship between on-board and wayside devices of ATP, ATC, and ATO system.

48. Application for approval of alteration of structure or device of rolling stock.-(1) Any licensee to alter structure or device of rolling stock pursuant to sub-rule (3) of rule 45 shall submit the application to the Authority which shall specify-

- (a) name and address of the applicant;
- (b) type and code of rolling stock; and
- (c) proposed alteration indicating the difference between before and after such alteration.

(2) The application under sub-rule (1) shall enclose the concerned documents and drawings, from the list specified in sub-rule (3) of rule 47, with the alteration in the structure or device.

49. Notification of alteration of structure or device of rolling stock.-

(1) The minor alteration as specified in sub-rule (3) of Rule 45 shall be as such listed in Schedule 7 by type of rolling stock device.

(2) Any licensee to make minor alteration under sub-rule (1) shall submit the notification to the Authority which shall specify -

- (a) name and address of the applicant;
- (b) type and code of rolling stock; and
- (c) Proposed alteration.

(3) The application under sub-rule (2) shall enclose the concerned documents and drawings of the list specified in sub-rule (3) of Rule 47, together with the proposed alteration.

50. Approval of train operation plan or alteration of plan.-(1) Any licensee to deliver Metrorail service shall, prior to the commencement of Metrorail service, obtain approval of train operation plan or alteration alteration of the same.

(2) The Authority shall, upon confirmation of the conformity to the following criteria, approve train operation plan or alteration of the same-

- (a) the plan has no safety concerns; and
- (b) the plan is appropriate to execute the business plan of the licensee.

51. Application for approval of train operation plan or alteration of plan.-(1) Any licensee to determine or alter the train operation plan shall submit the application to the Authority which shall specify -

- (a) name and address of the applicant;
- (b) section of route to apply the determined or altered train operation plan;
- (c) the following items about the determined or altered train operation plan
 - (i) maximum travel speed;
 - (ii) arrival and departure time of the scheduled trains with a train operation diagram;
 - (iii) maximum number of trains in operation per hour;and
- (d) date of implementation.

(2) The application under sub-rule (1) shall enclose the documents and drawings specified in Schedule 8.

(3) The maximum travel speed shall indicate the information specified in Schedule 8.

52. Determination of safety management system.-(1) Any licensee shall set forth the Safety Management System and notify the Authority in writing and the same shall apply for any alteration of the Safety Management System.

(2) Safety Management System shall set forth and comply with the code of practice, in respect to the matters listed in the following and prescribing the items listed in the Schedule 9-

- (a) policy of Metrorail operation in order to secure the safety of transportation;
- (b) organizational system for the execution of Metrorail operation and its management structure in order to secure the safety of transportation;
- (c) method for the execution of Metrorail operation and its management scheme in order to secure the safety of transportation;
- (d) appointment of Safety Manager, a person appointed by the licensee to manage the activities of clause (a)-(c) and be in a position to make managerial decisions in relation to mass rapid transit operation and who meet the specified qualifications such as sufficient hands-on experience and other requirements prescribed in rule 54;
- (e) appointment of Operations Manager a person appointed by the licensee who meet the specified qualifications such as sufficient hands-on experience and other requirements prescribed in rule 55 and in the position to manage operation of trains, maintain the capacities of train operation crews and

perform other matters concerning operation of trains listed in clause (b) and (c).

(3) Under sub-rule (2), related all shall be followed to determine the Code of Practice with licensee.

(4) If, in the opinion of the Authority, the Safety Management System does not conform to the provision of sub-rule (2) or regulations specified by the Authority, the Authority may order the licensee to improve the Safety Management System.

(5) The licensee shall appoint Safety Manager and Operations Manager.

(6) Upon appointment or dismissal of Safety Manager or Operations Manager, the licensee shall notify the Authority in writing without delay pursuant to the provision of Rule 56.

(7) The licensee shall pay due attention to the opinion of Safety Manager in performing his duties to ensure safety of transportation.

(8) The Authority may order the licensee to dismiss Safety Manager or Operations Manager, provided that the said Safety Manager or Operation Manager has neglected their duties and it may extremely hinder safety of transportation.

53. Application for Determination of safety management system.-(1)

Any licensee to determine the safety management system shall submit the application to the Authority which shall specify -

- (a) name and address of the applicant; and
- (b) date of implementation;

(2) The application specified in sub-rule (1) shall enclose the following documents:

- (a) safety management system; and
- (b) documents prescribing other necessary items as specified in the System.

(3) The licensee to determine the safety management system shall submit the application as specified hereunder by type of Metrorail business by the specified date-

- (a) Licensee to construct Metrorail facility – the date of application for approval of the first construction plan of Metrorail facility as specified under rule 30;
- (b) Licensee to manufacture new rolling stocks – the date of application for approval of the first structural design of rolling stock as specified under rule 47;
- (c) Licensee to provide Metrorail operation – the date of application for approval of the first train operation plan as specified under rule 51.

(4) Any licensee to make any alteration in the approved safety management system shall, by the date of enforcing the revised safety management system, submit the application to the Authority which shall specify -

- (a) name and address of the applicant;
- (b) date of enforcement; and
- (c) reasons for such alteration.

(5) The application under sub-rule (4) shall enclose the following documents-

- (a) revised safety management system;
- (b) a table illustrating the difference between before and after such alteration; and
- (c) other documents prescribing the necessary items as determined in the revised safety management system.

54. Qualifications of Safety Manager.-Qualifications of Safety Manager shall include the following requirements:

- (a) a person having sufficient knowledge to perform the safety management tasks;
- (b) a person having a power to administrate the safety management works in the organization of the licensee; and

- (c) A person except for those dismissed by the order under sub-rule (8) of Rule 52 within the last 2 years.

55. Qualifications of Operations Manager.-Qualification of the Operations Manager shall satisfy the following requirements:

- (a) a person having sufficient knowledge to perform the Metrorail Operation activities;
- (b) a person having a power to administer train operation, preservation of drivers' capacities, and other works related to train driving as listed in clauses (b) and (c) of sub-rule (2) of rule 52; and
- (c) A person except for those dismissed by the order under sub-rule (8) of rule 52 within the last 2 years.

56. Appointment and dismissal of Safety Manager and Operations Manager.-(1) Any licensee to appoint or dismiss Safety Manager or Operations Manager shall submit the application to the Authority which shall specify -

- (a) name and address of the applicant;
- (b) name of the appointed or dismissed Safety Manager or Operations Manager;
- (c) date of appointment or dismissal; and
- (d) reasons for dismissal.

(2) The application under sub-rule (1) shall enclose the documents by type of submission as specified in the corresponding sub-sections:

(a) Appointment of substitute Safety Manager – the documents to certify that the selected person is in the managerial position for Metrorail service and satisfies the qualifications as specified in rule 54.

(b) Appointment of substitute Operations Manager – the documents to certify that the selected person satisfies the qualifications as specified in rule 55.

57. Driver Instruction Manager.-(1) Licensee to deliver Metrorail service shall appoint a Driver Instruction Manager at each driver's office for the purpose to assist the works of the Operations Manager for maintenance and enhancement of the drivers' fitness, knowledge, skills, and other qualifications.

(2) The Driver Instruction Manager shall assist the works of Operations Manager and make best efforts to maintain qualifications of train drivers.

Chapter V

Fare

58. Qualifications of members of Fare Assessment Committee:-

Members other than Executive Director of the Fare Assessment Committee shall have the following qualifications-

- a) Minimum of one year of working experience in any work related to mass transportation.
- b) Working experiences in Republic employment or in any association related to mass transportation.
- c) Has not been convicted of any criminal offense involving moral turpitude or has not been declares as a loan defaulter by any competent court.
- d) Citizen of Bangladesh, or permanent resident of Bangladesh, or domicile of Bangladesh.

59. Recommendation of the Fare Assessment Committee.- (1) The

Fare Assessment Committee shall at least once in a year on reviewing the rate of existing highest and lowest fare to be paid by the passengers submit its recommendation to the Government.

(2) In case of assessment for recommendation of the fare rate of Metrorail, on observing the provision of sub-section (2) of section 18 of the Act, the Fare Assessment Committee may consider the following-

- (a) social equity and payable price for public;
- (b) to continue sustainable Metrorail service under appropriate cost and benefit for the highest fare rate; and
- (c) to ensure sound competition with other public transportation for the lowest fare rate.

(3) Highest and lowest fare rate of the fare of Metrorail service shall be set on categories of -

- (a) route and riding distance; and
- (b) adults, children, aged persons and disabled persons.

(4) Fare Assessment Committee shall take its decision in accordance with the opinion of the majority of its members.

60. Determination of fare.- (1) The Government shall immediately send to the Authority his/her directives about the highest and lowest fare rate according to the recommendation of the Fare Assessment Committee.

(2) The Authority shall determine fare as normal fare between the highest and lowest fare rate of the directives from the Government.

61. Fare collection etc.-(1) The licensee may introduce some Fare Products. Fare Products shall be determined between the highest and lowest range determined by the Authority.

(2) Only the licensee or authorized person can collect fare specified sub-section (2) of rule 60 or fare products specified sub-section (1) from the passengers.

62. Application for review of fare.-(1) The licensee may apply for fare review of Metrorail service to the Fare Assessment Committee if it is necessary due to the radical inflation or price hike of commodity etc.

(2) The Fare Assessment Committee shall assess Metrorail fare pursuant to Rule 59 upon receipt of the application under sub-rule (1).

Chapter VI

Appeal etc.

63. Appellate Authority: (1) For the purpose of appeal by the aggrieved person under sub-section (2) of Section 24 of the Act, the Government shall constitute an Appellate Authority having following 5 (Five) members through gazette notification-

- a) A currently working or a retired Government officer of Secretary Status who has experience regarding Law, he shall also be the Chairman of the Appellate Authority;
- b) A Government officer of Joint Secretary Status;
- c) An officer of Joint Secretary Status from Roads and Highway department;
- d) A professor from Mechanical Engineering or Civil Engineering or Electrical Engineering faculty of Bangladesh University of Engineering and Technology (BUET) nominated by the vice Chancellor of that university; and
- e) An officer of Joint Secretary Status nominated by Director of Bangladesh Railway.

(2) The working period of the Chairman appointed under sub-section (1) shall be 4 (four) years and he shall be appointed for one time only.

(3) The Chairman can resign from his position through a signed letter addressed to the Government; and the Government can remove the Chairman anytime from his position if the Government perceives that the Chairman has become ineligible to remain in his position due to serious misconduct or due to physical or mental disability.

However noted that, under this sub-section the Chairman cannot be removed from his position without offering a reasonable opportunity for hearing.

64. Appeal: (1) Appeals filed against the order, given under Section 24 sub-section (1) of Act shall mention the reasons of objection briefly and clearly.

(2) Every appeal shall have the following document, such as-

- a) An authenticated copy of the order or instruction against which the appeal being done.
- b) Treasury receipt of depositing one thousand Taka on account of appeal fees as an evidence.
- c) Any other documents related to appeal.

65. Procedure Followed by Appellate Authority: (1) Appellate Authority shall assign a date for appeal hearing considering their office obligations and required time to issue notice to the Opposition.

(2) Appellate Authority, together with a copy of appeal shall send a notice to the Authority mentioning the date of appeal hearing.

(3) Appellate Authority can anytime call for all necessary documents and information from Appellant or Opposition for the settlement of the appeal.

66. Procedure during Appeal Hearing: (1) Appellant's statement in justification of his appeal shall be heard on the date fixed for hearing or on the following date if the hearing has been deferred.

(2) If the Appellant does not appear upon being called for appeal hearing on the date fixed for hearing or on the following date if the hearing has been deferred, the Appellate Authority may order to dismiss the appeal.

(3) Hearing of the appeal shall proceed unilaterally if the Appellant appears but the Opposition does not appear.

(4) After hearing from the parties or any one party, the Appellate Authority may approve, alter or cancel the discussed order, instruction or penalty.

(5) Appellate Authority shall settle an appeal within 30 (thirty) days of filing of the appeal.

(6) Appellate Authority shall record the logical reasons behind their decision and shall mention the remedy receivable by the Appellant.

(7) Copy of the order given by the Appellate Authority shall be sent to Appellant, Authority and the Government as early as possible.

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF ROAD TRANSPORT AND BRIDGE
ROADS TRANSPORT AND HIGHWAYS DEPARTMENT

Form-A

[Ref. Rule 4]

Application for License

1. Applicant Name:

Registration No:

Address:

Phone:

Fax:

Email:

2. Bank Draft or Pay Order no of Deposited License Fees (Not Applicable cases under Section 9 of Metrorail Act):

3. Description of Metrorail Area:

4. Description of Metrorail Business: (Metrorail system establish / development / operation or operation of any construction work of its establishment program/ offer Metrorail service or establish and operation of any equipment to do that):

5. The Period of Metrorail operation:

6. Business Plan-

- (a) type of Metrorail system;
- (b) salient features of Metrorail system, specifying-
 - (i) single or double rail track;
 - (ii) propulsion system;
 - (iii) gauge;
- (c) maximum design speed;
- (d) designed transport capacity per day;
- (e) station locations and names

*Applicant shall attach the documents described in sub-section (2) and sub-section (3)-(5) (on the basis of requirement) of rule 4 with this application.

Declaration

The information and Documents provided in the application form are accurate. I didn't submit any false information. If any false information or documents are proved incorrect I will be liable for legal prosecution.

Signature of the Officer authorized by Applicant

Seal

Date:.....Eng.
.....Ben.

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF
BANGLADESH
MINISTRY OF ROAD TRANSPORT AND BRIDGE
ROADS TRANSPORT AND HIGHWAYS DEPARTMENT

Form-B

[Ref. Rule 7]

Metrorail License

License No:
Date of Issue:
Date of Expire:
Date of Renewal:
Date of Expire of Renewed License:

1. Name of Licensee:
Company's Registration No:
Address:
Phone:
Fax:
Email:

2. Metrorail Route:
From ----- To----- and Through-----

3. Description of Metrorail Business: (Metrorail system establish / development / operation or operation of any construction work of its establishment program/ offer Metrorail service or establish and operation of any equipment to do that):

Signature of the Authorized Officer

Signature:

Seal:

Name:

Designation^^^^

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF ROAD TRANSPORT AND BRIDGE
ROADS TRANSPORT AND HIGHWAYS DEPARTMENT

Form-C

[Ref. Rule 15]

Application for Renewal of License

1. Applicant Name:

Registration No:

Address:

Phone:

Fax:

Email:

2. Description of Metrorail Area:

3. Description of Metrorail Business: (Metrorail system establish / development / operation or operation of any construction work of its establishment program/ offer Metrorail service or establish and operation of any equipment to do that):

4. Is there any alteration in Management of Metrorail Company?:

5. Expire Date of Metrorail License:

6. Bank Draft or Pay Order No of Deposited Renewal Fees (Not Applicable cases under Section 9 of Metrorail Act):

*Applicant shall attach the documents described in sub-section (2) of Rule 15 with this application.

Declaration

The information and Documents provided in the application form are accurate. I didn't submit any false information. If any false information or documents are proved incorrect I will be liable for legal prosecution.

Signature of the Officer authorized by Applicant

Seal

Date:.....Eng.

.....Ben.

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF ROAD TRANSPORT AND BRIDGE
ROADS TRANSPORT AND HIGHWAYS DEPARTMENT

Form-D

[Ref. Rule 19]

Application for Re-issue of License

1. Applicant Name:

Registration No:

Address:

Phone:

Fax:

Email:

2. Description of Metrorail Area:

3. Description of Metrorail Business: (Metrorail system establish / development / operation or operation of any construction work of its establishment program/ offer Metrorail service or establish and operation of any equipment to do that):

4. Expire Date of Metrorail License:

5. Date of the Lost /Ruined/Damaged License:

6. Bank Draft or Pay Order No of Deposited Re-issue fees (Not Applicable cases under Section 9 of Metrorail Act):

Declaration

The information and Documents provided in the application form are accurate. I didn't submit any false information. If any false information or documents are proved incorrect I will be liable for legal prosecution.

Signature of the Officer authorized by Applicant

Seal

Date:.....Eng.

.....Ben.

Schedule 1 (Route Alignment Drawing)

(with reference to Rule 22)

- 1) Plan and Profile: scale shall be larger than 1 to 25,000. Such drawings shall show -
 - a) Name of the terminal stations
 - b) Prime locations on the route
 - c) Name and chainage of the stations
 - d) Track centerline and successively increasing distance per kilometer
 - e) Geographic formation and planimetric features
 - f) Scale and directions

- 2) Vertical Cross-section: With the scale larger than 1 to 25,000 in horizontal and 1 to 2,000 in vertical, such drawings shall show -
 - a) Chainages of existing ground level and formation level at track centerline in every 200m.
 - b) Gradient at the track centerline
 - c) Name and chainage of the stations
 - d) Length and chainage of tunnels and bridges
 - e) scale

Schedule 2 (Construction Plan)

(with reference to Rule 33, 34 and 45)

Metrorail Facilities	Construction Plan	Attached Documents and Drawings
1. Metrorail Track		
(1) General	1. Rail centerline and track centerline 2. Curve radius at track centerline 3. Transition curve length and circular curve length at track centerline (for main line only) 4. Height of formation level at track centerline 5. Gradient at track centerline 6. Vertical curve radius at track centerline (for main line only) 7. Construction gauge and rolling stock gauge (in drawing) 8. Width of formation level (for main line only) 9. Distance between track centerlines	
(2) Earth Structures	Structure of embankment and cutting (in standard drawings of embankment and cutting)	
(3) Retaining Wall	1. Structure type 2. Material 3. Dimension (in standard structure drawing)	1. Stress intensity table 2. Permissive stress intensity table 3. Stability factor table
(4) Bridge	1. Design load of train 2. Structural type of superstructure and substructure 3. Material of main structure 4. Dimension (in standard structure drawing)	1. For statically indeterminate bridge structure (1) Load arrangement diagram (2) Stress diagram 2. Stress intensity table 3. Permissive stress intensity table 4. Stability factor table 5. Maximum deflection table of girder

<p>(5) Tunnel and Anti-stone fall Cover, etc.</p>	<p>1. Type 2. For tunnel (1) Material (2) Structure dimension (in standard structure drawing and design drawing) (3) Ventilation method (4) Location of drainage facilities (5) Fire fighting facility - Type and location of fire fighting, evacuation, alarm facilities (in drawing) - Type of smoke ventilation method 3. Location of anti-stone fall facility</p>	<p>1. Drawings about tunnels (1) Load arrangement diagram (2) Stress diagram (3) Stress intensity table (4) Permissive stress intensity table 2. Documents about tunnels (1) Functions of ventilation facilities (2) Functions of smoke ventilation facilities</p>
<p>(6) Level Crossing</p>	<p>1. Type 2. Angle 3. Width</p>	<p>Result of traffic survey</p>
<p>(7) Track</p>	<p>1. For ordinary Metrorail (1) Gauge (2) Type and structure dimension of rail and rail assemblies (in drawing) (3) Type and structure dimension of turnout (in drawing) (4) Material and structure dimension of sleeper (in drawing) (5) Interval of laying each sleeper (or fastening) (6) Type and structure dimension of rail fastening (in drawing) (7) Type and structure dimension of track base (or thickness of ballast) (in drawing, except ballasted track)</p>	
<p>2. Station, Signalling Station, and Depot</p>		

(1) Station	<ol style="list-style-type: none"> 1. Chainage and cumulative chainage at the Station center 2. Locations of signage indicating effective length of main line and the extent of rolling stock 3. Location of passenger handling facilities 4. For platform <ol style="list-style-type: none"> (1) Effective length, effective width and effective height (2) Distance between the edge of platform and track centerline 5. Width of access for passengers 6 Structure dimension of platform shed, overbridge, and the like (in standard structure drawing and design drawing) 7. Ventilation method (for underground station only) 8. Fire fighting facilities (for underground station only) <ol style="list-style-type: none"> (1) Fire fighting, evacuation, alarm facilities and (2) Type of facilities and functions of disaster prevention control room (3) Smoke ventilation method 	<p>Explanatory documents about underground stations</p> <ol style="list-style-type: none"> (1) Functions of ventilation facilities (2) Functions of smoke ventilation facilities
(2) Signalling Station	Locations of signage indicating effective length of main line and the extent of rolling stock	
3. Depot and Workshop		
(1) Depot	Stabling capacity	
(2) Train Maintenance Facilities	<ol style="list-style-type: none"> 1. Layout of inspection facilities and repair facilities 2. Inspection capacity (by type of inspection) 	
4. Train Control Facility		

(1) Train Control Facility	<ol style="list-style-type: none"> 1. Blocking system and method of ensuring safety distance between trains 2. Action of blocking system (in schematic drawing) 3. Type and location of wayside signals (in drawing) 4. For cab signals, <ol style="list-style-type: none"> (1) Method and type of signal display (2) Beginning location of signal display section and varieties of display (in writing) 5. Type and action of interlocking system (in schematic drawing) 6. Method, items and location of remote control devices and centralized train control system 7. ATP, ATC, and ATO system <ol style="list-style-type: none"> (1) Type and action (with explanatory documents of functions or in schematic drawings) (2) Location and structure dimension (in drawing) (3) For blocking method, linkage with wayside signals or cab signals and linkage with conditions of tracks (in drawing) (4) For the device to secure distance between trains, varieties of control items of ATC or linkage between ATO and varieties of control items (in drawing) 	Explanatory documents about functions
(2) Communication Facilities	<ol style="list-style-type: none"> 1. Type and location (in communication line drawing) 2. For wired communication facilities, type of wire and method of installation (in electrical facility drawing) 3. For radio communication facilities, frequency band and communication method 	Explanatory documents of train radio functions
(3) Level Crossing Safety Facility	Control method and action (in schematic drawing)	
5. Substation, etc.		

(1) Substation	<ol style="list-style-type: none"> 1. Location 2. Total capacity of converter device (indicating for regular use or spare) 3. Type, quantity, voltage, electric current, phase and frequency of rectifier, rotary inverter, transformer (except for auxiliary power transformer), power generator, and the like 4. Type of main circuit and breaking capacity of automatic breakers 5. Electrical connection (in schematic) and location (in mechanical drawing) of electrical devices listed in 3. and 4. 6. Type and action of protection device (in schematic drawing) 7. Method, items and location of remote control devices and centralized train control system 	<ol style="list-style-type: none"> 1. Capacity calculation sheet 2. Explanatory documents about functions
(2) Power Substation	<ol style="list-style-type: none"> 1. Items listed in 1. 4. and 6. of 2 of (1) 2. Type, quantity, voltage, electric current, phase and frequency of transformer (except for auxiliary power transformer) and power generator 3. Electrical connection (in schematic) and location (in mechanical drawing) of electrical devices and automatic breakers of main circuit listed in 2. 	
(3) Switching Station	<ol style="list-style-type: none"> 1. Items listed in 1. 4. and 6. And 7. of 2 of (1) 2. Electrical connection (in schematic) and location (in mechanical drawing) of automatic breakers of main circuit 	
6. Electrical Facilities		
(1) Power Transmission Line, Distribution Line and Feeder Line	<ol style="list-style-type: none"> 1. Length and number of circuit 2. Electrical mode and standard voltage 3. Type and cross section of electric wire 4. Method of installation (in electrical system drawings) 5. For feeder line <ol style="list-style-type: none"> (1) Electrical connection (in schematic drawing) (2) Feeder mode (for AC only) and quantity and capacity of auto transformer 	<ol style="list-style-type: none"> 1. Schematic drawing of power transmission 2. Schematic drawing of power distribution 3. Schematic drawing of feeder line

(2) Catenary	<ol style="list-style-type: none"> 1. Electrical mode and standard voltage 2. Method of installation 3. In case of simple overhead catenary, <ol style="list-style-type: none"> (1) length (2) Type, cross section and trolley method (3) Method of installation (in electrical system drawing) (4) Type of supporting structure and maximum interval between the structures (5) Type and cross section of auxiliary line and rail bond 4. In case of third rail <ol style="list-style-type: none"> (1) Items listed in (1) and (3) of 3. (2) Type and cross section of third rail (3) Type and cross section of rail bond (4) Location (for expansion joint and anchoring) and structure dimension of expansion joint, anchoring, end approach (in drawing) (5) Structure dimension of protection facility (in drawing) 5. In case of rigid double catenary, <ol style="list-style-type: none"> (1) Items listed in (1), (3) of 3 and (4), (5) of 4 (2) Type and cross section of electrical line 6. In case of overhead double catenary, items listed in (1) – (4) of 3 	
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Remarks

1. Items listed in 1. – 3. of 1. (Metrorail Track) and 3. of (5) (Tunnel and Anti-stone fall Cover, etc.) of (1) (General) shall be indicated in the plan and profile drawing prescribed in Section 1 of Schedule 3.
2. Items listed in (3) of 1. (For ordinary Metrorail) of (7) (Track) of 1 (Metrorail Track), 1. – 5. of (1) (Station), (2) (Signalling Station) of 2. (Station, Signalling Station, and Depot) and 1. of (2) (Train Maintenance Facilities) of 3. (Depot and Workshop) shall be indicated in the plan and profile drawing prescribed in the conditional clause of Section 1 of Schedule 3.
3. Items listed in 5. of (1) (General) of 1. (Metrorail Track) and 1. of (1) (Station) of 2. (Station, Signalling Station, and Depot) shall be indicated in the plan and profile drawing prescribed in Section 1 and in the vertical drawings prescribed in Section 2 of Schedule 3.
4. Items listed in 4. and 6. of (1) (General) and (4) of 2. (For Tunnel) of (5) (Tunnel and Anti-stone fall Cover, etc.) of 1. (Metrorail Track) shall be indicated in the vertical drawing prescribed in Section 2 of Schedule 3.

Schedule 3 (Track Alignment Drawing for Construction Plan)

(with reference to Rule 35)

- 1) Plan and Profile: the scale shall be over 1 to 2,500. The drawings shall provide the following information, provided, however, the drawings with the scale over 1 to 500 shall be attached additionally for the sections of stations, depots and other rolling stock maintenance facilities.
 - a. Name of the terminal stations, name of area with boundaries where the track centerline of the alignment passes by
 - b. Geographic formation and planimetric features of the areas within the distance of at least 100m from the track centerline
 - c. Track centerline and successively increasing distance per kilometer
 - d. Chainage of the beginning and end of circular curves at the track centerline, length of the circular curves, crossing angle, tangential line length and radius of the circular curves
 - e. Chainage of the beginning and end of the circular curves at the track centerline and chainage of the beginning and end of the transition curves at the track centerline
 - f. Gradient and chainage of the transition points at the rail centerline
 - g. Name of the bridges, chainage at the midpoint of the bridges and length of the bridges
 - h. Name of the tunnels, chainage at the midpoint of the tunnels and length of the tunnels
 - i. Name the level crossings and chainage at the midpoint of the level crossings
 - j. Name and chainage of the stations
 - k. Name of the depots and rolling stock maintenance facilities and chainage at the midpoint of the depots and rolling stock maintenance facilities
 - l. Scale and directions
- 2) Vertical drawings – Scale shall be over 1 to 2,500 in horizontal and 1 to 400 in vertical and such drawings shall provide the following information –
 - a. Chainages of existing ground level, embankment and cutting earth at track centerline in every 20m.
 - b. For Metrorail project with underground profile, chainage of tunnel in every 20m
 - c. Offset at the track centerline of the vertical curves in every 20m
 - d. Chainage of the beginning and end of circular curves at track centerline, radius and directions
 - e. Chainage of crossings with other Metrorail, railway, track, cableway and road
 - f. The items listed from c. to d. and from g. to k. of the preceding section
 - g. Scale

Schedule 4 (Minor Alteration of Construction Plan)

(with reference to Rule 38 and 46)

Metrorail Facilities	Minor Alteration
1. Metrorail Track	
(1) General	<ol style="list-style-type: none"> 1. Alteration of rail centerline or track centerline within the shift of 20 meters at both sides (length of alteration shall be within 1 km) 2. Alteration of curve radius of track centerline <ol style="list-style-type: none"> (1) Enlargement (2) Reduction within 240 meters 3. Alteration of transition curve length or circular curve length (for main line only) associated with the alteration prescribed in 1. and 2. 4. Alteration of height of formation level at track centerline within the height of 1 meter 5. Alteration of gradient at track centerline <ol style="list-style-type: none"> (1) Reduction (2) Increment within 2.5% 6. Alteration of radius of vertical curve at track centerline (for main line only) 7. Enlargement of width of formation level (for main line only) 8. Enlargement of distance between track centerlines 9. In addition to 1., 2., 4., and 5., for siding lines, <ol style="list-style-type: none"> (1) Alteration of rail centerline or track centerline (2) Alteration of radius of curve at track centerline (3) Alteration of height of formation level at track centerline (4) Alteration of gradient at track centerline
(2) Earth Structures	<ol style="list-style-type: none"> 1. New construction of embankment or cutting earth within the height or depth of 6 meters 2. Alteration of embankment or cutting structure within the height or depth of 6 meters after such alteration 3. Demolishment of embankment or cutting earth
(3) Retaining Wall	<ol style="list-style-type: none"> 1. Alteration of retaining wall within the height of 6 meters <ol style="list-style-type: none"> (1) New construction (2) Structure type (3) Material 2. Alteration of structure dimension <ol style="list-style-type: none"> (1) Under similar design (2) Within the height of 6 meters

(4) Bridge	<ol style="list-style-type: none"> 1. Alteration of structure dimension after modification within the span of 40 meters and under similar design 2. Demolishment
(5) Tunnel and Anti-stonefall, etc.	<ol style="list-style-type: none"> 1. Alteration of tunnel <ol style="list-style-type: none"> (1) Alteration of structure design after modification within the span of 200 meters and under similar design (2) Demolishment 2. Anti-stonefall <ol style="list-style-type: none"> (1) Installation (2) Change of location (3) Demolishment
(6) Level Crossing	<ol style="list-style-type: none"> 1. Alteration of type, angle or width 2. Demolishment
(7) Track	<ol style="list-style-type: none"> 1. Alteration for ordinary Metrorail, <ol style="list-style-type: none"> (1) Type or structure dimension of rail for increase of rail weight (2) Type or structure dimension of rail assemblies (3) Type or structure dimension of turnout (4) Material or structure dimension of sleeper (5) Reduction of interval between each sleeper (or fastening) (6) Type or structure dimension of rail fastening (7) Structure type (except for ballasted track) of track base or increase of thickness of ballast (for ballasted track only)
2. Station, Signalling Station and Depot	
(1) Station	<ol style="list-style-type: none"> 1. Alteration of chainage at the center of station within 20 meters 2. Alteration of locations of signage indicating effective length of main line and the extent of rolling stock 3. Alteration of passenger handling facilities 4. Alteration of platform <ol style="list-style-type: none"> (1) Enlargement of effective length or effective width (except for those requiring change in track centerline) (2) Reduction of distance between platform edge and track centerline (except for those requiring change in track centerline) 5. Alteration of width of access for passengers 6. Alteration or demolition of platform shed, overbridge, and the like
(2) Signalling Station	<ol style="list-style-type: none"> 1. Establishment 2. Alteration of locations of signage indicating effective length of main line and the extent of rolling stock 3. Demolishment
3. Depot and Workshop	

(1) Depot	<ol style="list-style-type: none"> 1. Establishment 2. Alteration of handling capacity 3. Demolishment
(2) Workshop	<ol style="list-style-type: none"> 1. Establishment 2. Alteration of layout of inspection or repair facilities 3. Alteration of inspection capacity 4. Demolishment
4. Train Control Facilities	
(1) Signalling Facilities	<ol style="list-style-type: none"> 1. Alteration of wayside signalling <ol style="list-style-type: none"> (1) Installation (2) Alteration of location 2. Alteration of cab signalling <ol style="list-style-type: none"> (1) Installation of beginning point of signal display section (2) The alteration of beginning point of the signal display section 3. Alteration of location of remote control device or centralized train control device 4. Alteration of ATP, ATC, or ATO, <ol style="list-style-type: none"> (1) Alteration of location or structure dimension (2) (In case of blocking system) alteration of linkage between wayside signals or cab signalling, or linkage with the condition of track
(2) Communication Facilities	<ol style="list-style-type: none"> 1. Installation (except train radio facilities) 2. Alteration of location (except train radio facilities) 3. For wired communication facilities, alteration of type or installation method of wire 4. Alteration of radio communication facilities <ol style="list-style-type: none"> (1) Alteration of frequency band (2) Alteration of communication mode (except train radio facilities)
(3) Level Crossing Safety Facility	<ol style="list-style-type: none"> 1. Alteration of control method 2. Alteration of action 3. Demolishment (associated with the demolition of level crossing)
5. Substation Facility, etc.	

(1) Substation	<ol style="list-style-type: none"> 1. Alteration of location 2. Alteration of transformer (except for auto transformer and within the capacity of 500 KVA only) <ol style="list-style-type: none"> (1) Installation (2) Alteration of type, quantity, capacity, voltage, electric current, phase or frequency 3. Alteration of rectifier, rotary inverter and the like (within the capacity of 500 KW only) <ol style="list-style-type: none"> (1) Installation (2) Alteration of type, quantity, capacity, voltage, electric current, phase or frequency 4. Alteration of total capacity of converter device associated with 2. and 3. 5. Alteration of automatic breaker of main circuit (for receiving breaker only) <ol style="list-style-type: none"> (1) Installation (2) Alteration of type or breaking capacity 6. Alteration of electrical connection of electrical devices, including rectifier, rotary inverter, transformer (except auxiliary power transformer), power generator, and automatic circuit breaker associated with the alteration of 5. 7. Alteration of layout of electrical devices prescribed in 6. 8. Alteration of actions of protection device 9. Alteration of control items of remote control device or automatic control devices associated with the alteration prescribed in (1) of 5. 10. Alteration of supervisory location of remote control device or automatic control device
(2) Power Substation	<ol style="list-style-type: none"> 1. Alteration prescribed in 1., 2., 5., and 8. of (1) 2. Alteration of electrical connection of transformer (except auxiliary power transformer), power generator and automatic breaker of main circuit associated with the alteration prescribed in 5. of (1) 3. Alteration of layout of electrical devices prescribed in 2.
(3) Switching Station	<ol style="list-style-type: none"> 1. Alteration prescribed in 1., 5., 8., and 9. of (1) 2. Alteration of electrical connection of automatic breaker of main circuit associated with the alteration prescribed in 5 of (1) 3. Alteration of layout of automatic breaker of main circuit
6. Electrical Facilities	

<p>(1) Power Transmission Line, Power Distribution Line and Feeder Line</p>	<p>1. Alteration of power transmission line installed outside of the metrorail area, (1) Installation (2) Alteration of length or number of circuit (3) Alteration of electrical mode or standard voltage (4) Alteration of type or cross section of electric wire (5) Alteration of method of installation 2. Alteration of power transmission line installed within the premise of metrorail area, (1) Installation (within the service voltage of 10,000V) (2)Alteration of length or number of circuit (within the service voltage of 10,000V) (3) Alteration of type (except for changing to bare wire) or increase of cross section of electric wire 3. Alteration of type or increase of cross section of feeder line (except for changing to bare wire) 4. Alteration of power distribution line or installation method</p>
<p>(2) Catenary, etc.</p>	<p>1. Alteration of simple overhead catenary (1) Increase of cross section of electrical wire (2) Alteration of installation method (3) Alteration of supporting structure or reduction of maximum interval between each supporting structure (4) Alteration of type or cross section of auxiliary wire or rail bond 2. Alteration of third rail (1) Alteration of installation method (2) Increase of cross section of third rail (3) Alteration of type of rail bond or alteration of cross section (4) Installation or location (for expansion joint and anchoring only) or structure dimension of expansion joint, anchoring, end approach (5) Installation of protection facilities or alteration of structure dimension 3. Alteration of rigid double catenary (1) Alteration prescribed in (1), (4) and (5) of 2. (2) Increase of cross section of electrical wire 4. Alteration of overhead double catenary prescribed in (1), (2) and (3) of 1.</p>

Schedule 5 (Alteration of Existing Metrorail Facility Requiring Inspection upon Completion of Works)

(with reference to Rule 47)

- 1) Any alteration(s) in Metrorail Facilities that is/are applicable to the following:
 - a. Works for any change in the type of Metrorail
 - b. Works for additional main line between Metrorail stations
 - c. Works for electrification or alteration(s) in power supply system and standard voltage of power distribution system
 - d. Works for change of gauge
 - e. Works for change in track centerline for over 1 km length
 - f. Works for change in main line of elevated or underground structure

- 2) Any alteration(s) in facilities other than Metrorail Facility as listed in Subsection 1)
 - a. New construction, change(s) in type of structure, or change(s) in materials of bridges with over 10m length of span
 - b. New construction, change(s) in type of structure, or change(s) in materials of the tunnels with over 200m length
 - c. New construction or relocation of stations, development of additional platforms and installation of fire fighting facilities for stations shall be based on the ridership
 - d. Change(s) in signaling and train control facilities that is/are applicable to the following.
 - i. Change(s) in blocking devices for the alteration of blocking system
 - ii. New installation of “type 1” interlocking devices
 - iii. New installation of Centralized Traffic Control System and change(s) in control method
 - iv. New installation of ATP, ATC, and ATO and change in type
 - e. Change(s) in substation facilities (except for the transformers of power receiving and switching stations located out of Metrorail Area)
 - i. New installation of substations
 - ii. New installation of rectifiers, rotary converters, and other electrical devices for similar purposes (restricted to those with the output power over 1,000 kW) and change in type, number and capacity thereof
 - iii. New installation of main transformers (restricted to those with the capacity over 1,000 kVA and 500 kVA for the service voltage of under 10,000V and over 10,000V, respectively) and change in type, number and capacity thereof
 - iv. New installation of generators, other electrical equipment and engines for similar purpose and change in type, number and capacity thereof
 - v. New installation of remote control devices and change in control method thereof
 - f. Change(s) in electrical facilities (except for transmission lines located out of MRT service area) applicable to the following:

- i. New installation of transmission lines and power distribution lines
- ii. New installation of feeder lines and overhead contact lines
- iii. Increase of transmission lines
- iv. Change(s) in the feeding system of feeder lines

Schedule 6 (Approval of structure of Rolling Stock)

(with reference to Rule 50)

Rolling Stock Elements	Structure and Device
1. General	<ol style="list-style-type: none"> 1. Tare weight 2. Passenger capacity 3. Floor area per passenger (seating capacity, standing capacity and other capacities, as appropriate, shall be indicated) 4. Maximum loading 5. Maximum design speed 6. Major dimensions, indicating the relationship with rolling stock gauge in plan and profile, longitudinal, edge, and cross section drawings 7. Layout of major devices (in drawing) 8. Items regarding fire fighting
2. Running Device, etc.	<ol style="list-style-type: none"> 1. Material and structure of bogie (in drawing) 2. Material and structure of wheel and axle (in drawing) 3. Spring characteristics of suspension device 4. Material and structure of guideway device (in drawing) 5. Type and structure of cruise device (in drawing)
3. Propulsion System and Transmission System	<ol style="list-style-type: none"> 1. Type and output of propulsion system (in drawing) 2. Mode of power transmission device 3. Control method 4. Characteristic of driving force (in drawing)
4. Braking Device	<ol style="list-style-type: none"> 1. Type and structure of braking device (regular braking device, stabling braking device, or safety braking device indicated separately in drawing) 2. Braking efficiency (regular braking device, stabling braking device, or safety braking device indicated separately) 3. Location of braking device instruments, air pipe and hydraulic pipe (in drawing) 4. Plumbing of inner pressure container, accumulator, and assemblies (in schematic drawing) 5. Capacity of air compressor and hydraulic pump 6. Adjusted pressure of pressure governor and safety valve
5. Electrical Device (except non-safety device such as air conditioning and fan)	<ol style="list-style-type: none"> 1. Electrical circuit (in drawing) 2. Type, voltage and output of power generator 3. Voltage and capacity of battery

6. Coupling Device	<ol style="list-style-type: none"> 1. Type of coupling 2. Type of dumper
7. Train Control System	<ol style="list-style-type: none"> 1. Type, action and structure of ATS, ATC, and ATO (in drawing) 2. Type, action and structure of information transmission device (in drawing) 3. Frequency band and communication protocol of the on-board equipment of train radio
8. Miscellaneous	Material of glass window or the like for the same purpose

Schedule 7 (Minor Alteration of Rolling Stock)

(with reference to Rule 52)

Rolling Stock Elements	Minor Alteration
1. General	<ol style="list-style-type: none">1. Reduction of tare weight2. Alteration of passenger capacity3. Alteration of floor area per passenger4. Alteration of dimension including<ol style="list-style-type: none">(1) Reduction of maximum dimension(2) Alteration of interior dimension5. Alteration of relationship with rolling stock gauge associated with the alteration prescribed in (1) of 4.6. Alteration of layout of key instruments
2. Running Device, etc.	<ol style="list-style-type: none">1. Alteration of material and structure of bogie (for the parts relevant to lubricator, cowcatcher, or tread cleaning device only)
3. Braking Device, etc.	<ol style="list-style-type: none">1. Increase of braking efficiency (not involving alteration of type and structure of braking device)2. Alteration of adjusted pressure of pressure governor or safety valve
4. Electrical Device (except non-safety device such as air conditioning and fan)	<ol style="list-style-type: none">1. Alteration of electrical circuit in relation to<ol style="list-style-type: none">(1) Power collector(2) Power generator(3) Battery(4) lamp2. Alteration of type or voltage of power generator3. Alteration of voltage or capacity of battery
5. Coupling Device	<ol style="list-style-type: none">1. Alteration of type of coupling2. Alteration of type of dumper
6. Miscellaneous	Alteration of materials of glass window or the like

Schedule 8 (Attachments to Application of Train Operation Plan)

(with reference to Rule 54)

- (1) The application forms of Section (1) shall enclose the documents and drawings as follows –
- 1) The documents to certify the safety operation of trains running at the maximum travel speed to be determined or altered.
 - 2) Run curve drawings (only the concerned drawings shall be required for change in train operation plan)
- (2) The maximum travel speed as specified in Provision a., Subsection 3) of Section (1) shall indicate the maximum travel speed of the following.
- 1) Structure of the track and driving performance of the rolling stock
 - 2) Curve radius at the track center and curve passing performance of the rolling stock
 - 3) Vertical gradient at the track center and braking performance of the rolling stock

Schedule 9 (Contents of Safety Management System)

(with reference to Rule 55)

- 1) Philosophy of Metrorail Service to ensure safety of transportation
 - a. General principles
 - b. Compliance to the relevant legislations (relevant legislations and other rules/regulations to ensure safety transportation)
 - c. Safety management activities
- 2) Institutional structure for execution of Metrorail Service and administration to ensure safety of transportation
 - a. Organization structure
 - b. Mandates of corporate managers for safety of transportation
 - c. Mandates of Safety Manager
 - d. Mandates of Operations Manager
 - e. Selection and mandates of Driver Instruction Manager
 - f. Selection and mandates of other managers necessary to ensure safety of transportation
- 3) Method statements for execution of Metrorail Service and administration to ensure safety transportation
 - a. Transmission and sharing of information
 - b. Development and execution of accident prevention measures
 - c. Accident and disaster management
 - d. Monitoring of execution and administration
 - e. Promulgation of Safety Management System
 - f. Preparation and control of documents on the relevant legislations, records of decisions pertaining to Metrorail Service, and other documents on safety management
 - g. Execution and improvement of administration
 - h. Train operation and administration, including -
 - a) Determination and alteration of train operation plan
 - b) Rostering plans of train crews and rolling stock
 - c) Capacity certification of train drivers and other key operating personnel
 - d) Capacity building and retaining for train crews and others involved
 - e) Controlling/dispatching of train operation
 - f) Collection and transmission of information required for safe train operation
 - g) Management in the event of accidents, disasters, and other urgencies
 - h) Subcontracting of works
 - i. Execution and administration regarding Metrorail Facility, including -
 - a) Construction, improvement, and maintenance of Metrorail Facility
 - b) Safety assurance during construction and maintenance
 - c) Retaining of capacity for construction and maintenance workers
 - d) Subcontracting of works

- j. Execution and administration regarding rolling stock
 - a) Manufacturing, rehabilitation and maintenance of rolling stock
 - b) Retaining of capacity for rolling stock maintenance personnel
 - c) Subcontracting of works
- 4) Appointment and dismissal of Safety Manager
- 5) Appointment and dismissal of Operations Manager

Appendix 3

Technical Standards for the Metrorail in Bangladesh



Technical Standards for the Metrorail in Bangladesh

Dhaka Transport Coordination Authority (DTCA)

Preface

The Technical Standards for Metro-Rail has been formulated with a view to developing smooth transits, increase efficiency and improve the quality of passenger service. Moreover, the Technical Standards shall apply to the Metrorail in Bangladesh while considering safety, economics, convenience, comfort and other factors of basic standard concerning Metrorail.

In exercise of the powers conferred by section 15(2) of the Metrorail Act, 2015 (1 of 2015), the Governing Council of Dhaka Transport Coordination Authority (DTCA) has approved the Technical Standards for the Metrorail in Bangladesh in its 3rd decision of the sixth Governing Council meeting dated May 28, 2015.

**DHAKA :
June 21, 2015.**

**Md. Kaikobad Hossain
Executive Director
Dhaka Transport Coordination Authority**

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I. GENERAL PROVISIONS

1. General Provisions

1.1 Objective

The intent of these technical standards (hereinafter “Standards”) is to contribute to the development of Metrorail through aiming to promote smooth transits, increase efficiency and improve the quality of passenger services while considering securing safety, economics, convenience, comfort and other factors by establishing basic standards concerning Metrorail which a mass transit to be introduced in Bangladesh.

1.2 Scope of Technical Standards

This Technical Standards shall apply to the Metrorail in Bangladesh.

1.3 Prevention of Danger

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

1.4 Measures to be Provided for Smooth Transport of the Elderly and the Handicapped

The passenger facility shall have facilities and equipment for elderly and the handicapped.

1.5 Implementation Standard

A Metrorail Operator shall set a standard (hereinafter referred to as “implementation standard”) to implement this standard and abide by that standard.

2. Terms and definitions

1.6 Terms and definitions

In these Standards the following words or expressions shall have the meanings hereby assigned.

- (1) “Main track” means the tracks on which trains are regularly operated.
- (2) “Side track” means the tracks that are not classified as a main track.
- (3) “Gauge” means the shortest distance between rail heads when measured within 16 mm from rail head surfaces.
- (4) “Curve Incidental to Turnout” means the curve created before or after the curve within the turnout because of installation of the turnout and provision of the curve in the turnout.
- (5) “Design Maximum Speed” means the maximum speed specified in the basic business plan while taking the future transportation system into consideration, and specifically means the maximum speed used as the design criterion for radius of curvature for main track, gradients and width of formation level, etc.

- (6) “Cant” means the arrangement making the outer rail higher than the inner rail to prevent derailment occurring due to the centrifugal load when rolling stock pass through a curve.
- (7) “Gauge Widening” means the arrangement to slightly increase the inside rail on a curve or turnout to enable rolling stock to pass through the curve as smoothly as possible.
- (8) “Buffer Stop” means the device installed at the edge of tracks to prevent a train or rolling stock from overrun, or derailment.
- (9) “Scotch Block” means the device installed on the side track to prevent the stopped rolling stock from moving by itself.
- (10) “Station” means the place used for passengers getting on and off the vehicle
- (11) “Signal station” means the place that is used exclusively to allow trains to pass each other or wait for each other.
- (12) “Railway station” means station and signal station
- (13) “Halt” means those without routes inside the station and starting routes in sections implementing ATC methods among stations
- (14) “Rolling stock” means electric cars and special kinds of cars (which means track testing cars, electric testing cars, accident relief cars and cars with other special structures or equipment) that are used for the railways business
- (15) “Train” means railway transportation equipment constituted by rolling stock for operation on tracks outside of the stations
- (16) “Sheds” means places to be exclusively used for containing rolling stock
- (17) “Motive power car” means rolling stock with power units
- (18) “Continuous brake” means equipment that enables applying brakes on all rolling stock at once by the driver’s operation through brake pipes penetrating the front part of coupled rolling stock or through wire to control brakes, and apply emergency brakes automatically when coupled rolling stock separate.
- (19) “Brake axle ratio” means ratio of the number of brake axles (total number of axles that brakes apply among the number of coupling axles) against the number of coupling axles (total number of axles of rolling stock made up as train) as 100
- (20) “Cab signal” means signal devices that indicate signal aspects consistently within the rolling stock.
- (21) “Automatic Train Control (ATC)” means equipment with functions to indicate signal aspects on cab signals and automatically lower the speed of trains or rolling stock depending on the distance between preceding trains and route conditions.
- (22) “Centralized Train Control (CTC)” principally means controlling signal devices and switches in stations in a centralized manner at an operation control center, and conducting operation management of trains, etc.
- (23) “Railway signals” means signals, signs and indicators.
- (24) “Signal” means those that indicate conditions when operating trains or rolling stock to officials.

- (25) “Sign” means the action by officials that indicates the intention of a sign giver to the counterparty.
- (26) “Indicator” means those that indicate the location of things, direction, condition, etc., to the officials.
- (27) “Tunnel” means underground structures which consist of underground stations and between stations.
- (28) “Metrorail” means town based rail system where there shall be a dedicated right of way with underground, elevated or at grade rail track.
- (29) “Dhaka Transport Coordination Authority (DTCA)” means the transport coordination authority of Dhaka.
- (30) “Aptitude” means the physical and mental ability.

II. OFFICIALS IN CHARGE

2.1 To Secure Safety in Operation

When operating a train, etc., officials in charge (hereinafter “officials”) shall strive to secure safety by comprehensively utilizing their knowledge, skills and operation related facilities.

2.2 To Keep Knowledge and Skills

Officials shall have sufficient knowledge and skills to operate trains or rolling stock safely.

2.3 To Supervise Officials

A Metrorail Operator shall supervise officials appropriately, such as requesting them to report or giving them instructions on matters necessary for operation before getting onboard, while operating trains and other suitable times.

2.4 Education, Training, etc. of Officials

2.4.1 Metrorail Operators shall provide the officials engaged in work directly related to the operation of trains, etc., and officials who carry out maintenance and other related work on facilities and rolling stock with education and training so that they gain knowledge and skills necessary for their work.

2.4.2 Metrorail Operators shall confirm that officials engaged in work directly related to the operation of trains, etc., have the aptitude, knowledge and skills necessary for their work.

2.4.3 Metrorail Operators shall not allow the officials to do their work when the officials engaged in work directly related to the operation of trains, etc. is recognized to be in a condition unable to fully utilize one’s knowledge and skills.

2.4.4 “The officials engaged in work directly related to the operation of trains, etc.,” in the above items shall have the meaning given in the following items.

- (1) The officials who drive a motive power car (hereinafter “driver”);
- (2) The officials who conduct railway traffic operation arrangements such as changing the operating order of trains, changing the locations where trains pass each other and cancelling operations (hereinafter “traffic dispatcher”);
- (3) The officials boarding trains for train protection, to conduct brake operation or making signs necessary for train operation (hereinafter “conductor”);
- (4) The officials who control and block routes for trains, etc., handle railway signals, and also operate switches;
- (5) The officials who conduct work directly related to the operation of trains due to maintenance, construction and such of railways, contact lines or train protection equipment, or the officials who direct and supervise such work

2.4.5 “The officials who carry out maintenance and other related work on facilities and rolling stock” in paragraph 1 shall mean the following. In the case where Metrorail Operators

commission “maintenance and other related work on facilities and rolling stock” to outside, officials belonging to the commissioned operators shall be included in the officials.

- (1) The officials engaging in maintenance service for structures, railways and buildings;
- (2) The officials engaging in maintenance service for electric equipment and train protection equipment;
- (3) The officials engaging in inspection and repair work of rolling stock;
- (4) The officials who directly conduct operation to open/close machinery in electric equipment.

2.5 To have a Driver Onboard, etc.

2.5.1 A driver shall be onboard a train.

2.5.2 A driver shall possess a driver’s certification specified by a Metrorail Operator; provided, however, that this shall not apply in the following case.

- (1) When an apprentice driver operates a motive power car under the instruction of another certificated driver onboard.

2.5.3 The drivers shall not board trains in a state in which there are concerns that they are unable to operate normally under the influence of drugs, etc.

III. CIVIL

1. General Provisions

The civil work shall conform to the design requirements set out in this standard which is the minimum prescribed.

2. Civil Structures

3.1 Design requirement for civil structure

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

3.2 Design life

The design life required for civil structure shall be obtained by the use of durable, corrosion protection, resistance to or avoidance of wear etc.

3.3 Codes and standards

The civil design and construction work shall conform to the internationally recognized codes and standards. The following codes and standards shall be applicable:

- (i) Design Standards for Railway Structures (issued in Japan)
- (ii) AASHTO (American Association of States Highway and Transportation Officials) Specification
- (iii) BS (British Standard)
- (iv) IRC (Indian Railway Code)
- (v) Any other internationally recognized codes and standards

3.4 Seismic design

Civil structures shall be designed for earthquake resistance. Seismic load shall be followed with “Bangladesh National Building Code (BNBC)”. The seismic analysis shall be designed in accordance with the internationally recognized codes and standards.

3.5 Design loading

The structure shall be analyzed for the specified loads and effects to obtain the most severe combination of forces on every component member. The method and sequence of construction shall be clearly specified, and taken into account in the design. For the purpose of computing stresses and deformations, the following loads and consequential effects shall be taken into account as applicable:

- (1) Dead loads;

- (2) Super imposed dead load;
- (3) Live loads;
- (4) Dynamic effects;
- (5) Forces due to curvature or eccentricity of track;
- (6) Temperature effects;
- (7) Frictional resistance of expansion bearings;
- (8) Longitudinal forces;
- (9) Long welded rail forces;
- (10) Centrifugal forces;
- (11) Wind pressure effect;
- (12) Forces and effects due to earthquake;
- (13) Erection forces and effects (Construction Stage Safety check);
- (14) Drying shrinkage of Concrete;
- (15) Concrete creep;
- (16) Differential Settlement; and
- (17) Other loads

3.5.1 Loading Combination

The various combinations of loads and effects to which components of the structures can be subjected are given in using design standard (refer to clause 3.3). Each component of the structure shall be designed for all applicable combinations of these loads and effects.

3.5.2 Train loading

The train loading shall be guided by the selected rolling stock parameters. In case of the design of structures for only electric-car line, the load pattern “M-16” as shown Figure 3.1 may be applied. The nominal loading for the design of members shall comply fully loaded trains with individual cars each having four axels of 16 tons and 20 m overall length. This load pattern shall be placed at the most critical position to generate maximum stress for the part of structure considered.

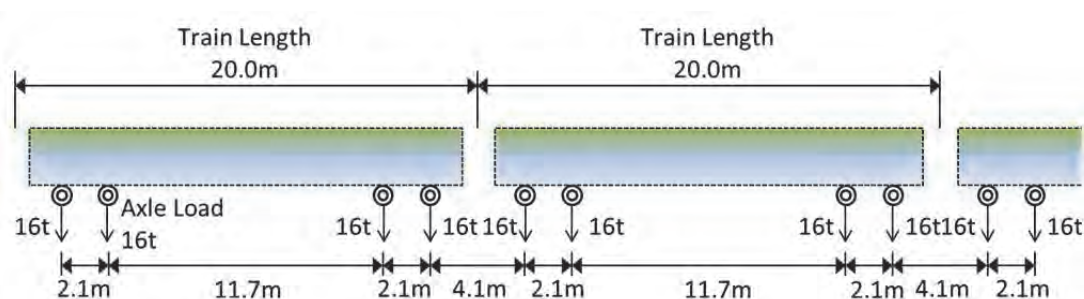


Fig.3.1 Load pattern “M-16”

3.6 Bearings

Bearings shall conduct the load definitely from superstructures to substructures, and also shall have strong enough for all sorts of loadings such as dead load, live load, temperature effects, drying shrinkage, concrete creep, earthquake and wind. Durability for degradation factor by dust and storage water shall be examined and facility for construction, maintenance and repair shall be considered in the design of bearing.

3.7 Environmental consideration

The design and works of civil structures shall conform to the Bangladesh environmental standards, codes and regulations.

3.7.1 Prevention of heavy noise

A Metrorail operator shall strive to prevent heavy noise to be generated with the movement of a train. A Metrorail operator shall comply with the acts and regulations issued by the government of Bangladesh.

3.8 Cable Duct

Ducts for lying electrical, signaling and telecom cables provision shall be considered in the design of the deck.

3.9 Drainage arrangements

Properly designed drainage scheme for the elevated guide-way structure, stations and concourse and depot shall be provided. All drains shall be of adequate size as per hydraulic calculations and shall be connected to the nearest underground drainage facilities or discharge facilities.

3.10 Precautions against flooding

Mitigating measures shall be taken in areas where flooding is likely to occur. In order for the rail track structure not to be disturbed by flood water, the top of the embankment shall be above the maximum flood water elevation at Depot area and grade structure.

3.11 Facilities for the prevention of a disaster

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

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

3.12 Protection of the area under bridge beams

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

If overhead bridges spanning the busy road or river are vulnerable from the impact of the automobiles and ships underneath, they shall be equipped with relevant protective devices to minimize the impact from them.

3.12.1 Vertical clearance below deck

The minimum vertical clearance available below soffit of beam structure on the road shall be 5.5 m and / or as relevant codes of traffic authorities.

3.13 Evacuation Facilities

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

3.14 Inspection and trial operation of facilities

Newly installed, reconstructed, renovated or repaired tracks and electric facilities shall not be used unless inspection and test run are completed. Test run may be omitted, however, for track and electric facilities that have been slightly reconstructed or repaired and also for side tracks that do not seem to impair the main track.

When the track and electric facilities were suspected of faulty because disaster and other operation accidents took place, and also the track and the electric facilities that have not been used for a while are to be used for train operation, the relevant track and electric facilities shall be inspected in advance and test run shall be conducted wherever and whenever necessary.

3.15 Patrol inspection and monitoring of main track

Patrol inspection shall be conducted for the main track and overhead contact line installed over the main track, according to the situation of the section block and traffic conditions of trains. When a possibility of disasters that can interfere with the safe train operation on the main track is found, the relevant track shall be carefully monitored.

3.16 Periodic Inspection of civil structures

Periodic Inspection shall be enforced every period as shown Table 3.1.

Table 3.1 Period of inspection

Structures	Period of Inspection
Elevated structure	2 years
Building for operation	2 years

3.17 Irregular inspection

In case of check the damage of civil structures by the weather disaster, car crash or the like, irregular inspection shall be enforced.

3.18 Records

All the records of inspections, conversions, renovations and repairs of the civil facilities shall be kept for the pre-determined period of time. Also, all the records of the deformations of bridges, tunnels, and other structures shall be kept in such manner that the history of such deformations can be understood.

IV. TRACK

1. Alignment and Basic Structure of Track

4.1 Gauge

The standard gauge (1,435mm gauge) shall be used.

4.2 Track Alignment

The curve radius (excluding curve incidental to turnout) and the gradient of the main track shall be determined so as to attain the maximum design speed, in consideration of the performance of the rolling stock and other factors. This does not apply, however, to those cases where there are unavoidable circumstances due to topographical conditions or other restricting factors.

4.3 Radius of Curvature

4.3.1 Radius of curve shall be able to ensure the safe running of trains, in consideration of the characteristic of the rolling stock, such as curve passing performance, running speed, and the other relevant factors.

4.3.2 The minimum curve radius on the main track (excluding curve incidental to turnout) shall be 400m in response to the design maximum speed of 110 km/h.

4.3.3 Regardless of the provision in the preceding article, the minimum curve radius of the main track may be 160 m, in cases where there are unavoidable circumstances due to topographical conditions or other restricting factors.

4.3.4 The minimum radius of the curve incidental to turnout on the main track shall be 160m. However, in cases where there are unavoidable circumstances due to topographical conditions or other restricting factors, the minimum radius of curvature may be set to 100m.

4.3.5 Radius of curvature along a platform on the main track shall be set to 400 m or greater.

4.4 Length of Straight Line between Curves

4.4.1 The minimum straight line between two transition curves on the main track shall be set greater than the largest vehicle length.

4.4.2 Regardless of the provision in the preceding article, in case that the straight line cannot be set as specified by unavoidable circumstances due to topographical conditions or other restricting factors, any of the following measures may be taken.

- (1) Direct connection of the two transition curves
- (2) Curve diminishing of cant on two transition curves

4.5 Length of Circular Curve

(1) The length of the circular curve shall be set greater than the largest vehicle length. This does not apply, however, to curves inside a turnout.

(2) In cases where the circular curve cannot be set as specified by unavoidable circumstances due to topographical conditions or other restricting factors, the provision in article 4.4.2 shall apply mutatis mutandis.

4.6 Cant (Super elevation)

4.6.1 Cant provided to the circular curve shall be determined in consideration of the centrifugal force exerted on the rolling stock during traveling. The value calculated by following formula shall be set as a standard. This does not apply, however, to the curve incidental to turnout or the like where there is no danger of the train overturning due to speed restricting.

$$C_0 = 11.3 \frac{V_0^2}{R}$$

Where, C_0 , V_0 and R represent the following values.

C_0 : Actual Cant (mm)

V_0 : Average speed of the train passing through the relevant curve (km/h)

R : Curve radius (m)

Maximum cant value shall be less than the value calculated by following formula.

$$C_m = \frac{G^2}{6H}$$

Where, C_m , G and H represent the following values.

C_m : Maximum cant value (mm)

G : Gauge (mm)

H : Height between surface of rail and vehicle gravity (mm)

Allowance cant deficiency shall be determined in response to curve passing speed. The value calculated by following formula shall be set as standard.

$$C_d = 11.3 \frac{V^2}{R} - C_0$$

Where, C_d , V , R and C_0 represent the following values.

C_d : Allowance cant deficiency (mm)

V : Speed of the train passing through the curve (km/h)

R : Curve radius (m)

C_0 : Actual cant (mm)

4.6.2 In cases where a transition curve is provided, the cant shall be stepped down along the whole length of the transition curve. In cases where no transition curves are provided (excluding the case where two circular curves in the same direction are connected), the cant shall be stepped down in the adjacent tangent section with a length over 300 times the cant.

Further, when the curve diminishing of cant is taken, the cant depression slope shall not exceed 1/300.

4.6.3 In cases where two curves in the same direction connect without intermediate transition curve, the cant difference between two curves shall be stepped down in the larger radius curve section. The length of cant depression shall be set at least 400 times of the cant difference.

4.7 Gauge Widening (Increasing of the distance between rails)

Gauge widening shall be determined as following descriptions, in consideration of curve radius, wheelbase, the number of axles and other such factors of the rolling stock traveling on said curve section.

4.7.1 Gauge widening shall not exceed the value calculated by following formula.

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

Where, S_{\max} , B, R and η represent the following values.

S_{\max} : Maximum value of Gauge Widening (mm)

B: Maximum wheel base of the rolling stock traveling on the said curve (m)

R: Curve radius (m)

η : Movable allowance between wheel and rail (mm)

Regardless of the above provision, the maximum value of gauge widening shall be 25 mm.

4.7.2 Gauge widening shall be gradually decreased in accordance with the following criteria

(1) In case where a transition curve is provided, gradual decreasing shall be carried out along its entire length.

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

4.8 Transition Curve

Transition curve shall be provided between straight line and circular curve or between two circular curves to secure the safe train operation. This does not apply, however, to curves incidental to turnouts, circular curves with small cant, and other cases where preventive measures, such as speed restriction, are taken.

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

$$L = 0.4 C_m$$

Where, L and C_m , represent the following values.

L: Transition curve length (m)

C_m : Actual cant (difference between two actual cants when the transition curve is provided between two circular curves: mm)

When curve diminishing of cant is taken, the length of the transition curve shall be so determined that the maximum cant depression slope is 1/300.

4.9 Gradient

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

4.9.1 The maximum gradient in the traveling areas for trains shall be 35/1,000

4.9.2 The maximum gradient in the stopping areas shall be 5/1,000. However, it may be 10/1,000 in the areas not used for parking or coupling/decoupling of the rolling stock, but only if there is no possibility of interference with train departure and arrival.

4.10 Vertical Curve

4.10.1 Vertical curve shall be provided wherever a gradient changes to secure the safe train operation, in consideration of operation speed and structure of the rolling stock. The radius of a vertical curve shall not be less than 2,000m (3,000m when the horizontal curve radius is not greater than 600m). However, where the change of gradient is smaller than 10/1,000, vertical curves may be omitted.

4.10.2 The combined use of a vertical curve and a transition curve shall be avoided as far as possible.

4.11 Structure Gauge

Metrorail Operator shall specify a structure gauge and make sure not to build buildings or other structures within it. Fig. 4.1 shows a standard drawing of structure gauge for tangent track.

4.11.1 Clearance in widthwise, between structure gauge and basic rolling stock gauge at the sides of the windows in tangent track, shall be greater than 400mm (200 mm is limited to rolling stock having a structure that prevents a passenger from extending his/her body out of the windows). In platform section, clearance between structure gauge and rolling stock gauge at upward and the side of the platform shall be greater than 50mm.

4.11.2 Even within the basic structure gauge, certain constructions can be built if they are necessary for the train operation or the maintenance of railway facilities and if there is no possibility of impeding the safe running of trains. In such a case, this shall be stipulated in the structure gauge provisions.

4.11.3 Structure gauge at a curve (including the structure gauge for platforms along curves) shall be increased, according to the deviation of the rolling stock, by adding the values calculated by the following formula to both sides of the structure gauge at a tangent track, and shall be slanted corresponding to the cant. However, if the amount of deviation due to the curve radius is substantially smaller than the clearance between the structure gauge and the

basic rolling stock gauge, the increase of the structure gauge at a curve according to the deviation may be omitted, with the exception of the platform.

(1) Deviation towards the inside of curve W_1

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

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

(2) Deviation towards the outside of curve W_2

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

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

L_0 : Wheelbase (m)

L_1 : Distance of fixed axles of bogie (m)

L_2 : Length of rolling stock (m)

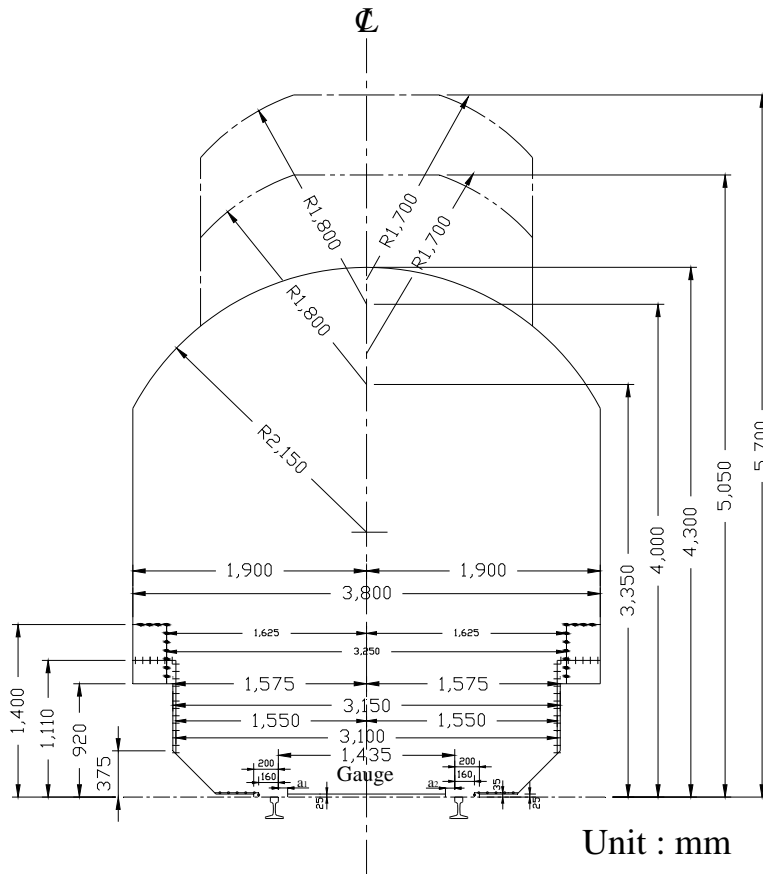
B : Width of rolling stock (m)

R : Curve radius (m)

W_1 : Deviation toward the inside of the curve (m)

W_2 : Deviation toward the outside of the curve (m)

4.11.4 Structure gauge on the section from the end of a circular curve (where two transition curves are connected directly, the point of the connection, hereafter the same) to a point outside the end of the transition curve (where there is no transition curve, the end of said circular curve) for the length of the longest rolling stock traveling on said line, shall be determined by gradually decreasing the value, calculated by the provision in preceding article, that should be added at the end of relevant circular curve, and adding it to both sides of the structure gauge at a tangent track.



- Basic structure gauge
- Structure gauge for those other than overhead contact lines, their suspension equipment, and insulated reinforcing materials on railway tracks operated with DC electric power supplied through contact lines.
- Structure gauge required for those other than overhead contact lines, their suspension equipment and insulated reinforcing materials in tunnels, bridges, over bridges, and platform roofing as well as the sections before and after those structures on railway tracks operated with DC electric power supplied through overhead contact lines.
- +++++++ Structure gauge for platform
- Structure gauge for signals, markers, signs, and special tunnels and bridges
- Structure gauge for run-over type turnouts
- Structure gauge for shunt and crossing

Fig. 4.1 The standard drawing of structure gauge for straight lines

4.12 Width of Formation Level

4.12.1 Formation width is the distance from the center of the track to the outer edge of formation level. Formation width shall be appropriately set to maintain the function as a railway track in response to the track structure. Also it shall be able to provide enough space for crew to take shelter when a train is approaching. Formation width at tangent track shall be 2.50 m or greater. However, this can be reduced if there is no hindrance in consideration of the track structure, sheltering area, and other factors.

4.12.2 Formation width at curve section shall be widened the width of tangent track specified the provision in preceding article, according to the deviation of rolling stock and the amount of cant.

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

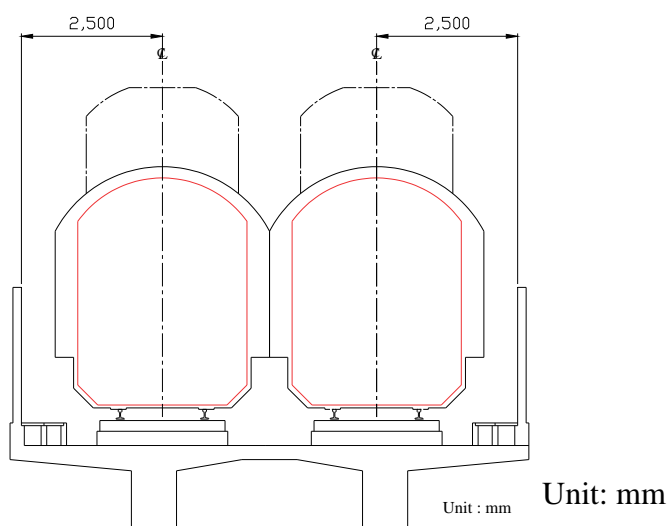


Fig. 4.2 Example of the Formation width

4.13 Distance between Track Centers

4.13.1 Distance between track centers at a tangent track of the main track shall not be less than the maximum width of the basic rolling stock gauge plus 600 mm. However, the said distance shall not be less than the maximum width of the basic rolling stock gauge plus 400 mm on lines where vehicle for train operation is limited to the vehicle having a structure that prevents passengers from extending any part of their bodies from the windows. In addition, in case that sheltering area is provided between the tracks, the distance specified in the above shall be increased by 700 mm or grater.

4.13.2 Distance between track centers at a curve section shall be increased by the value corresponding to the deviation of rolling stock to the distance specified by the provision in preceding article.

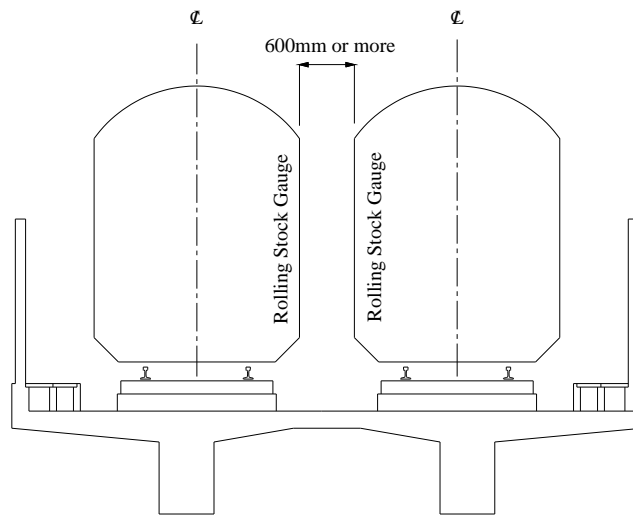


Fig. 4.3 Example of Distance between Track Centers

4.14 Structure of Track

4.14.1 Railway track shall conform to the structure of a rolling stock and shall be able to guide the train to a specified direction. Also railway track shall withstand the anticipated load.

4.14.2 Several types of permanent deformation are generated in various parts in railway track, such as irregularity of gauge, irregularity of cross level, longitudinal level irregularity, alignment irregularity and twist fault, because the train load is applied repetitively. However, railway track shall not deform to jeopardize the safe train running.

4.14.3 Railway track shall not impede the maintenance of railway.

4.14.4 The weight of the rail used for the main track shall be 50kg/m or more.

4.15 Structure of Turnout

4.15.1 Turnout shall not impede the safe train running.

4.15.2 Turnout shall not be installed on transition curve or vertical curve section.

4.15.3 Turnout shall not be installed on a ballast-less bridge.

4.15.4 Turnout shall not be installed behind the abutment of a bridge. This does not apply however, to cases where there are topographical restrictions and when additional measures of reinforcing the roadbed have been taken.

2. Safety Equipment

4.16 Guardrail

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

4.17 Prevention of Rolling Stock Overrun, etc.

Protection devices as following descriptions shall be provided at locations where there is a risk of rolling stock overrun or a train leading to dangerous situation.

4.17.1

At a point where the main tracks or important side tracks intersect with each other at the same ground level or branch from each other, and there is a possibility of them interfering with each other, a refuge siding shall be provided. This does not apply, however if equipment that can automatically stop a train in conjunction with a signal indication of the main signal at the starting end of the line section concerned is provided, or if any of the following cases is applicable.

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

4.17.2 The facilities, as following descriptions, shall be provided at the end of the track.

- (1) At the end of a refuge siding or a track where there is a risk of a serious damage occurring, a car stop made of heaped gravel or other car stop that has a cushioning effect that is at least as good as that of heaped gravel shall be provided according to the estimated approach speed of a train and its weight.
- (2) At the end of a track line other than the lines mentioned in preceding paragraph (1), a car stop for stopping rolling stock at its body or coupler shall be provided.
- (3) At a location on a side track where two lines are connected together or intersect each other, a derailling switch or a stop block shall be provided.

4.18 No trespassing to Guide Way and Protection of Guide Way

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

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

4.19 Evacuation Facilities, etc.

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

4.20 Crossing another Railway

Train level crossing shall be avoided. This does not apply, however, to the station yard where the appropriate protective devices are provided.

4.21 Intersection with Road

Railway shall not intersect with roads at grade (Roads here mean the roads used by the general public traffic. The same definition shall apply hereinafter.). This does not apply, however, to the line where traffic volume at rail crossing is small or where it is difficult to make a separate crossing due to topographical conditions.

4.22 Level Crossing

Level crossing roads shall be provided with appropriated consideration for the safe and smooth passage of people and automobiles (hereinafter referred to as “level crossing road passengers, etc.”). Level crossing roads shall conform to the following criteria.

4.22.1 The angle of intersection between the railway and the road must be at least 45 degrees.

4.22.2 A warning sign and crossing gate shall be provided.

A warning device shall be provided, in cases where the number of train operation and road traffic are extremely small or where it is extremely difficult to construct the crossing gate due to technical aspects.

3. Sign Posts

4.23 Wayside Posts

The following wayside posts shall be provided on a main track in order to ensure that tracks are appropriately maintained and trains can run safely.

- (1) Clearance post
- (2) Distance post
- (3) Curve post
- (4) Grade post

4. Maintenance of the Railway Facilities

4.24 Maintenance of the Railway Facilities

(1) Rail track shall be maintained in an appropriate condition to provide a safe train operation at the designated speed.

(2) In case the main track is not in the condition described in the preceding paragraph temporarily, necessary measures including speed restriction shall be taken to maintain a safe train operation. Those sections that need special attention shall be carefully monitored.

4.25 Inspection and Test operation for Newly-built facilities

(1) Newly installed, reconstructed, renovated or repaired tracks shall not be used unless inspection and test run are completed. Test run may be omitted, however, for track that have been slightly reconstructed or repaired and also for side tracks that do not seem to impair the main track.

(2) When the track facilities were suspected of faulty because disaster and other operation accidents took place, and also the track facilities that have not been used for a while are to be used for train operation, the relevant track facilities shall be inspected in advance and test run shall be conducted wherever and whenever necessary.

4.26 Track patrol and watched for Main line

(1) Patrol inspection shall be conducted for the main track, according to the situation of the section block and traffic conditions of trains.

(2) When a possibility of disasters that can interfere with the safe train operation on the main track is found, the relevant track shall be carefully monitored.

4.27 Periodic Inspection of Facilities

A pertinent cycle, item and method of periodic inspection for main track facilities shall be determined according to their types, structure and usage, in advance. Periodic inspection shall be carried out within every 1 year.

V. ARCHITECTURE

1. General Provisions

5.1 Architectural buildings

Architectural buildings including station facilities and access for passengers shall withstand the anticipated load and shall not impair the safe train operation and safe utilization by passengers.

5.2 Design standards

Bangladesh's existing standards regarding the buildings with station facilities and including fire extinguishing facilities shall be applied, if it can be useful.

5.3 Station facilities

Station facilities shall include platforms, facilities for passenger flow (passageways, concourses, stairs, passenger's overpasses, lifts, escalators, etc.), facilities for serving passengers (ticket offices, gates), queue facilities (ticket offices, waiting rooms), business facilities (station office), toilets, lighting facilities, information facilities (guidance signs, location signs, information signs, regulation signs, etc.) and so on.

2. Platform facilities

5.4 Platform facilities

5.4.1 Distance between the edge of the platform and pillars on the platform must be 1.0m or greater.

5.4.2 Distance between the platform edge and the entrance of passenger's overpasses, underground passages, waiting shelters, etc. on the platform must be 1.5m or greater.

5.4.3 The provisions in preceding articles 5.4.1 and 5.4.2 does not apply to a platform provided with platform screen doors or other facilities for adequately protecting passengers from other trains (hereinafter called "platform screen doors, etc.").

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

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

5.4.6 The clearance between the edge of the platform and the edge of the floor surface of the rolling stock shall be as small as possible within the range where the running of the rolling

stock is not impeded. Note, however, that if this clearance is unavoidably large due to structural considerations, facilities for warning passengers to this effect shall be provided.

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

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

5.4.9 Facilities for warning passengers of the approach of a train using text, etc., and also audible warning facilities shall be provided on the platform.

5.4.10 Copestones on the edge of the platform shall be of a non-slip finish.

3. Access for Passengers

5.5 Access for Passengers

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

The Bangladesh's existing standards regarding the Access for Passengers shall be applied, if it can be useful.

5.5.1 The width of accesses for passengers and stairs for passengers shall be at least 1.5 m.

5.5.2 Stairs for passengers shall have one landing every 3 m or so of height.

5.5.3 Stairs for passengers shall have handrails.

4. Barrier—free facilities

5.6 Barrier—free facilities

The architectural buildings shall conform to the following criteria in order to promote aged and disabled persons make easily accessible transportation mobility with convenience and safety.

5.6.1 One or more channels that connect station entrance and platform where the level difference is eliminated by lift or ramp shall be provided.

5.6.2 Dotted blocks shall be installed on the edge of the platform in order to prevent visually impaired persons from falling. This does not apply, however, to a platform provided with platform screen doors, etc.

5.6.3 Lighting facilities shall be provided at passageway and platform.

5.6.4 The lift car shall be provided with a structure that wheelchair can easily change the direction and turn at the place.

5.6.5 Equipment for notifying with sound that the doors of the destination floor and the car itself, and that of shaft will close shall be provided inside the lift car. And equipment for

notifying the direction in which the car is moving with sound shall be provided in the lift lobby.

5.6.6 Passageways and the other facilities that constitute channels between station entrance and platform shall be provided with guidance blocks for visually impaired persons.

5.6.7 Dotted blocks shall be installed on passageways next to the end of staircases, ramps and escalators.

5. Station in a Building

5.7 Station in a Building

In case of a building which has Metrorail station with own land, station facilities and access for passengers shall conform as follows,

5.7.1 Design standards of its building shall be applied the Bangladesh's existing standards.

Note, in cases which the railway loading may affect, the effects of railway loading shall be considered in reference to 'Design loading' specified in Clause 3.5 of this standard.

VI. STATIONS

1. Station Facilities

6.1 Track Layouts in Stations

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

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

6.1.3 Main tracks must not be branched away outside of the station.

6.2 Platform

Platform shall conform to the following criteria in order to secure passengers, depending upon the train speed, frequency and operational patterns.

6.2.1 The effective length of a platform shall be at least the maximum length from the front-most passenger car to the rear-most passenger car of a train that arrives at, and/or departs from, said platform, and in addition, shall not impede the safe and smooth boarding and alighting of passengers.

6.2.2 Platform width shall not impede smooth boarding and alighting of passengers. The width of the platform shall be at least 3 m at the center part and at least 2 m at the end parts in the case where both sides of the platform are used, and at least 2 m at the center part and least 1.5 m at the end parts in the case where only one side is used.

VII. ELECTRIC FACILITIES

1. Electric line facilities

7.1 Contact Lines and Other Facilities

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

7.1.1 Overhead Catenary system

(1) Catenary system shall be simple catenary system or feeder messenger catenary system.

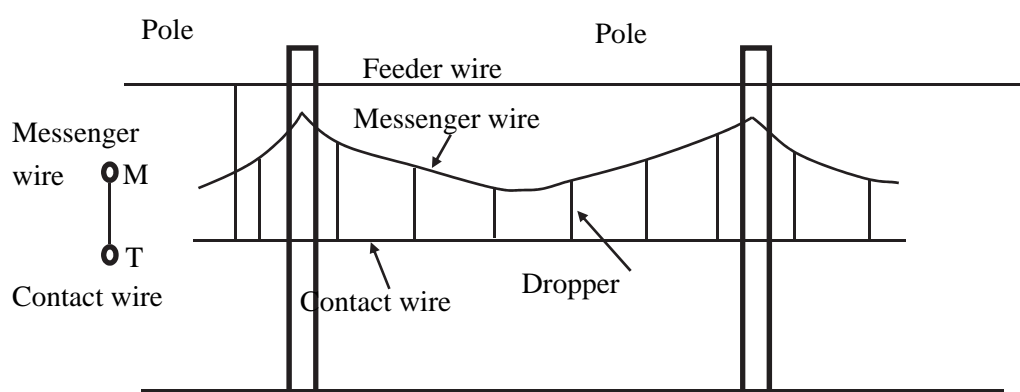


Fig. 7.1 Simple Catenary system

(2) The deflection of single overhead contact lines shall be within 250 mm from the center plane of the track perpendicular to the rail surface in sections using pantographs as current collectors.

(3) The inclination of single overhead contact lines with respect to the rail surface shall be 5/1,000 in the case of suspension of an overhead

7.1.2 Overhead contact line and feeder line shall be installed at an appropriate height depending upon the location, installation method and standard voltage to make them free from of the risk of electric shock or other impediment to train traffic. The height above the rail top of a single overhead contact line on an ordinary railway shall be 5 m as standard, not less as 4.4 m for DC, and not less than 4.8 m in the case of installation at level crossing. Additionally, each height shall be not less than the value obtained by adding 400 mm to the maximum height of all traveling vehicles with the current collector folded.

In tunnel section, the height above the rail top of rigid conductor shall be reduced to the numerical values specified. In the cases of (1) and (2) below, values of 400 millimeters in the item 7.1.2 may be shortened 250 millimeters (150 millimeters in the case of procedures to avoid cutting off the load current through pantographs on DC overhead contact wires)

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

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

7.1.3 Contact line shall be withstood the predictable maximum wind pressure load, tension of electric wire, etc. and also shall be installed appropriately to collect electricity without any impediment according to the train speed and feeder system.

7.1.4 Contact line and feeder line shall be installed in such a manner as to prevent failures caused by an inadvertent contact or confusion with other contact line or feeder line that differs in standard voltage, frequency and so on.

7.1.5 The voltage of contact line shall be maintained at sufficient level to guarantee adequate train operations. The voltage of contact line shall be 1,500V as standard, maximum voltage shall be 1,800V and minimum voltage shall be 900V as standard.

7.2 Proximity or Crossing of Overhead Electric Lines, etc.

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

7.3 Division of Insulation of Contact Lines

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

7.4 Prevention of Troubles at over bridge, etc.

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

7.5 Installation of Return Current Rail

Rail for return current shall be installed in such a manner as to configure the sufficient electric circuit for return current and also to minimize the leakage current from the rail to the ground.

7.5.1 Return circuit rails shall be electrically connected at joints using bonding or similar,

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

7.6 Transmission and Distribution Line Routes

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

7.6.1 Overhead transmission line and overhead distribution line shall be installed at an appropriate height to eliminate the possibility of electrocution and other impediment to traffic. The height of overhead transmission/distribution lines shall be as follows.

(1) In the case of spanning a railway or track, the height shall be not less than 6 m above the rail top.

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

(3) In the case of spanning a level crossing, the height shall be not less than 6 m above the level crossing surface.

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

7.7 Measures to Prevent Lightning Damages, etc.

Protective measures and equipment against lightning damages shall be installed to those vulnerable locations deemed necessary from the security standpoint, such as at contact line and feeder line together with their accessories, as well as overhead transmission and distribution lines. This rule does not apply, to the area that are less susceptible of lightning damages.

7.8 Prevention of Induction Damage

When contact line, feeder line, transmission line and distribution line are installed, distance among each other shall be increased, or protective devices shall be installed in order to seclude the influence of inductive interference from them.

2. Substation and Other Facilities

7.9 Equipment at Substations, etc.

Substation, distributing station and switching station (hereinafter referred to as "substation, etc.") shall be constructed in the manner to exclude unauthorized persons.

7.9.1 Substations, etc., shall be equipped with appropriate devices and fire extinguishers to protect equipment, contact lines and other facilities at a time of emergency. It is not necessary, however, to install any fire extinguisher at substation, etc., where there is no risk for fire.

7.9.2 The capacity for transformers to be used for train operation shall be sufficient to withstand the anticipated load.

7.9.3 Monitored substations (meaning automated, remotely controlled and monitored substations, and portable substations without stationary operators) and switching stations shall be provided with a control post with the surveillance and control equipment, and shall be able to deal with any accident, disaster and failure.

3. Electrical Equipment and Other Facilities

7.10 Electrical Equipment, Power Distribution Board and Others

Electric equipment, power distribution board and other relevant equipment shall be installed to be free from the risk of electric shock and fire.

7.11 Lead and Distribution Line, etc.

Lead line (excluding the line to be installed outside the exclusive right of way) and distributing line shall be installed in the manner to be free from electric shock and fire, impediment to other traffic and damage to other structures, depending upon the location and type of installation, and the voltage.

7.11.1 Appropriate devices shall be installed to the critical locations from the safety and security need, to protect the electric line and equipment from grounding or short circuit faults.

7.11.2 Overhead ground wires to be installed to the contact line as protection for lightning or for other purposes shall have the strength to withstand the anticipated maximum wind load and the tensile strength of the electric line.

4. Miscellaneous Provision

7.12 Insulation of Electric Route etc.

Insulating performance of the electric line and equipment shall be able to withstand the danger from the insulation damage, taking the abnormal voltage at the time of fault into consideration.

7.13 Grounding of Electric Facilities

At critical locations of electric facilities, effective grounding shall be provided to prevent electrocution and fire caused by the abnormal elevation of electric power and invasion of high voltage, etc.

VIII OPERATION SAFETY FACILITIES

1. Railway Signaling Facilities

8.1 Devices to Ensure Block, etc.

Devices to ensure a block shall be capable of providing the signal aspect that comply with the condition of the block sections on the route or assuring the block.

8.1.1 The devices to ensure the interval between trains shall be capable of retarding or stopping the speed of the relevant train, by continuously controlling it according to the intervals with other trains/cars and track conditions on the route.

8.2 Railway signal devices etc.

Structure providing method and installation of railway signals shall be free from the chance of misrecognition.

8.2.1 Signal device shall be appropriately installed to let the train/car decelerate or stop according to the speed instructed by its aspect before it comes to the front end of the section to be protected by the signal

8.2.2 To secure safe train/car operation signal indication devices shall be installed at intersections or junctions or other vulnerable locations that could cause collision or derailment.

8.3 Apparatus to Interlock Signals, etc.

At intersections or junctions or other vulnerable locations that are susceptible to collisions or derailment, interlocking apparatuses shall be installed to coordinate signals, turnouts on the route and other comparable facilities, in order to prevent collision and to secure safe train operation.

8.3.1 The remote control device to the aforementioned apparatus shall be able to display necessary information to secure safe train operations, including but not limited to where trains are located and whether the route is open or not.

8.4 Apparatus to Automatically Decelerate or Stop Trains

In the case when trains are operated by the block system, apparatus to automatically decelerate or stop trams depending upon signal aspects and line conditions shall be installed, This does not apply, however, to those cases where safe train operation will not be jeopardized from the standpoint of operational and route conditions.

8.5 Devices for automatic operation

Apparatus for automatic train operation to be installed for an unmanned train (without a driver) unit shall comply with the following standards.

8.5.1 A train shall not be able to be departed until after confirming the safety of all passengers getting on and off the train.

8.5.2 A target speed shall be set below the operating speed indicated by the control information from the apparatus that are ensuring train intervals and the train speed shall be controlled smoothly.

8.5.3 A train shall be stopped smoothly at the location which would not interfere with passengers getting on and off

8.6 Apparatus to Detect Trains, etc.

Apparatus to detect trains (limited to those needed from a safety standpoint) shall be able to detect trains without failure, by preventing an impediment caused by inductive interference, etc.

8.6.1 If the boundary is set for the area to be detected by the aforementioned apparatus to detect, the boundary shall be drawn at the location where there is no danger for trains to collide.

2. Safety Communication Facilities

8.7 Safety Communication Facilities

In order to communicate or exchange information quickly to each other or among themselves, safety communication facilities shall be installed at station and halt, power substations, and traffic control centers ,electric power dispatching stations and other location deemed necessary from the safety and train operational standpoints.

8.7.1 Safety communication facilities to be located between power dispatch and traffic control center, between electric power dispatch and substations, between traffic control center and stations and between stations that handle blocks or hold preliminary discussions on the direction of train operation shall have dedicated lines.

8.8 Installation of Overhead Communication Line

Overhead communication lines shall be installed with an appropriate height so as not to impair with other transportation movement.

8.8.1 Overhead communication lines shall be installed properly not to pose hazard to people and other equipment, and at the same time to prevent the damages caused by electric mixture and lightening hazard.

The height of overhead communication lines shall meet the following requirements:

- (1) In the case of spanning a railway or a track, the height shall be not less than 6 m above the rail top.
- (2) In the case of spanning a road, the height shall be more than 5.5 m above the road surface.

3. Level Crossing Protection Facilities

8.9 Level Crossing Protection Facilities

Level crossing safety facilities shall be able to warn the danger of approaching train to people going across level crossings, and to block the street traffic into the crossing to secure the safety for both train and people. However, for those exceptional cases where the traffic volumes at the crossing is minimal or where it is extremely difficult from the technological standpoint to install the device to shut the street traffic, warning device fan approaching train suffices as protection.

8.9.1 Level crossing safety facilities shall take into consideration the train speed traffic volume of both rail and road, the type of vehicles that go across the crossing and so on, if necessary safety facilities shall include the device to let relevant trains etc., be informed of any automobile interfering with the crossing.

4. Miscellaneous Provision

8.10 Securing Safety When in Troubles

Those facilities to secure safe train operation shall be equipped with the function, according the performance characteristics of its electric equipment and circuit not to interfere with safe train operations even at the time of failure.

5. Other Facilities

8.11 Devices for recording the operating condition of trains

For trains operation control centers or other necessary places, event recorders to record train operation shall be installed.

8.11.1 The "Device for recording the operating condition of trains" shall be capable of recording the following items. However, this does not apply when the maximum train operating speed is 40 km/h or less or when the recording of the necessary information is difficult due to structure.

(1) Basic information relating to train operation

1) Time

2) Position (including when calculated from speed and time)

(2) Recording of communications between operating dispatch center and driver, etc.

1) Voice

2) Time

8.11.2 The recording of 1.1 shall be capable of recording the amount for the most recent one day or more.

IX. ROLLING STOCK

1. Rolling Stock Structure

9.1 Rolling Stock Gauge

9.1.1 A Metrorail Operator shall comply with the rolling stock gauge on a straight track as shown in Figure 9.1. The rolling stock shall not exceed that rolling stock gauge.

9.1.2 The “rolling stock shall not exceed the rolling stock gauge” in 9.1.1 means the rolling stock shall not exceed the rolling stock gauge in the following conditions.

(1) On a flat, straight track, the rolling stock (including with the wheels, etc. worn), is in the stopped state with the center line of the car body and bogies align with the center line of the track.

(2) The load condition is between the empty condition and the maximum load condition.

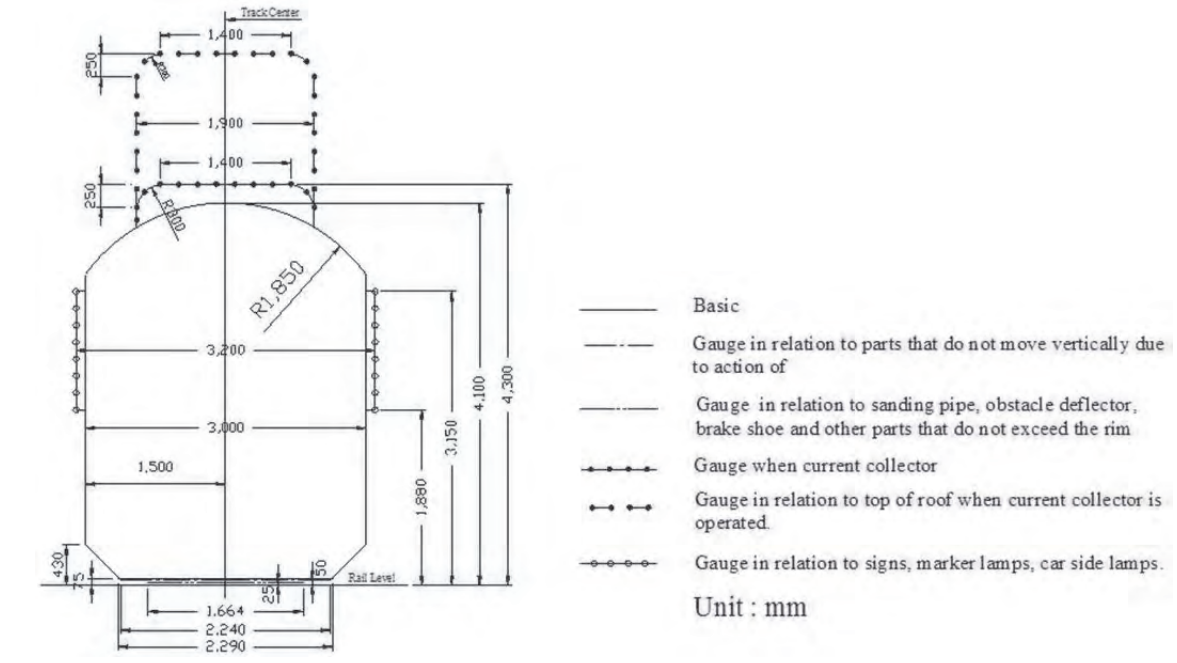
(3) The car body and bogies are not tilting due to passengers or loaded material.

9.1.3 The relevant devices in the following table may, within the range of the various conditions, exceed the rolling stock gauge.

Table 9.1

Device	Conditions
Wheels, track lubricator	When parts are within the structure gauge
Obstacle deflector	When movable parts are within the structure gauge
Doors	When open
Track measuring wheels, rail inspecting equipment, rail grinding equipment and structure gauge measuring equipment	When in use within structure gauge

9.1.4 The rolling stock gauge on a curve shall have the relative values corresponding to the displacement of the rolling stock added to each side of the rolling stock gauge presented in 9.1.1.



Gauge	Height	Width	Note
<u>Basic Gauge</u>	4100mm	3000 mm (over 430 mm in height)	Depend on figure

Fig. 9.1 Rolling Stock Gauge

9.2 Weight of Rolling Stock

Rolling stock shall not impose the impact that exceeds the capacity of track and structure. The rolling stock weight per one pair of wheel shall be maximum 16t in the stopped and loaded state. The conditions to calculate loaded state shall be decided by Metrorail Operator.

9.3 Car-body material

The aluminum alloy or stainless steel shall be used as a main material of rolling stock car body structure.

9.4 Stability

9.4.1 Rolling stock shall be capable of ensuring stable travel even under the conditions indicated below.

- (1) Passenger loading conditions, etc. (From empty car to maximum load capacity)
- (2) Travel conditions (Travel speed, acceleration, deceleration, etc.)
- (3) Wheel wear, etc.

(4) Atmospheric conditions, such as wind, rain, etc. (however, does not include times of disaster)

9.4.2 The rolling stock, when stopped on a curved track, shall not be tipped over by forces acting on the inside of the curved track. Moreover, the rolling stock, when passing through a curve at high speed, shall not be tipped over by forces acting on the outside of the curved track.

9.5 Wheel load balancing of rolling stock

The appropriate ratio of wheel load balance of rolling stock (the ratio which divided the wheel load acquired by one-half the axle load, when the car is empty) shall be determined and the rolling stock shall be managed by this ratio. In addition, the rolling stock shall have a structure by which adjustment of the ratio of wheel load balance can be easily performed. For example, the target of the ratio of wheel load balance at the same axle shall be within 15%.

9.6 Running Gear of Rolling Stock, etc.

Running gear, etc., shall comply with the following standards:

9.6.1 The wheels of a running rolling stock shall not damage the track;

9.6.2 The axles shall be arranged appropriately without imposing any problem for a train to negotiate the curve of the minimum radius of the line on which it is supposed to run;

9.6.3 The suspension devices shall have sufficient capacity and stability against shock from the track and when a suspension device with air springs is used, it shall be as follows:

(1) Air reservoirs with sufficient capacity shall be provided;

(2) The car body shall be safely supported even if an air leak of significantly affecting spring characteristics were to occur;

9.6.4 The front part of the leading car of a train shall be equipped with the device to remove any obstacle left on the top of the rails;

9.6.5 In addition to the paragraphs prescribed above, the running gear, etc., shall be made robust with sufficient strength and shall be able to secure safe and stable vehicle operations.

9.7 Traction Power Generation and Related Equipment

9.7.1 The traction power generation and related equipment shall conform to the facilities and shall have a structure that is capable of generating and transmitting sufficient power to satisfy operating conditions. In this case, the "traction power generation system" shall include all of the following devices:

(1) Devices that generate the power for running (in case they have electric braking device including electric braking force);

(2) Devices that transmit the power that has been generated;

(3) Devices that directly control the extent of the power to be generated;

(4) Current collection devices;

(5) Auxiliary power supply devices necessary for the generation of main power, such as auxiliary power supply equipment and auxiliary rotating equipment, etc.;

(6) Equipment electrically or mechanically connecting the above-referred devices.

9.7.2 The electrical circuits for the electric facilities for the rolling stock shall be as indicated below.

(1) The function and structure of the electric facilities (including electric wires) shall be as shown below:

1) There shall be no risk of electrical shock or fire due to the breakdown of insulation, etc.

2) There shall be no risk of being easily touched by persons other than the operator;

3) Electric wires shall be as shown below;

(a) Sections that may be damaged by sliding, vibration, etc., shall be protected.

(b) There shall be no risk of rain water entering into the service inlet ports and service outlet ports for protective piping and equipment.

(c) Wires with different voltages shall not be inserted into the same protective piping. However, this does not apply to the wiring in the said protective piping when the wires being used have an insulating effect that is equal to or better than the standard for the insulated wire with the highest one of the voltages being applied to the said wires.

4) There shall be no risk of other electric circuits being affected by induction effect (limited to facilities provided for use by a Metrorail Operator and items provided on the rolling stock).

5) The pantograph shall have the tracking performance for the contact line on the section of the electric railway where it will be used, and shall be as shown below:

(a) On electric cars comprising a train, the pantograph shall be capable of being completely lowered all together by an operation from the crew cabin;

(b) The mounting part for the pantograph on passenger trains operating on sections of track electrified by direct current shall have double insulation;

(c) The pantograph on rolling stock shall be capable of being raised by mechanical force, such as by springs. Here, mechanical force includes that generated by pneumatic pressure;

(2) The following devices shall be provided on the main circuit:

1) An automatic circuit breaker and a manually operated cut-off switch capable of maintaining the circuit in the open position shall be provided near the current collector device. However, this does not apply to rolling stock receiving its power supply by way of the said circuit from another car having a circuit provided with the automatic circuit breaker and cut-off switch.

2) Electric railcars, etc., equipped with pantographs shall be provided with an arrester at a location near the pantograph;

(3) The following devices shall be provided on the power supply side of electric circuits other than the main circuit:

1) Fuses (including non-fused circuit breakers, etc., having equal or greater performance.)

However, this excludes rolling stock receiving its power supply by way of the said circuit from another car having a circuit equipped a fuse;

2) Switches on power supply circuits for electric conversion devices such as electric generators, static inverters, etc., and motors for pneumatic compressors, etc. However, excluding the power supply circuits for electric motors, etc., of air compressors receiving their power supply from electric power conversion devices equipped with switches.

9.8 Brake Devices

9.8.1 Rolling stock shall be equipped with the brake devices that comply with the following items:

- (1) Shall be able to decelerate or stop the rolling stock without failure;
- (2) Shall be applied to all the consisted cars in conjunction with the control from the crew cabin;
- (3) Shall be free from failure caused by vibration, impact and other factors;
- (4) Shall be able to apply braking force continuously;
- (5) Shall be applied automatically at the time when consisted vehicles are separated;
- (6) Shall be able to bring a train to a rapid stop;
- (7) Shall be able to prevent the train from departing when the braking effort would be adversely affected without securing the braking power supply source;

9.8.2 In addition to the aforementioned devices, rolling stock shall also be equipped with the braking devices that comply with the following items:

- (1) Shall be capable of preventing rolling of the parked vehicles from moving and complying with the previous item 9.8.1. (3). This does not apply, however, for those cases when a rolling stock is prevented from rolling by being fixedly coupled to other rolling stock;
- (2) Shall be equipped with independent braking capability that can be utilized when the brake devices mentioned in the previous paragraph would fail and can also satisfy the standards of the item 9.8.1 (1), (3) and (4) of the previous paragraph;

9.8.3 The types of rolling stock brake devices are as shown below and brake device corresponding to the type of rolling stock as shown in the following table 9.2 shall be provided.

- (1) "Service brake device" is the brake device usually used for braking the rolling stock during operation and it has a function that enables the rapid stopping of the rolling stock during operation.
- (2) "Parking brake device" is the brake device for preventing the parked rolling stock from rolling.
- (3) "Security brake device" is the brake device used for braking the rolling stock during operation when the service brake device has failed.

Table 9.2

Type of Rolling Stock		Type of Brake device To be Necessarily Provided		
		Service	Parking	Security
Electric Cars	Without cab	✓		✓
	With cab	✓	✓	✓

Note : When the security brake can prevent the parked rolling stock from rolling, the parking brake can be eliminated.

9.8.4 There shall be no risk that vibration, shock, etc., will impede the operation of the equipment, piping and braking function of the brake device on the rolling stock.

9.8.5 The function and performance, etc., of the service brake shall be as shown below:

(1) The service brake shall be capable of decelerating the traveling rolling stock, stopping it and maintaining it in the stopped condition.;

(2) There shall be a function that applies braking force to all wheels of the rolling stock.

(3) The braking force shall be according to the brake ratio and the loaded car brake ratio (the ratio of total force acting on the brake shoes to the weight of the loaded cars) shall be 70/100 or more.

(4) When the air is used as the source of operating power, the following shall apply:

1) The air tank shall have the capacity for storing sufficient pressure for braking;

2) When there is the risk that a reduction in pressure in the main air reservoir or a reduction in pressure in the brake piping will impede the braking effect, there shall be the mechanism that will not enable departure.

3) The equipment and air piping (except being installed in the interior, hereinafter the same) in the section from the final air tank (including the check valve on the main air reservoir side, hereinafter the same) used to supply braking force to the brake cylinders shall be arranged within the width of the bogie (including the bolster anchor and other main parts provided on the bogie). However, this does not apply when the equipment and air piping is protected by some means having suitable strength;

4) On the rolling stock having a driving cab (of the crew cabins, this is defined as the cabin stationed by the person who drives the motive power vehicle and performs the control of powering, braking, etc. Hereinafter the same.), the equipment and brake piping in the section from the final air tank, serving as the supply for braking force for the cab that will become the front part of the leading car of a train, to the brake cylinder shall be arranged to the inside of the front end of the underframe. However, this does not apply when the equipment and air piping is protected by some means having suitable strength.

(5) When the hydraulic pressure is used as the source of operating power, the following shall apply:

1) The accumulator shall have the capacity for storing sufficient pressure for braking;

2) When there is the risk that a reduction in pressure will impede the braking effect, there shall be a structure that will not enable departure;

3) In the driving cab, it shall be possible to confirm that the supply source for the braking force of rolling stock is normal;

4) The equipment and hydraulic piping (except being installed in the interior. Here in after the same.) in the section from the final accumulator used to supply braking force to the brake cylinders shall be arranged within the width of the bogie (including the bolster anchor and

other main parts provided on the bogie). However, this does not apply when the equipment and air piping is protected by some means having suitable strength;

5) On the rolling stock having a driving cab, the equipment and brake piping in the section from the final accumulator serving as the supply for braking force for the cab that will become the front part of the leading vehicle of a train to the brake cylinder shall be arranged to the inside of the front end of the underframe. However, this does not apply when the equipment and air piping is protected by some means having suitable strength.

9.8.6 The function and performance, etc., of the parking brake device shall be as shown below:

- (1) "Parking brake device" shall have performance that is equal to or higher than the manual brake device, car side brake device and others that are used for preventing the parked rolling stock from rolling;
- (2) The braking force shall be according to the brake ratio and shall satisfy the values in the following table that correspond to the type of brake.

Table 9.3

Type of brake	Empty vehicle brake ratio	Calculation conditions
Hand brake device	20/100	The force for operating the handle shall be 294 N for a handle operated by one hand and 441 N for handle operated by both hands. Braking leverage shall be 1200 or less.

Note : The empty vehicle brake ratio means the ratio of total force acting on the brake shoes to the weight of the empty vehicle.

9.8.7 The function and performance, etc., of the security brake device shall be as shown below:

- (1) The security brake device shall stop the traveling rolling stock when the service brake device has failed and shall be capable of maintaining the stopped condition for the necessary period;
- (2) The security brake device shall automatically activate when the service brake device has failed. However, this does not apply when the driver and conductor can operate this device from the driving cab and conductor's cabin (this means a crew cabin other than the driving cab for 9.8.5. (4). 4). Hereinafter the same.);
- (3) The braking force shall correspond to the empty vehicle brake ratio of 70/100 or more;
- (4) When the air is used as the source of operating power, the following shall apply;
 - 1) The air tank shall have the capacity for storing sufficient pressure for braking;
 - 2) The equipment and air piping in the section from the final air tank serving as the supply source for braking force to the brake cylinder shall, as far as possible, be independent from other equipment and air piping;

3) The equipment and air piping in the section from the final air tank serving as the supply source for braking force to the brake cylinder shall be arranged to the inside of the width of the bogie frame. However, this does not apply when the equipment and air piping is protected by some means having suitable strength;

4) On the rolling stock having a driving cab, the equipment and brake piping in the section from the final air tank serving as the supply for braking force for the cab that will become the front part of the leading car of a train to the brake cylinder shall be arranged to the inside of the front end of the underframe. However, this does not apply when the equipment and air piping is protected by some means having suitable strength.

(5) When the hydraulic pressure is used as the source of operating power, the following shall apply;

1) The accumulator shall have the capacity for storing sufficient pressure for braking;

2) The equipment and hydraulic piping in the section from the final accumulator serving as the supply source for braking force to the brake cylinder shall, as far as possible, be independent from other equipment and air piping;

3) The equipment and brake piping in the section from the final accumulator serving as the supply for braking force to the brake cylinder shall be arranged to the inside of the width of the underframe. However, this does not apply when the equipment and air piping is protected by some means having suitable strength;

4) On the rolling stock having a cab, the equipment and brake piping in the section from the final accumulator as the supply for braking force for the cab that will become the front part of the leading vehicle of a train to the brake cylinder shall be arranged to the inside of the front end of the underframe. However, this does not apply when the equipment and air piping is protected by some means having suitable strength.

9.8.8 A continuous brake for rolling stock shall be provided on the brake device for coupled and operated rolling stock and its functions shall be as shown below:

(1) The continuous brake shall act with being interlocked by operation from a crew cabin in the consisted rolling stock;

(2) The brake shall act automatically when the consisted rolling stock is separated;

(3) When coupling the rolling stock provided with brake devices, there shall be coupling of the main air tank piping (when there is no main air tank piping, the brake pipe). However, this does not apply if it is possible to confirm in the driving cab that the pressure in the main air reservoir of all the rolling stock in the consisted train is normal.

9.8.9 The brake functions for rolling stock operated with a single vehicle that has driving cabs at both ends shall be as shown below:

(1) The brake device for passenger electric vehicles and for passenger internal combustion vehicles that have driving cabs on both ends and travel as a single vehicle shall have one of the following mechanisms in addition to the stipulations in 9.8.1 through 9.8.8

- 1) Two sets of independent brake systems shall be provided for the section from the air tank supplying the source of the braking force for the air brakes for the service brake device and the security brake device to the brake cylinder;
- 2) There shall be dual air tanks and check valves for the security brake device, and by arranging the check valves so that they are on the right and left of the rolling stock it shall be possible to ensure the brake function of either the front or rear bogie;
- 3) By using some method such as rail brakes other than air brakes, it shall be possible to ensure performance of 35/100 or more at the empty vehicle brake ratio when the service and security brakes have failed, and it shall be possible to maintain the rolling stock in the stopped condition.

9.9 Structure of Car Body

9.9.1 Rolling stock car body shall be made sturdy with enough strength and be capable of withstanding train operation.

9.9.2 Facilities to prevent passengers on the platform from falling into the gap between coupled cars shall be provided at the coupling portion (limited to portions coupled at all times) of railway rolling stock. However, this shall not apply to cases where facilities are in place on the platform to prevent passengers from falling into the gap.

9.10 Structure of Driver's Cabin

9.10.1 Driver's cabin shall be separated from passengers in order for the driver not to be disturbed, and shall be provided with exclusive entrance and exit as the train operation is not interfered with.

9.10.2 Window of a driver's cabin shall be able to provide the view necessary for driving. The front window shall also have sufficient strength to protect a driver from gravel, wind pressure and other objects.

9.10.3 Driver's Cabin structure shall be as shown below.

(1) The driver's cabin shall be partitioned from the passenger room.

(2) Notwithstanding (1), cabs that may not be staffed by a crew member shall have a structure that provides a door, etc., partition so that passengers cannot easily contact the equipment provided in the cab, or shall have a structure whereby the same devices, etc., that can be mechanically or electrically locked.

(3) The exterior entrance/exit for the driver's cabin shall be as shown below.

1) An exterior entrance/exit for the crew shall be provided. However, this shall not apply to rolling stock that enables the crew to easily enter/exit through the passenger room, etc.

2) The door of an entrance/exit on the side of the rolling stock shall be an inward-opening hinged door or a sliding door. However, when the door only opens to the cab, and when a device is provided to indicate this, an outward-opening door may be used. When an outward-opening door is used, a gap of 75 mm or more shall be maintained between the opened door and the structure gauge.

(4) On passenger cars having a driver's cab, an entrance/exit with a sliding door or hinged door structure shall be provided between the driver's cab and passenger room, etc. In this case, when a hinged door is to be used for evacuation in the event of emergency, it shall open into the driver's cab, or be capable of opening in both directions.

9.10.4 Driver's cabin windows shall be as shown below.

(1) A window having the necessary visibility for operation shall be provided on the front surface of the cab and a wiper device, etc., shall be provided to ensure visibility during rain, etc.

(2) Glass, or other material having equal or better performance, that can withstand the wind pressure from the operating travel speeds and climatic conditions, that can ensure operator visibility even when damaged by a small stone, bird or other flying objects, and that cannot be easily penetrated, shall be installed in this window. In this case, JIS R 3213 safety glass, are examples of conforming glass that cannot be easily penetrated.

(3) Windows necessary for operation shall be provided on both sides of driver's cabin. In this case, the windows on both side surfaces (when the conductor's room is provided on one side of the rolling stock, which side) that are to be used by the conductor shall be capable of being opened and closed.

9.11 Structure of Passenger Car

9.11.1 Passenger room structure shall be as shown below.

(1) Windows shall be as shown below.

1) Shall not be capable of opening to the outside.

2) The height of the bottom border of the opening section (the section that passengers and staff can open, hereafter the same) from the floor surface shall be as follows.

(a) Window at the side surface of seat or behind a seat: 800 mm or more.

(b) Window facing an aisle: 1200 mm or more.

3) Dimensions of opening section (dimension between upper border and lower border) are as shown in the table below.

Table 9.4

	Height from Floor surface	Dimensions of openings		
		General rolling stock	Rolling stock operated on sections where the space between the centerlines of the tracks is narrow. (Note 1)	Rolling stock operated on sections where the space between the structure clearance and rolling stock clearance is small. (Note 2)
Window contacting the side surface of seat or behind a seat	800 mm or more 1200 mm or less	No limit	200 mm or less. However, no limit when there are protective bars, etc., on the window. (Note 3)	150 mm or less However, 250 mm or less when there are protective bars, etc., on the window. (Note 4)
	1200 mm or more	No limit	No limit	No limit
Windows contacting accommodations for standing passengers or an aisle	1200 mm or more 1400mm or less	No limit	200 mm or less. However, no limit when there are protective bars, etc., on the window. (Note 3)	150 mm or less. However, 250 mm or less when there are protective bars, etc., on the window. (Note 4)
	1400mm or more	No limit	No limit	No limit

Note 1: When the maximum width of the rolling stock operating on track sections where the distance between track centers of the main line exceeds the maximum width of the basic limits for the rolling stock gauge by less than 600 mm (excluding signs), excluding rolling stock where the maximum wide has been reduced to 600 mm or less than the distance between track centers of the main track.

Note 2: Rolling stock operated on sections where the space between the structure clearance and basic limits of the rolling stock gauge at the side section is less than 400 mm.

Note 3: Protective bars on the window (including alternative facilities to these, hereafter the same) shall be mounted on the outside of the window and the space between the center of this mounting and the bottom border of the opening shall be in a range from 150 mm to 200 mm.

Note 4: Protective bars on the window shall be mounted on the outside of the window and the space between the center of this mounting and the bottom border of the opening shall be in a range from 100 mm to 150 mm.

4) Window glass shall be safety glass or have performance that is equal to or better than it. In this case, examples of “safety glass” is safety glass in compliance with JIS R 3205 laminated glass, JIS R 3206 reinforced glass or JIS R 3213 safety glass.

(2) One or more wheelchair spaces shall be provided in each passenger train.

9.11.2 Passenger room interior ventilation shall be as shown below.

Table 9.5

	When natural ventilation is used	When forced air ventilation is provided
Normal operation	The total area of the opening for the windows, etc., in the passenger	The forced ventilation device shall have the performance capacity that has been calculated using two times the rated passenger capacity, based on a ventilation volume of 13m ³ per person per hour. (Note 1)
One of the following shall apply in the event of the main power supply being interrupted.	room during normal times shall be 1/20 or more that of the floor area of the passenger room of said rolling stock (Note 1).	One of the following shall apply in the event of the main power supply being interrupted. [1] Be capable of maintaining the function of the forced ventilation device for a fixed period. [2] In addition to the windows in the passenger room, the total area of the openings added for side doors, etc., shall be 1/20 that of the floor area of the passenger room of said rolling stock. (Note 2)

Note 1: When natural ventilation alone or forced ventilation alone cannot satisfy the conditions, it is acceptable to satisfy the conditions by adding/combining each respective capacity.

Note 2: Measures shall be taken at these doors to prevent falling, etc. In addition, limited to when the rolling stock consist is fixed, when the area of the opening for the side sliding doors is added, the total of the surface area of the opening at the gangway connecting adjacent rolling stock may be added to the total for the surface area of openings in said rolling stock, to make [the total surface area of the openings] 1/20 that of the floor area of the passenger room of said Rolling stock. However, in this case, the total of openings for the all rolling stock in the fixed consist shall be 1/20 that of the floor area of the passenger room of the entire consist for said rolling stock.

9.11.3 Lighting shall be as shown below.

- (1) Appropriate lighting devices shall be provided.
- (2) Auxiliary lighting devices that will automatically come on in the event of the main power supply being interrupted shall be provided. However, this shall not apply to lighting devices that do not go out even when the main power supply is interrupted.
- (3) When an auxiliary lighting device (including lighting devices that do not go out even when the main power supply is interrupted) is provided, illumination equal to or exceeding the level that enables the positions of doors or door cocks, etc., to be identified shall be maintained. (The reference standard shall be the brightness of two or more 10-watt incandescent bulbs for each 10 m length of the car.)

9.11.4 Accommodations for standing passengers shall be as shown below.

- (1) Accommodations for standing passengers may be provided [when] limited to the floor space other than the floor space provided for use by dedicated seating.

For example, the standing capacity shall be calculated by dividing the floor area where the effective width not less than 550mm and the effective height not less than 1900mm are secured from which the seat areas and the area of 250mm from the front end of the seats are excluded in the passenger cabin floor area, by the area occupied by a passenger. The calculated value shall be an integer by rounding number after the decimal point. The area occupied by a passenger shall be 0.3 m².

- (2) Hand straps, hand rails and other facilities to ensure the safety of passengers shall be provide.

9.11.5 Seats shall be as shown below.

The passenger car shall be provided with the appropriate number of passenger seats by taking into consideration the application of the rolling stock, the section of track it will use, etc.

For example, the seating capacity shall be calculated by dividing the seat width by the length occupied by a passenger. The calculated value shall be an integer by rounding numbers after the decimal point. The length occupied by a passenger shall be 430mm or more.

9.12 Structure of Passenger Entrance and Exit

9.12.1 Entrance/exits for passenger getting on and off shall be provided on both sides of passenger cars.

9.12.2 The function and structure of entrance/exit for passenger shall be as shown below.

- (1) The effective width of the entrance/exit for passenger getting on and off shall be 1300 mm or more and the effective height shall be 1800 mm or more. However, the effective width for entrance/exits wheelchairs shall be 800 mm or more.
- (2) Entrance/exit for passenger shall have sliding doors or slide-type plug doors.
- (3) The gap between the floor surface of the entrance/exit for passenger and the border of the platform shall be as small as possible within the range that there is no danger of rolling stock travel being impeded.

(4) The height of the floor surface of the entrance/exit for passenger and the height of the edge of the platform shall be as even as possible.

(5) The floor surface of the entry and exits shall have a patterned-indented surface or the material, etc., used for the surface shall be slip resistant.

(6) Facilities shall be provided for audio notification of the side where the door of the passenger entrance/exit is opened and closed.

(7) The step height in rolling stock shall be easily identifiable by means of a large difference in brightness between the color of the edge of the step and that of the surrounding portion, etc.

9.12.3 An automatic door operating device shall be provided for the entrance/exit for passenger getting on and off doors.

9.12.4 The function and construction of the door operating device provided on entrance/exit for passenger getting on and off doors shall be as shown below.

(1) The crew shall be able to perform unified opening or closing operations and confirmation of the open or closed state of the doors.

(2) The operating device shall be capable of being electrically or mechanically locked.

(3) The doors shall have a structure that will not enable them to open even if the lock in (2) is released during travel and the door operating device is set to the release position.

(4) There shall be lamp provided that automatically illuminates when the entrance/exit door for passenger is opened, and this lamp shall be as follows.

1) It shall be provided at the top part on both of the side surfaces of the rolling stock.

2) It shall be red.

3) It shall be easily recognizable from among other lamps.

(5) A device that enables the doors to be manually operated during an emergency shall be provided on the inside and outside of the rolling stock. In this case, the device on the inside shall be capable of being easily operated by passengers. However, this shall not apply to the following rolling stock.

1) In dedicated underground structures, rolling stock traveling on sections of track where the space between the structure gauge and the rolling stock gauge is small.

Note 1: Excluding rolling stock traveling on sections where evacuating from the side of the train is possible.

Note 2: "In . . . underground structure, rolling stock traveling on sections of track where the space between the structure gauge and the rolling stock gauge is small" means that of the passenger cars of an underground railway, these are the rolling stock that travel on section of track where the space between the structure gauge and the basic limit of the rolling stock gauge at the side section less than 400 mm.

(6) For the device in (5) (limited to devices that are installed on the inside of the rolling stock), the location, operating instructions and precautions of the operating device shall be displayed so as to be easily visible by passengers. However, this shall not be displayed in the rolling stock indicated in (5) 1).

9.12.5 Doors at entrance/exits for passengers shall have a structure whereby it is not possible to depart until after the doors are closed.

9.12.6 Doors at entrance/exits for passengers shall take the safety of the passengers into consideration, such as by a structure that reduces the speed of the doors just prior to them closing.

9.13 Structure of Gangway Entrance and Gangways

9.13.1 The dimensions of passageway and gangway facilities shall be as indicated in the following table.

Table 9.6

Type of rolling stock	Required number of passenger ways	Required number of gangways	Effective width of passenger ways and gangways	Effective height of passenger ways and gangways
Passenger cars operating one dedicated car (Of passenger cars used in subways, etc., excluding rolling stock operated on sections where the space between the structure clearance and basic limits of the rolling stock clearance at the side section is less than 400 mm and rolling stock operated on sections of track with third rails.)	0	0		
Passenger car	2	2	600 mm or more	1800 mm or more
Rolling stock that serve as the front-most or rear-most part of the train. Rolling stock with special measures taken (Note)	1	1		
Rolling stock travelling on sections where the space between the structure clearance and basic limits of the rolling stock clearance at the side section is less than 400 mm.	2	2		
Rolling stock or more operating as dedicated single car	2	0		
Rolling stock that serve as the front-most or rear-most part of the train.	2	1		

Note: "Rolling stock with special measures taken" means when any one of the following measures has been taken for the rolling stock of the coupled sections when the rolling stock on a passenger train is comprised of coupled consists of two or more cars.

(a) When there is a crew member (hereafter, the security crew member) in each of the coupled trains that can provide guidance and evacuate passengers in the event of an emergency.

(b) When there is a security crew member in either of the coupled trains, and there is a function provided on the emergency communication devices in all rolling stock forming said passenger train that enables communication between passengers and the security crew member.

9.13.2 Passage way and gangway structure shall be as shown below.

(1) The following door that is capable of being securely closed during normal times shall be provided at the passageway at the front end that will serve as the front-most part of the train or at the rear end that will serve as the rear-most part of the train.

1) When this is a hinged door, it shall be capable of maintaining the released condition when it is on the coupled side.

2) If it can be easily touched by passengers, it shall have a construction that will not cause a dangerous condition when inadvertently operated by a passenger.

(2) Other than when the door indicated in 9.13.2 (1) is provided, this shall be a sliding door.

(3) A diaphragm and gang plank, etc., shall be provided at a gangway free of substantial differences in height, etc., that would impede passage so as to enable safe passage.

9.14 Couple Device

9.14.1 The couple device for the rolling stock (except connecting bogies and structures similar to that) shall be as indicated below.

(1) Shall be rugged and have sufficient strength to withstand operation.

(2) It shall not release due to vibration and impact.

(3) It shall automatically couple by the tight contact of rolling stock to rolling stock. However, this shall not apply to coupling devices provided on fixed-coupled rolling stock and coupling device for rescue, etc.

(4) It shall have a shock absorbing function. However, this shall not apply to coupling devices provided on fixed-coupled rolling stock and coupling device for rescue, etc.

9.14.2 The air piping coupling device shall not be caused to leak air due to vibration [and/or] impact.

9.14.3 The electric wiring coupling device shall prevent mixed contacts or short circuits due to the ingress of water, vibration [and/or] impact.

9.15 Equipment of a Driver's Cabin

9.15.1 A driver's cabin or crew's cabin shall be provided with the facilities shown in the following table. Moreover, these facilities shall be capable of being easily operated or confirmed by the crew.

Table 9.7

Type of Crew Room	Facilities Provided	
1 Driver's Cab	(1)	Operating devices for control facilities
	(2)	Operating devices for service brake devices
	(3)	Transmitting devices and receiving devices for sign devices and communication devices (limited to rolling stock provided with said equipment)
	(4)	Speedometer
	(5)	Aspect facilities of onboard signal equipment (limited to rolling stock operating on sections of track using onboard signal equipment)
	(6)	Operating device for raising and lowering the pantograph (limited to rolling stock provided with pantograph)
	(7)	Transmitting devices and receiving devices for security communication devices (limited to the said devices provided on the rolling stock)
	(8)	Warning generating devices and transmitting devices for alarm signal facilities
	(9)	Whistle activation device
	(10)	Pressure gauge indicating pressure of main air tank piping
	(11)	Operating devices for front marker lamps
	(12)	Receiving devices for emergency communication devices or device indicating the operating status of an emergency stop device (Limited to rolling stock provided with emergency alarm device or emergency stop device)
	(13)	Door closed confirmation device for entrance/exit for passengers
2 Conductor's room	(14)	Operating devices for service brake devices (Limited to those items for rapidly stopping the rolling stock)
	(15)	Sign devices or transmission devices and receiving devices for communication devices (Limited to rolling stock provided with sign devices or communication devices)
	(16)	Transmission device for onboard public address device
	(17)	Operating device automatic door closing device for entrance/exit for passengers
	(18)	Receiving devices for emergency communication devices or device indicating the operating status of an emergency stop device (Limited to rolling stock provided with emergency alarm device or emergency stop device)

9.15.2 In addition to the above, the following devices shall be provided in the cab.

(1) A device shall be provided that automatically and rapidly stops the rolling stock when the staff person operating the propulsion car become sick, etc. (hereafter, operator abnormality train stop device). However, this shall not apply to rolling stock operated on sections of underground or elevated track with automatic train operation device, automatic brake device or automatic train stop device (limited to devices where there is no danger of the normal speed limited being exceeded).

(2) The operator abnormality train stop device shall not be capable of easily releasing the function manually.

9.15.3 The speedometer shown as table 9.7.(4) in the table in 9.15.1 shall comply with the standard “JIS E 4603 Electric Measuring Speedometers for Railway Rolling Stock” or have performance equal to or better than it.

9.15.4 The transmitting device for the warning signal facility shown as table 9.7 (8) in the table in 1 shall automatically switch to a power supply from a separate electrical source even when the main electric power supply and electrical power supply from the storage battery shown in the Interpretive Criteria relating to Article 9.20 have been interrupted. However, this shall not apply to the following.

(1) When the power supply from storage battery shown in the Interpretive Criteria relating to Article 9.20 is automatically supplied by a separate circuit from the power supply circuit from the main electric power supply and there is no danger of the electrical power supply being interrupted by a collision.

(2) When the storage battery shown in the Interpretive Criteria relating to Article 9.20 is installed inside and there is no danger of the power supply being interrupted by a train collision, etc.

(3) When used in combination with a device that can be used even when the supply from the main electrical power supply and the storage battery shown in the Interpretive Criteria relating to Article 9.20 have been interrupted.

9.15.5 The pressure gauge shown as table 9.7 (10) shall display the regulator inflow pressure and the release pressure. However, this shall also include digital pressure gauges using a different display method when below the inflow pressure and when above the release pressure (meaning a pressure gauge that displays respective pressures intermittently for a preset interval)

9.15.6 The following shall apply to rolling stock traveling on sections of track provided with automatic train stop device, automatic train brake device and automatic train operation device.

(1) Indicator device indicating the operating status of said device and an operating device shall be provided in the cab that is being used for operation.

(2) A release switch for the onboard facilities shall be provided.

(3) The release switch shall not be capable of being operated while the staff member is in the normal operating position, or said switch shall be covered by a switch cover, etc.

9.16 Internal Pressure Vessels and Other Pressure Supply Sources and Other Accessories

9.16.1 The following shall apply for the pressurized vessels and its attached device.

(1) A safety valve shall be provided at the main air tank or at a location near to where the air piping connects to the said air tank.

(2) The main air tank shall be provided with a drain cock (this shall include a drain plug on the main air tank that receives its air supply from a compressor provided with a desiccant filter unit) or an automatic drain device. In addition, of the drain cocks indicated above, a protective device shall be provided on those for which there is the danger of damage due to impact from a foreign object during operation.

(3) The pressurized vessels and its piping shall be mounted so as to be protected from damage due to vibration or shock.

(4) Pressurized vessels shall be provided in a place where it is easy to inspect.

9.16.2 Rolling stock equipped with an air compressor shall be provided with a regulator. However, when two or more air compressors are installed on a train and they are connected by air piping, it is acceptable not to provide a regulator with each compressor.

9.16.3 The following shall apply for the accumulator and its attached device.

(1) A safety valve shall be provided at the accumulator or at a location near to where the hydraulic piping connects to the said accumulator.

(2) The accumulator and its piping shall be mounted so as to be protected from damage due to vibration or shock.

(3) Accumulators shall be provided in a place where it is easy to inspect.

9.16.4 A hydraulic pump shall be provided with a regulator.

9.17 Rolling stock Accessory Devices

9.17.1 Rolling stock shall be equipped with the following attached devices.

(1) Sign device:

(2) Communication device:

(3) Whistle device:

(4) Public address system:

(5) Emergency alarm Device:

(6) Emergency stopping device:

(7) Marker light:

(8) Onboard guidance equipment

(9) Destination guidance devices

9.17.2 The following shall apply the sign device.

(1) A sign device shall be provided on rolling stock on which the departure sign is performed by the conductor.

(2) Transmission and receiving shall only be performed reciprocally among crew members.

(3) It shall have a structure in which the function cannot be easily cancelled by the decision of the receiver.

9.17.3 The following shall apply the communication device.

(1) A communication device (including a portable communication device) shall be provided on passenger trains. However, this does not apply to rolling stock operated as a single car.

(2) Transmission and receiving shall only be performed reciprocally among crew members. However, this does not apply when it has a function that gives priority to reciprocal communication among crew members and will not impede crew member communication.

(3) It shall have a structure in which the function cannot be easily cancelled by the decision of the receiver.

9.17.4 At the front part of the first car of trains shall be provided a whistle device that has sufficient volume capable of warning danger.

9.17.5 An onboard public address device shall be provided that enables guidance information to all rooms on passenger cars.

9.17.6 The following shall apply the emergency alarm device.

(1) An emergency alarm device shall be provided on passenger cars. However, this does not apply to the rolling stock provided with an emergency stop device.

(2) The transmission device of the said device shall be provided in the room of passenger cars provided with an emergency alarm device.

(3) The location and operating instructions shall be displayed at the emergency alarm device or near to it so as to be easily visible by passengers.

(4) It shall not be possible to manually cancel the function.

(5) On passenger cars provided with an emergency alarm device, a lamp shall be provided that automatically lights on when the said device is operated. However, this does not apply when the location of the emergency alarm device that has been operated can be confirmed by the crew in the driver's cab and conductor's room.

(6) The lamp in (5) shall be provided at the top part on both of the side surfaces of the rolling stock and shall be easily distinguished from other lamps (except lamps that automatically light on when the emergency exit is opened and when emergency stopping device are operated).

9.17.7 The following shall apply the emergency stopping device.

(1) The operating device for the emergency stopping device shall be provided in the room of passenger cars provided with an emergency stopping device.

(2) The location and operating instructions shall be displayed at the emergency stopping device or near to it so as to be easily visible by passengers.

(3) It shall not be possible to manually cancel the function.

(4) On passenger cars provided with an emergency alarm device, a lamp shall be provided that automatically lights on when the said device is operated. However, this does not apply when the location of the emergency stop device that has been operated can be confirmed by the crew in the driver's cab and conductor's room.

(5) The lamp in (4) shall be provided at the top part on both of the side surfaces of the rolling stock and shall be easily distinguished from other lamps (excluding lamps that automatically

light on when the emergency exit is opened and when an emergency communication device is operated).

9.17.8 The following shall apply for marker lights.

(1) White-color front marker lights shall be provided at a symmetrical position to the center surface of the rolling stock on the front surface of rolling stock having a driver's cab. Furthermore, at night, it shall be possible to confirm that the lights are on from the front of the rolling stock, and shall be possible to reduce the light intensity or changing the direction of the light beams downward.

(2) Rear markers shall be provided on the rear surface of the rolling stock of the rear end part of the last car of a train. The rear markers should be red lamps and shall be capable of shining from the rear of the rolling stock at night.

(3) The rear marker lights on the front surface of the rolling stock and front marker light on the rear surface of the rolling stock shall not provide confusing lamp lights.

9.17.9 In the passenger car, Equipment for displaying by characters, etc., and equipment for audibly providing the name of the next station the train is going to stop at and other information relating to the operation of the train must be provided.

9.17.10 The destination and type of service of the train must be clearly displayed on the side of the car body. However, this shall not apply when the destination and type of service are clearly known.

9.18 Rolling Stock Indication

9.18.1 Rolling stock shall have indication necessary to be properly identified. The indication for rolling stock shall be as shown below.

(1) Rolling stock shall have the indication such as code, number, etc., in order to identify individual rolling stock.

9.19 Countermeasures against Rolling Stock Fire

9.19.1 The countermeasures against rolling stock fire shall be as shown below.

(1) The countermeasures of wiring, equipment, etc., against rolling stock fire shall be as shown below.

Table 9.8

Wiring	Items near to or connected to equipment for which there is the danger of arcs or heat being generated.	Cover with extremely flame retardant material (including incombustible material, hereinafter the same.)
	Other than the above	Cover with extremely flame retardant material (including incombustible material, hereinafter the same.). However, this does not apply to items for which there is no danger of mixed contact or shorting.
Electrical Equipment	Equipment for which there is the risk of arcs or heat being generated.	Shall isolate from, walls, etc., and as necessary provide insulation and incombustible heat-resistant plate between them.

(2) The countermeasures against rolling stock fire for passenger cars shall be as shown in the following table

Table 9.9

Part		General Passenger Cars
Roof	Roof (Note 1)	Metal or equal to or better than the incombustibility of metal(Note 2)
	Roof top surface	Shall be covered with a flame retardant insulating material (limited to passenger trains that travel on sections of track with electrified overhead contact line)(except extremely high voltage contact lines)
	Equipment and hardware mounted to the roof	The mounted part shall be insulated from the car body or shall be covered with a flame retardant insulating material (limited to passenger trains that travel on sections of track with electrified overhead contact line)(except extremely high voltage contact lines)
External sheeting	End section	Incombustible Shall use incombustible material for the surface paint (Note 4)
	Other than end section	Incombustible Shall use incombustible material for the surface(Note 4)
Passenger room	Ceiling	Incombustible Shall have resistance to burning due to radiant heat, and shall have resistance to melting and dripping (Note 3) Shall use incombustible for the surface paint (Note 4)
	Inside panel	Incombustible Shall use incombustible material for the surface paint (Note 4)
Heat insulation and Noise insulation		Incombustible
Floor	Floor	Structure where there is little risk of smoke and fire flowing
	Floor covering	Flame retardant
	Filler material under floor covering (Note 5)	Extremely flame retardant
	Floor panel	Metal floor sheeting or equal to or better than the incombustibility of metal (Note 2)
	Underfloor surface ((Note 6)	Shall be incombustible or surface covered with metal and shall use incombustible material for the surface paint (Note 4)
Underfloor equipment box (Note 7)		Incombustible. However, flame retardant when the need for insulation is unavoidable
Seat	Fabric	Flame retardant
	Filler	Flame retardant

	When electric heater is provided under the seat	Provide incombustible heat-resistant plate in between heating element and seat
Window shade	Window shade	Flame retardant
Gangway bellows	Gangway bellows	Flame retardant

Note 1: "Roof" means the section above the rain trough or rain gutter of the upper structure of the car body, but when the rain trough or rain gutter is located inward of one-third the maximum car body width as measured from the centerline of the car body, "roof" shall mean the section up to one-third the maximum width of the car body respectively as measured from the centerline of the car body. However, when part of the roof is in integral part of the external sheeting of end section, the said section shall be the "end section" of the "external sheeting" shown in (2) of the table.

Note 2: The expression "equal to or better than the incombustibility " for "roof" and "floor" means that the non-combustion performance is equal to or better than the metal used on the existing roof and floor sheeting, which is different from the stipulation for incombustible in the combustibility standards for materials used in railway rolling stock.

Note 3: The material for ". . . have resistance to burning due to radiant heat, and shall have resistance to melting and dripping . . ." shall, in addition to ceiling materials, include main facilities for air conditioning outlets, etc., installed in upper section of passenger rooms. However, excluding small items, etc., that will not affect the spreading of the fire.

Note 4: "Surface paint" means the most outer coat of paint when there are multiple coats.

Note 5: "Filler material under floor covering" means the filler for floors with keystone construction, and the hardboard, water-resistant veneer, etc., that are sandwiched between metals or between metal and flooring material are included in the stipulations for filler material.

Note 6: When a metal sheet is affixed under the underfloor surface so that hot air from equipment installed underfloor will not affect the underfloor surface, the said metal sheet shall be deemed the "underfloor surface."

Note 7: The covers for relays, etc., are not included in "underfloor equipment box."

(3) Non-combustible, extremely flame retardant and flame retardant are used in the tables in (1) and (2) are according to the standards in the following table which are based on the following Test Method I for Non-Metallic Materials for Use on Railways.

Table 9.10 Combustibility Standards for Materials for Use on Railways

Classification	During Burning of Alcohol				After Burning of Alcohol			
	Ignition	Flame	Smoke	Flame Condition	Residual Flam	Residual Ash	Carbonization	Deformation
Non-combustible	None	None	Negligible	—	—	—	100mm or less discoloration	100mm or less surface deformation
Extremely flame retardant	None	None	Little	—	—	—	Does not reach top edge of test piece	150mm or less deformation
	Yes	Yes	Little	Weak	None	None	30mm or less	
Flame retardant	Yes	Yes	Normal	Flame does not exceed top edge of test piece	None	None	Reaches top edge of test piece	Deformation that reaches edge, localized penetrating holes

Note: Dimensions of carbonization and deformation are shown on major axis.

Items that burn abnormally shall have one rank lower classification.

Determinations shall be according to the following test methods.

Test Method I

In the Test Method I for Non-Metallic Materials for Use on Railways a B5-size (182 x 257 mm) test material is held at a 45 degree angle as shown in the figure and the center of the bottom of the fuel container is placed on wood platform, such as cork, having a low heat conduction ratio so that it will be positioned 25.4 mm (1 inch) perpendicularly below the center of the bottom plane of the test piece. The fuel container is filled with 0.5 cc of pure ethyl alcohol, which is ignited and allowed to burn until consumed.

The determination of combustibility is classified into during burning and after burning, with ignition, flame, smoke condition and flame condition, etc., of the test material being observed during burning and residual flame, residual ash, carbonization and deformation being investigated after burning.

In regards to the pre-test treatment of the specimen, when the material has absorption characteristics, it shall be finished to the prescribed dimensions and left in the ventilated rooms for 5 days above 1 m or more apart from the floor surface avoiding the direct sunshine. The conditions in the test room shall be as follows, without any flow of air. Temperature: 15 to 30 degrees Celsius, Humidity: 60% to 75%

General Sketch of Test Method

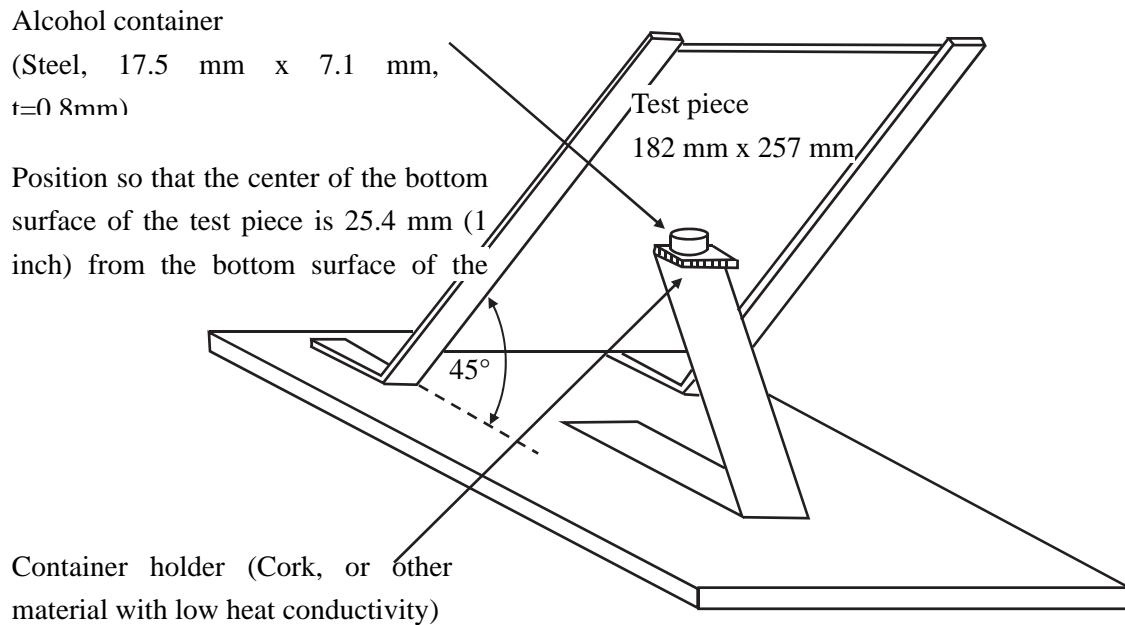


Fig. 9.2 General Sketch of Test Method

(4) "... shall have resistance to melting and dripping ..." used in the table in (2) means that the surface of the material shall maintain its smoothness after the alcohol in the Test Method I for Non-Metallic Materials for Use on Railways has been burned .

(5) "Resistance to burning" in the table in (2) shall be according to the following standard which is based on the Test Method II for Non-Metallic Materials for Use on Railways.

Table 9.11

Overall heat value(MJ/m ²)	Ignition time (Sec)	Maximum heating speed (kW/m ²)
8 or less	—	300 or less
Exceeding 8 and 30 or less	60 or more	

Test Method II

Test Method II for Non-Metallic Materials for Use on Railways applies ISO 5660-1: 2002 as shown in figure, where a square test specimen having a smooth surface and width and length of 100mm and thickness of up to 50 mm is exposed to a radiant heat of 50 kW/m² for 10 minutes.

This test verifies whether the difference between the average value of the maximum heating speed of three test specimens and the maximum heating speed of each test specimen is less than 10%, and if less than 10%, the data of the said three test specimens will be adopted. In the event that the difference was 10% or more, the tests shall be conducted on another three test specimens, and among the six test specimen sheets, the data of the four test specimens of which the maximum value and the minimum value of the maximum heating speed are excluded shall be used. The combustion determination shall be based on the total heating value (MJ/ m²) and the maximum heating speed (kW/ m²) and ignition time (seconds) during the test.

The ignition time (seconds) shall be the time from the start of the test until the initial ignition is confirmed. The initial ignition is deemed to be the case that the flame has existed for 10 seconds or more.

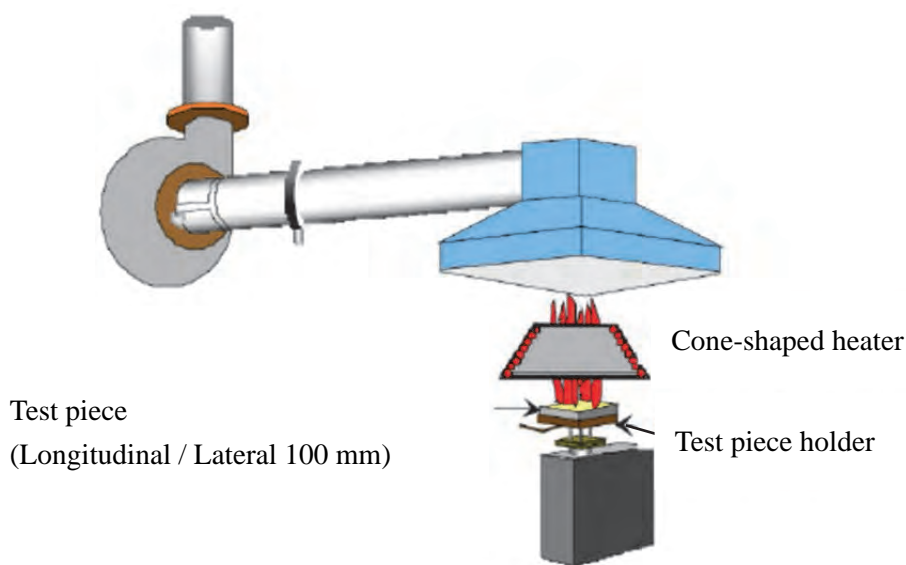


Fig. 9.3 General Sketch of Test Method II

(6) The appropriate fire extinguisher shall be provided for passenger cars. Furthermore, the location of the fire extinguisher shall be shown in a position that can be easily seen by passengers. However, this does not apply when the fire extinguisher can be easily seen by passengers.

9.19.2 A gangway door, etc., having a function to close it during normal operation, shall be provided on rolling stock with connecting rooms on passenger cars. However, if the

connecting section is the crew room, it is acceptable that the door for the gangway entrance be one that is easily closed.

9.20 Function of Devices at Power Failure

9.20.1 The devices or equipment needed to secure the safety of both train operation and passengers shall be able to function for a fixed period of time even after the main power supplies source is interrupted.

9.20.2 When the devices, etc., indicated in the following table are provided, their functions shall be ensured for a fixed period of time by a storage battery even when the power supply from the contact line has been interrupted or when the failure of a generator, etc., causes a state of interrupted power supply.

Table 9.12

Item	Device, etc.
Brake devices	<ul style="list-style-type: none"> ▪ When electric circuits are used for brake operation.
Passenger room construction	<ul style="list-style-type: none"> ▪ Ventilation for rolling stock provided with force-air ventilation (When appropriate to [Normal operation] of Approved Model Specifications relating to Article 9.11.2.table 9.5) ▪ Lighting devices or auxiliary lighting devices.
Construction of entrance/exits for getting on and off of passengers	<ul style="list-style-type: none"> ▪ Automatic door closing device ▪ Door open indicator lamps for entrance/exits for getting on and off of passengers. ▪ Indicator of location and operating method of the door opening device (limited to when this device is provided on the inside of the rolling stock) that enables doors to be opened manually in case of emergency.
Construction of emergency exits	<ul style="list-style-type: none"> ▪ Indicator of location and operating method for emergency exits. ▪ Door open indicator lamps for emergency exits.
Crew room facilities	<ul style="list-style-type: none"> ▪ Aspect facilities for onboard signal equipment ▪ Train stop device in case of driver's abnormality ▪ Cut-out switch for onboard facilities, devices indicating operating status of automatic train stop device, automatic train control device and automatic train operation device. ▪ Device indicating door-opening/closing status of emergency exit. ▪ Door closed confirmation device for entrance/exit for getting on and off of passengers.
Devices attached to rolling stock	<ul style="list-style-type: none"> ▪ Sign device ▪ Whistle ▪ Communication device ▪ Public address device ▪ Lamps that light on for indicating the functions of the emergency alarm device/emergency stop device, the location and operating method indicators, and

	<p>lamps that light on when the emergency alarm device/emergency stop device are operated.</p> <ul style="list-style-type: none"> ▪ Rear marker lights
Rolling stock facilities for trains, etc., stationed by a single driver	<ul style="list-style-type: none"> ▪ Onboard facilities for safety communication facilities
Other facilities	<ul style="list-style-type: none"> ▪ Operating condition recording device

9.21 Rolling Stock Facilities for One Man Operation

9.21.1 The train stationed by a single staff member who drives the motive power car shall not only abide by the rules stipulated in the previous Article 9.1 through the 9.20, but also comply with the following standards.

(1) A passenger car that runs in the underground structure or other sections that make a quick evacuation of passengers difficult at the time of emergency shall be equipped with appropriate measures to maintain passengers' safety in case of emergency, including the installation of automatic notification system to inform to stations or control centers that the device under paragraph 6 to of Article 9.17 has been triggered.

(2) A crew that operates a motive power car shall be able to communicate without difficulty with station or operation control center at the regular operating position when needed safety.

(3) As for a passenger car, a crew that operates a motive power car shall be able to manipulate the passenger doors and make necessary announcement easily from the regular operating position.

(4) A train without a crew to operate the motive power car shall abide by the rules or standards covered from the Article 9.1 through the preceding Article. Further, safety device that enables passengers in a passenger car to communicate with operation control centers and other security measures to maintain passengers' safety shall be installed. This rule does not apply, however, to the case when crew onboard can secure the safety in case of emergency.

9.21.2 The following shall apply to trains stationed by a single staff member who drives the motive power car.

(1) Rolling stock for trains stationed by a single staff member who drives the motive power car shall be according to the Approved Model Specifications relating to Article 9.1 through to the preceding article 9.20. However, the facilities that should be installed in the conductor's room shown in the table for Item 1 table 9.7 of the Basic Items of Approved Model Specifications relating to Article 9.15, Basic Item 3 and Items 5, 6(1) of the Basic Items of Approved Model Specifications relating to Article 9.15 does not apply.

(2) Shall be provided with an onboard public address device that enables guidance information to all rooms in passenger cars.

(3) An emergency alarm device shall be provided on passenger cars. However, this does not apply to the rolling stock provided with an emergency stop device and the rolling stock operated as one) car.

(4) On passenger cars, a device for operating the onboard public address device and the automatic door operating device for entry/exits for the getting on and off of passengers shall be provided in the driver's cab of rolling stock serving as the front section of the first car of a passenger train.

(5) The device for operating the onboard public address device and the automatic door closing device for entry/exit for the getting on and off) of passengers shall be capable of being easily operated when the crew member is in his/her regular operating position.

(6) The operating device for the automatic door operator shall be in position that enables easy confirmation of the condition of the passengers at the station through the use of car-side mirrors, etc. However, when the condition of the passengers is confirmed by a window provided on the side surface, it shall be the position where the crew confirms the getting on and off of the passengers.

(7) On the rolling stock operated on sections where the space between the structure gauge and rolling stock gauge is small, shall display the method for opening the said gangway door near the gangway entrance that serves as the rear part of the last car of a train.

(8) The rolling stock that do not indicate the location, etc., of the device for enabling the door to be manually opened inside of the car, shall be provided with a function that enables communication to the train dispatcher, etc., and that enables onboard announcements to the passenger room from the train dispatcher, etc., in case that notification from the passenger room to the crew cannot be ensured.

(9) The following devices shall be provided in the driver's cab.

1) Train stopping device in case of driver's abnormality shall be provided in the cab. However, this does not apply to the rolling stock operated by automatic train operation device on sections of track with underground construction or elevated construction and also the rolling stock without passengers onboard being operated on sections of track with underground construction or elevated construction by automatic train brake device or automatic train stop device (limited to devices where all the time there is no danger of the limited speed being exceeded).

2) When a device in 1) is provided on passenger cars for subways, etc., a device shall be provided to automatically notify a station or an operation dispatch center when a device in 1) operates.

3) A device in 1) shall not be capable of easily releasing the function manually.

4) On the rolling stock operated on sections where the space between the structure gauge and rolling stock gauge is small, the doors between passenger rooms adjoining to the crew room at the rear section of the train (limited to crew rooms provided with a gangway exit) shall have a function that enables the door locks to be released from the driver's cab.

(10) The following onboard facilities for safety communication facilities shall be provided in the driver's cab.

1) On the rolling stock serving as the front part of the train, shall be provided onboard security communication facilities that enable transmission and receiving between a station and an

operating dispatch center. However, this does not apply when communication is performed by communication facilities provided at wayside.

2) Onboard facilities for the safety communication facilities shall not be capable of easily releasing the function manually and shall not be combined with onboard public address system and emergency alarm device.

9.21.3 For trains without a staff to drive the motive power car, the following shall apply in addition to the Approved Model Specifications relating to Article 9.1 through the preceding article.

(1) Trains without a staff onboard shall comply the following standards.

1) Passenger rooms shall be provided with onboard communication facilities that enable transmission and receiving with the operating dispatch center.

2) On railways with underground construction and other railways where the track cannot be used as an evacuation route, if a passenger attempts to open a getting on/off door, etc., on a running train, the said train shall automatically be stopped.

3) On railways with underground construction and other railways where the track cannot be used as an evacuation route, it shall not be easy for a passenger to open/close the train doors for getting on/off

4) On railways with underground construction and other railways where the track cannot be used as an evacuation route, it shall be possible for the train dispatch center to stop the rolling stock.

5) It shall be possible to confirm the abnormalities of rolling stock from the train dispatch center.

(2) The following standards shall apply to the trains stationed by a single staff member other than the driver.

1) In the crew room, shall be provided onboard facilities for the safety communication facilities that enable transmission and receiving with the train dispatch center.

2) When the staff member cannot perform stopping operations at the time of emergency, it shall be possible for the train dispatch center to stop the rolling stock.

3) Shall be according to the stipulations of Items 9.19.2 (7) to (8) and (9) 4).

9.22 Devices to Record the Train Operation

9.22.1 For trains shall be installed. The “Device for recording the operating condition of trains” shall be capable of recording the following items.

(1) Basic information relating to train operation

1) Time

2) Speed

3) Position (including when calculated from speed and time)

(2) Basic information relating to driver operation

1) Status of operating devices for control facilities

2) Status of operating devices for service brake devices

(3) Operation of automatic train stopping device and automatic train control device.

9.22.2 The recording of 1 shall be capable of recording the amount for the most recent one day or more.

2. Maintenance of Rolling Stock

9.23 Maintenance of Rolling Stock

9.23.1 Rolling stock shall not be used unless they are maintained to function accurately and to be safely operated.

9.24 Inspection and Field Test of Newly Manufactured Rolling Stock, etc.

9.24.1 Newly made or purchased and remodeled or repaired rolling stock shall not be used until after inspection and test run have been conducted. Test run may be omitted, however, when only a minor remodeling or repair was done.

9.24.2 Rolling stock that is suspected of failure because of derailment and other operation accidents and also that has not been used for a while shall be inspected in advance, or shall be put for test run if needed before it is put to operation.

9.24.3 When the modifications, etc. have done which may influence the static wheel load, the ratio of wheel load unbalance shall be confirmed to be appropriate by directly measuring the wheel load.

9.25 Inspection of Train

9.25.1 Main component of a rolling stock shall be inspected according to the type and traffic condition of trains.

9.25.2 A Metrorail Operator shall carry out the inspection of trains pursuant to the pre-determined content of the inspection at the pre-determined timing in consideration of the usage of the rolling stock, design method, the management method applied to them, and the traffic condition of the trains

9.26 Periodic Inspection of Rolling Stock

9.26.1 Inspection of the rolling stock shall be carried out periodically within the respective period specified in the table pursuant to the pre-determined items and methods according to their type, structure and usage. However, this does not apply to the parts of rolling stock having characteristics of anti-wear and durability, and the functions of such parts are assured to be maintained for a longer period than the period specified in the table.

Table 9.13

Kind of Rolling Stock	Period		
	Inspection of Condition And Function	Inspection of important and Critical Part	Overall Inspection
Passenger	3 months	4 years, or the period of traveled mileage of the rolling stock being not exceeding 600 thousand km, of which shorter period is selected.	8 years

9.27 Exceptions

9.27.1 In case of the rolling stock whose operation is suspended (limited to when certain measures to prevent corrosion, deformation, degradation of electric insulation, etc., possible to occur during such suspended period have been applied to such rolling stock if they are the rolling stock other than those of trackless electric car), such suspended period shall not be counted in the calculation of the period for the inspection interval stipulated in Article 9.26. However, such period not to be counted in the calculation of the period of inspection interval shall not exceed the period corresponding to the kind of inspection as specified below:

- (1) Inspection of condition and function: two (2) months
- (2) Inspection of important and critical parts: two (2) years
- (3) Overall inspection: four (4) years

9.27.2 In case of the rolling stock whose usage for operation is then suspended, and the facility or the rolling stock such that any inspection is unable to be implemented due to a certain special reason, inspections required by the provisions of Article 9.24 to 9.26 as stated above can be postponed until such situation or reason shall cease.

9.28 Records

9.28.1 Records shall be made and kept for all of the inspections, rebuilding, remodeling or repair carried out for facilities and rolling stock, according to the Article 9.24 to 9.26.

9.29 Workshop and Depot

9.29.1 Train workshop or/and depot shall have sufficient capacity to accommodate relevant rolling stock.

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

X. AUTOMATIC FARE COLLECTION (AFC)

10.1 Introduction of Automatic Fare Collection (AFC) System

10.1.1 The Metrorail operator shall introduce the AFC system in order to ensure collecting fare from passengers.

10.1.2 The ticket for the AFC system shall be contact-less IC card. But contact-less IC token can be used as the single journey ticket (hereafter, “contact-less IC card” includes “contact-less IC token”.)

10.1.3 In the introduction of the AFC system for the Metrorail, mutual availability with the contact-less IC cards which are used or planned to be used for the other public transport systems in Dhaka shall be secured.

10.1.4 In the introduction of the AFC system for the Metrorail, potential services such as E-cash service and Park-and-ride service shall be considered.

10.1.5 In the introduction of the AFC system, the climate conditions shall be considered.

10.1.6 The AFC system shall be designed considering passengers' safety and convenience, especially the aged, children, expected mothers, and the handicapped.

10.2 Services provided by the AFC system

10.2.1 This AFC system shall manage at least, but not limited to, these following railway services.

- (1) Single journey ticket service;
- (2) Day ticket service
- (3) Commuter pass service
- (4) Stored fare card service.

10.2.2 Personalized card service shall be taken into consideration for the commuter pass card and the stored fare card in system design.

10.2.3 All types of ticket which are anonymous shall be reusable.

10.3 Main Components of the System

10.3.1 The main components of the AFC system shall be, but not limited to:

- (1) Contact-less IC cards; and
- (2) Contact-less IC card handling system (including staff-pass issuing system).
- (3) Ticket vending machine;
- (4) Passenger gate;
- (5) Ticket office machine
- (6) Central server;
- (7) Network facilities;
- (8) Cash handling equipment;

10.4 The number of AFC Machines Provided at Stations

10.4.1 The adequate number of AFC machines at stations shall be installed corresponding to the capacity of machines and the number of passengers.

10.4.2 Layout of passenger gate shall consider separating the flow of passengers.

10.4.3 There shall be passenger gate for wheelchairs, at least one each for entering and exiting of every station.

10.5 Applicable Standards for AFC system

10.5.1 The AFC system shall follow the standards below.

(1) ISO/IEC 15408 for card security certificate

(2) ISO/IEC 18092 or ISO/IEC 14443 for data transmission between card and antenna.

10.6 Unique Card Identification Number

10.6.1 Every card shall be numbered uniquely for system identification and card stock management.

10.6.2 This unique card identification number shall be able to be inscribed on the card, as to be easily defined in case of card damage.

10.6.3 This unique card identification number shall include information of:

(1) Issue date;

(2) Issue operator code;

(3) Issue machine number; and

(4) Serial number.

10.7 Confirmation of card information

10.7.1 Information within the card shall be able to be confirmed at ticket vending machine and ticket office machine.

10.8 Monitoring

10.8.1 The AFC system shall have the system that can monitor real-time status of the AFC equipment.

10.9 Emergency mode

10.9.1 Means shall be provided to place all passenger gates in emergency mode. In an emergency mode, gates shall be opened for passengers to exit without tickets.

10.9.2 There shall be an alternative means, provided mechanically, to set all gates opened as emergency mode regardless the availability of the central server, the station server, network connection, and the power supply. Measures against fraud shall also be considered for this means.

10.10 Data Transmission

10.10.1 The Security for all data transmission shall be considered. Especially data transmission related to revenue data shall employ high-security encryption such as SSH File Transfer Protocol in order to avoid data modification.

10.10.2 The Secure measures against data loss shall be considered.

10.11 Data retain

10.11.1 The AFC system shall consider measures against any damage or loss of data. The measures shall be considered from the point of view of both software and hardware.

10.11.2 The AFC system shall consider measures against power failure or trouble.

10.11.3 The AFC system shall consider measures against network failure.

10.11.4 The AFC system shall retain backup data for 7 days or more. Targeted machine shall include, but not limited to:

- (1) Ticket vending machine;
- (2) Ticket office machine;
- (3) Passenger gate;

10.11.5 The Central server shall retain backup data for 1 year or more.

10.12 Hardware requirements

10.12.1 Hardware design of AFC machines shall consider:

- (1) Measures against vandalism (including wrenched open or damage touch-panels);
- (2) Measures against fraud; and
- (3) Measures against dust.
- (4) Measures against leakage of water
- (5) Measures against dew formation and
- (6) Measures against electric leakage

10.13 Bills and coins

10.13.1 The ticket vending machine shall accept bills and coins of Bangladesh.

10.13.2 The ticket vending machine shall detect and reject fake or unacceptable bills and coins.

10.13.3 The ticket vending machine shall have escrow function.

10.13.4 The ticket vending machine shall be able to give change back to the passengers.

10.13.5 Machines such as ticket vending machine shall be designed so that station staffs do not need to touch money, unless troubles such as jamming occur.

10.14 Contact-less IC Cards

9.14.1 Shape of contact-less IC card shall be credit-card size (85.60mm×53.98mm). But the size of contact-less IC token is not limited to this size.

10.14.2 Base material of the card shall be plastic.

10.14.3 Contact-less IC Card shall be powered by a modulated radio frequency signal transmitted from read / write units of each AFC machine. Contact-less IC card shall not have battery inside.

10.14.4 Data retention period shall be at least 10 years in normal use.

10.14.5 Data transfer rate shall be at least 212kbps.

10.14.6 Data retention shall be such that even when power supply to the card is interrupted while writing the card, the card shall assure data integrity by logically retaining the previous data

10.15 High security card

10.15.1 High security card shall be applied to;

- (1) Day ticket
- (2) Commuter Pass
- (3) Stored fare card;

10.15.2 Contact-less IC card for high security card shall be with contact-less IC chip which is certificated as at least EAL4+ of ISO/IEC 15408.

10.15.3 Access to the secure access area of the card before and after encoding (1st issue) shall be protected by encrypted authentication or other secured measures.

10.15.4 Able to handle plural, non-adjoining memory blocks as 1 file. Data reading and writing shall be handled by this file.

10.15.5 More than 2 keys shall be able to be set to each memory files.

10.15.6 Data hierarchy shall be more than 4 levels.

10.15.7 Access rights shall be created by files. Access rights shall be flexible enough to accommodate, considering the increase of other companies or operators.

10.15.8 Able to open (open means authenticate and release security) the specified files. Multiple files shall be opened by 1 authentication process.

10.15.9 File type shall be 3 or more, which include, but not limited to:

- (1) Sequential access type, which is ring-buffered;
- (2) Random access type; and
- (3) Amount calculating type, which allows full access, deduct-only access, or add-only access with limited maximum value.

Each file type can be set to have read-only access. Each access method of each file type shall have at least 2 types of file access, secure and non-secure.

10.15.10 Command sets shall include, but not limited to:

- (1) Identifying file types;
- (2) Issue (format, access control, etc.); and

(3) Authenticate.

10.15.11 Data transfer shall be encrypted when secure access is required.

10.15.12 Rewriting durability shall be at least 100 thousand times.

10.15.13 Minimum data capacity shall be 2560 bytes.

10.15.14 Reading data shall be handled by file, which enables to read separate and non-adjointing blocks of data by 1 read command.

10.15.15 Writing data shall be able to be handled by file, which enables to write separate and non-adjointing blocks of data by 1 write command. Data writing shall assure data integrity by logically retaining the previous data.

10.15.16 Time required for transaction between card and read/write unit of each AFC machine shall be equal or less than 100msec. Time required does not include transaction between AFC equipment and read / write unit, nor data processing time within AFC equipment. Time required shall be calculated under following conditions:

- (1) Opening multiple files;
- (2) Encrypting data transmission; and
- (3) Reading 240 bytes and writing 208 bytes.

10.16 Moderate security card (and token)

10.16.1 Moderate security card (or token) shall be applied to single journey ticket, in order to reduce deposit amount of the single journey ticket.

10.16.2 Security is required to avoid being copied or forged, at least to have a function that read / write units of each AFC machine can detect a copied or forged card using mutual authentication.

10.16.3 Rewriting durability shall be at least 50 thousand times.

10.16.4 Minimum data capacity shall be 240 bytes.

10.16.5 Data read at once shall be at least 64 bytes. Data written at once shall be at least 16 bytes. Data writing shall assure data integrity by logically retaining the previous data.

10.16.6 Time required for transaction between a card and read / write unit of each AFC machine shall be equal or less than 100ms. Time required does not include transaction between AFC equipment and read / write unit, nor data processing time within AFC equipment.

10.17 Ticket Vending Machine

10.17.1 The ticket vending machine must have at least following functions for passengers:

- (1) Issue stored fare card, day ticket, single journey ticket, etc.
- (2) Collect deposit
- (3) Top-up stored fare card
- (4) Show the data inside the card.

10.17.2 The ticket vending machine shall issue receipts on passenger's demand.

10.17.3 The ticket vending machine shall be able to handle at least four (4) passengers per minutes.

10.18 Passenger Gate

10.18.1 Two types of passenger gate shall be considered.

(1) Normal-width

(2) Wide-width

10.18.2 Wide-width gate shall be able to be used by wheelchairs.

10.18.3 The passenger gate shall pass at least sixty (60) passengers per minute.

10.18.4 Passenger gate shall be with horizontally swinging flap-door barriers.

10.18.5 Measures shall be taken to prevent an unauthorized person.

10.18.6 The gate status shall be indicated to passengers.

10.19 Ticket Office Machine

10.19.1 Ticket office machine shall be able to request card information to the central server.

10.20 Central Server

10.20.1 Central server shall collect and analyze information received from AFC machines.

10.20.2 Central server shall include assist terminal. Assist terminal shall show availability of following machines in each station including:

(1) Ticket vending machine;

(2) Passenger gate;

(3) Ticket office machine;

10.20.3 Central server shall be able to handle expected number of passengers.

XI. TRAIN OPERATION

1. Train Formation

11.1 Train operation plan

Metrorail Operators shall design the train operation plan which considered convenience, comfort enough in consideration for assumed passenger transportation demand, devises the suitable train working time that there is not of the problem in safety track condition, operating performance of rolling stock.

11.2 Maximum Number of Cars to be Coupled

Maximum number of cars to be coupled shall not exceed the length of the platform.

11.3 Train Brakes

A train shall be in a state in which a continuous brake works on all the axles. This rule does not apply, however, in the following listed cases and when any risk of interfering with the safe operation of the train is found.

- (1) A train for which the continuous brakes do not work on some of its rolling stock due to breakdowns, etc., but coupled with such rolling stock at the middle of train and use the brakes in the foremost and the rearmost rolling stock.
- (2) A train which has a broken rolling stock for which a continuous brake does not work coupled to the front or the rear of the train and supervising officials has boarded the rolling stock or taken measures so that the rolling stock should not be separated.

11.4 Train Brake Test

The driver shall confirm that the action of brakes is accurate in the following cases.

- (1) When a driver boarded a train or a rolling stock (except at times when boarded by driver change at the operating position where it has been confirmed that the action of brakes is accurate);
- (2) When the operating position of a train or a rolling stock has been changed;
- (3) When coupling a rolling stock to a train or a rolling stock

11.5 Train Braking Force

11.5.1 Train braking force shall be sufficient in accordance with the track gradient and running speed.

11.5.2 If the shortage in break axle ratio occurs during the operation of a train, one shall notify it to the traffic dispatcher and shall receive instructions.

2. Train Operation

11.6 Operation on Main Track outside Station

Rolling stock shall not be operated on the main track outside of a station (including halts), unless they form as a train, provided, however, that this shall not apply at the time of shunting rolling stock.

11.7 Station Boundaries

Station boundaries shall be indicated as follows.

- (1) As for the approaching direction of a train, outmost home indicator;
- (2) As for the departing direction of a train, outmost home indicator on the opposite track.

11.8 Train Operating Position

The drivers shall operate the train at the front head of the forefront rolling stock, provided, however, that this shall not apply in the following cases.

- (1) When conducting pushing operation;
- (2) When conducting backward operation

11.9 Handling when Unable to Operate at Forefront Rolling Stock

When unable to operate at the forefront of a train due to breakdown, etc., the driver shall report the situation to the traffic dispatcher and shall receive instructions for the subsequent operation method.

11.10 Backward Operation of Trains

No train shall perform backward operation except for the following cases.

- (1) When the track is defective;
- (2) When there is a breakdown in rolling stock;
- (3) When operating a train for construction;
- (4) When operating a relief train;
- (5) When operating to test facilities or rolling stock, etc.

11.11 Pushing Operation of Trains

No train shall perform push operation, except for the following cases.

- (1) When there is a breakdown in rolling stock;
- (2) When operating a relief train

11.12 Train Operation Time

Trains shall be operated based on departure time, passing time and arrival time at a specified station

11.13 Train Departure

The driver shall confirm the following when a train departs from a station

- (1) A signal that instructs proceed is indicated;
- (2) That it is the departure time;
- (3) Door-pilot lamp of rolling stock are lit

11.14 Operating Direction between Stations

The operating direction between the stations in the double track sections shall be left-side operation, provided, however, that this shall not apply in the following cases.

- (1) When conducting backward operation;
- (2) When operating a relief train;
- (3) When operating a train to test facilities or rolling stock, etc.

3. Track Possession

11.15 Track Possession

The following constructions or work shall be implemented only after the track possessions.

- (1) Construction that obstructs or might obstruct train or rolling stock operation;
- (2) Work that obstructs or might obstruct train or rolling stock operation;
- (3) Use of maintenance cars.

11.16 Indication of Stop Signal during Track Possession

When conducting construction that requires track possession, using maintenance cars or conducting construction that requires power shutdown, the track shall be closed by indicating a stop signal on the route located outside the concerned section until the construction, work or the use is complete.

4. Shunting of Rolling Stock

11.17 Shunting

Shunting of rolling stock shall be carried out using one of the following methods (including shunting of trains).

- (1) Method using signals;
- (2) Method using signs;
- (3) Method using indicators;

11.18 Shunting that Extend Outside Station

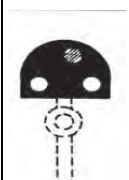

Shunting of rolling stock that extend outside of the stations shall not be conducted, provided, however, that shunting of rolling stock that extend outside of the stations can be conducted in cases when it is inevitable and the following conditions are satisfied.

- (1) When there are no trains proceeding into the direction of shunting;
- (2) When arrangements are made not to enable departure of a train from the adjacent station;
- (3) When having received instructions from the traffic dispatcher.

11.19 Types and Indication Method of Shunting Signal

Shunting signal indicates a signal for rolling stock of shunting operation, types and indication methods show as per the following table, provided, however, that, these are specified it by need separately and shall be able to use it.

Table 11.1 Types and Indication Method of Shunting Signal




Type of signal			Stop	Proceed
Indication method	Two-position	Position light		

11.20 Indication Method of Shunting Signal Appendix (Route Indicator)

The indication method of the shunting signal appendix (route indicator) shall be as per the following (1) and (2), provided, however, that, these are specified it by need separately and shall be able to use it.


- (1) Three-route indicator

Table 11.2 Three-route indicator

Direction of route		Route clear leftward	Route clear to the center	Route clear rightward
Indication method	Position light			

(2) Multi-route indicator

Table 11.3 Multi-route indicator

Direction of route		Route clear in the direction indicated by the alphanumeric figure
Method of indication	Position light	

Note: The figure indicates that the route is clear to the track No. 4.

11.21 Shunting Speed

The speed of shunting rolling stock shall be as follows, provided, however, that this shall not apply at the time of shunting by using ATC system.

- (1) 25km/h or less;
- (2) 45km/h or less in case of shunting in accordance with shunting signals and operating at the front head of the forefront rolling stock using continuous brakes.

11.22 Indication of Car- Stop Indicator

“In cases when a shunting signal is not installed at the end of section where shunting in accordance with a shunting signal is to be conducted, the car-stop indicator shall indicate the limit of the section where the rolling stock shall be stopped when necessary, and indication method, color and form shows as per the following figure, provided, however, that, these are specified it by need separately and shall be able to use it.



Remarks: Use lamps or a reflective material

Fig. 10.1 Car-Stop Indicator

5. Storing of Rolling Stock

11.23 Prevention of Rolling of Rolling Stock

When storing rolling stock, the hand-scotch should be applied when necessary in addition to locking the brakes.

11.24 Storing of Motive Power Cars

When storing a rolling stock with motive power, necessary measures shall be taken to prevent them from self-moving, such as pulling out the key from the brake controller in addition to conducting arrangements mentioned in the preceding article.

6. Safety Assurance between Trains

11.25 Train Operation Method

11.25.1 Train shall be operated by the following methods.

(1) Method using ATC system

Method using ATC system is a method to secure the safety between trains by using ATC to control train speed in accordance with the interval with the preceding train and the route conditions.

(2) Method using substitute block system

Method using the substitute block system is a method to secure the safety between trains by using blocks as a substitute for the ATC system when it is unable to implement the system.

(3) Method using driver's attentiveness

Method using driver's attentiveness is a method to be applied based on the instruction of the traffic dispatcher to secure the safety between trains by operating trains at a speed in which the driver can stop the train within the visible distance forward when it is unable to implement the ATC system or a substitute block system.

11.25.2 When unable to apply the preceding items, it shall apply the messenger system depending on the situation.

11.26 Regular Method of Train Operation

Train shall be operated under the ATC system.

11.27 Substitute Block System

11.27.1 Substitute block system shall be used when the ATC system cannot be used due to breakdown or other reasons.

11.27.2 A substitute block system when the ATC system is unable to be implemented shall be the command-type method.

11.28 Command-type Method

11.28.1 Command-type method shall be implemented when double track operation is possible in double-track sections but unable to implement the ATC system on the up and down tracks or in either one of the tracks.

11.28.2 When implementing a command-type method, the CTC traffic dispatcher shall confirm that there is not a train or a rolling stock between stations using a device displaying the condition of train operation and the train radio.

In this case, he or she shall notify the station masters of relevant stations that the section clear status has been confirmed.

11.28.3 When dispatching a train in a section under the command-type method, the CTC traffic dispatcher shall give instructions to dispatch the train to the driver after having done the following.

- (1) Confirm there are no trains or rolling stock in the relevant block section.
- (2) When another train was operated under the command-type method before the train, reception of notice that the other train has arrived at the station on the other side.

11.28.4 When a train has arrived at the station on the other side in a section under the command-type method, the driver shall so notify the CTC traffic dispatcher.

11.29 Implementation of Messenger System

The messenger system shall be implemented in the following cases.

- (1) In case of operating a relief train to the section due to being required from a train that stopped due to a breakdown or other reasons at a midpoint between stations (including the premises of halts. Same applies in this Article).
- (2) In case of operating another train for construction to the section where a train for construction is stopping that was operated to urgently repair a breakdown of tracks between stations.

7. Running Speed

11.30 Train Running Speed

The train running speed shall be less than a maximum of 110km/h, provided, however, that it shall be on respective stipulation in the following cases.

- (1) 25km/h or less; under pushing operation;
- (2) 25km/h or less; under backward operation;
- (3) 25km/h or less; under driver's attentiveness operation;

11.31 Speed Limit in Curves, etc.

Metrorail Operators shall establish a necessary speed limit for safety based on the physical conditions such as curve, down gradient and kind of turnout.

XII. RAILWAY SIGNALS

1. Relationship between railway signals and operation

12.1 Train Operation in Accordance with Railway Signals

Train, etc. shall be operated in accordance with the conditions shown or indicated by railway signals.

12.2 Type of Railway Signals

The types of railway signals are as follows.

- (1) Signals mean those which indicate conditions for train operation in a certain section to the driver of the train, etc. by means of shapes, colors, sounds, etc.
- (2) Signs mean the action among officials that indicates the intention of the sign giver to the counterpart by means of shapes, colors, sounds, etc.
- (3) Indicators mean those that indicate location of things, direction, condition, etc., by mean of shapes, colors, etc.

12.3 Daytime and Nighttime Signal Aspects or Methods of Indication of Railway Signals

Railway signals having different signal aspects or methods of indication during daytime and nighttime shall be as per the following specifications (1) to (3).

- (1) Daytime system from sunrise to sunset
- (2) Nighttime system when it is difficult to recognize the signal aspects or indications by the daytime system in tunnels or snow shelters or due to climatic conditions.
- (3) Nighttime system from sunset to sunrise

2. Cab Signal

12.4 Indication Method of Cab Signal

Types of signals and indication method of signals by cab signal (which indicate signals in the driver's cab of a train, etc.) shall be as shown in the following table.

Table 12.1 Indication Method of Cab Signal

Type of signal	Indication method
Stop signal	Light or red light with a drawing of code or letter(s) that represent stop
Proceed signal	Color light other than red light with an indication of code or figures (except 0) that represent speed

12.5 Home Indicator and Starting Indicator

The following indicators shall be displayed for the track in which a train is operated under the ATC system.

- (1) Track for a train to enter the station; home indicator
- (2) Track for a train to leave the station; starting indicator

12.6 Starting Route End Indicator

The starting route end indicator shall be installed to indicate the end of the outmost starting route.

12.7 Procedure when Stop Signal Aspect

In case the train has stopped due to the stop signal aspect (✖ or ⊗ signals) by the cab signal or the breakdown of the ATC system at a midpoint of stations in sections that implement ATC, the driver shall so notify the traffic dispatcher immediately and receive instructions for train operation thereafter.

12.8 Procedure after Stopping due to Stop Signal Aspect

When a train, etc. stops due to the previous Article, it shall not restart progression before following are indicated or instructed.

- (1) When a proceed signal is indicated; or
- (2) When being instructed to proceed; or
- (3) When operating under a shunting sign; or
- (4) When instructed for driver's attentiveness operation

3. Temporary Signals

12.9 Types of Temporary Signals

A temporary signal shall be installed temporarily to indicate signals in case a train, etc. is unable to run at a prescribed speed due to a breakdown of tracks or some other reason. Types of temporary signals and their indication methods shall be as shown in the following.

(1) Types of temporary signals

- 1) Slow-speed signal; Indicates a slow-speed signal to a train or rolling stock entering a section that requires driving at a reduced speed;
 - 2) Slow-speed warning signal: Subordinates to a slow-speed signal and indicates a warning signal of slow-speed to a train or rolling stock;
 - 3) Slow-speed release signal: Indicates a slow-speed release signal to a train or rolling stock which leaves a section requiring driving at a reduced speed.
- (2) In cases of making trains, etc. drive at a reduced speed with the slow-speed signal, the speed shall be indicated.
- (3) Temporary signals shall be used only after fixing their indication systems.

4. Hand Signals

12.10 Use of Hand Signals

Hand signals shall indicate signals with flags or lights when a cab signal is unable to be used or it is particularly necessary to indicate the signals.

12.11 Types of Hand Signals

Types of hand signals shall be as shown in the following table.

Table 12.2 Types of Hand Signals

Substitute hand signal	For use as a substitute when cab signal (limited to those which are used for trains entering or leaving a station) is unable to be used
Temporary hand signal	To be used when it is particularly necessary to indicate hand signals other than by using substitute hand signals

12.12 Indication Method of Hand Signals

The indication method of hand signals shall be as shown in the following table.

(1) Substitute hand signal

Table 12.3 Indication Method of Hand Signals (Substitute hand signal)

Type of signal	Indication method	
	Daytime	Nighttime
Stop signal	Red flag	Red light
Proceed signal	Green flag	Green light

(2) Temporary hand signal

Table 12.4 Indication Method of Hand Signals (Temporary hand signal)

Type of signal	Indication method	
	Daytime	Nighttime
Stop signal	A red flag or red light. If neither a red flag nor a red light is available, however, an object other than a green flag shall be waved around in a circle by an arm raised high.	Red light. If a red light is not available, however, any light other than a green light shall be waved around in a circle.
Slow-speed signal	Cross furred red flag and green flag held high above the head. If flags are not available, however, extend arms to right and left and move them up and down slowly.	Flashing green light
Proceed signal	A green flag or a green light. If neither a green flag nor green light is available, raise an arm high.	Green light

12.13 Identifiable Distance of Substitute Hand Signals

A flag or a light used for hand signals shall be indicated so they are identifiable from a distance of at least 400m.

5. Special Signals

12.14 Special signals

A special signal shall indicate signals when the need of stopping a train arises in an unexpected place. Special signals shall have the following types and indication methods.

Table 12.5 Special signals

Type of special signal	Type of signal	Indication method
Fusee signal	Stop signal	Red flame from a fusee
Flash signal	Stop signal	Flashing red light
Audible signal	Stop signal	Warning sound via radio communication

12.15 Stop Arrangement Due to Special Signals

The driver shall conduct the stop arrangement of the train immediately when recognizing the stop signal being indicated with a special signal.

6. Signs

12.16 Indication of Departing Sign by Conductor

12.16.1 The conductor shall indicate a departing sign when the train departs from the station.

12.16.2 The conductor shall confirm one of the following before indicating a departure sign.

- (1) A proceed signal is indicated at the starting route.
- (2) A proceed hand signal is indicated.
- (3) The repeater of departure signal is turned on.
- (4) A departure instruction sign is indicated.
- (5) A departure was instructed from a CTC traffic dispatcher

12.17 Starting Operation of Train without Depending on Departure Sign

When operating a train for which the departure sign will not be given from the conductor, the driver shall start operation of the train after confirming that conditions for departure have been satisfied.

12.18 Whistle Sign

Trains, etc. shall give a whistle sign for the following purposes

- (1) When warning against danger;
- (2) When there is a need to urge alert;

- (3) When there is a need to inform the approach of a train;
- (4) When an emergency accident occurred

7. Indicators

12.19 Train Indicator

12.19.1 Each train shall display a train indicator.

12.19.2 Types of train indicators shall be head indicator and tail indicator.

12.20 Method of Display

Train indicators shall be displayed using the following methods

- (1) Head indicator; One or more white lights shall be indicated on the front of the foremost rolling stock of the train. However, it can be skipped during the daytime.
- (2) Tail indicator; Two red lights shall be indicated on the back of the rearmost rolling stock of the train.

12.21 Displaying Contact Wire Terminal Indicator

A contact wire terminal indicator shall be installed at places where it is necessary to indicate a termination of an overhead contact line.

12.22 Car- Stop Marker

The car-stop marker shall indicate the car-stop on the stub station of a main line, sidetrack where shunting is frequently conducted, etc., and indication method, color and form shows as per the following figure, provided, however, that, these are specified it by need separately and shall be able to use it.



Fig. 12.1 Car-Stop Indicator

XIII. UNDERGROUND STRUCTURES AND FACILITIES

1. General Provisions

13.1 Underground Structures

Underground structures including tunnels shall be able to withstand the anticipated load. They shall also be free from any impediment for the safe car operation like the deviation of structures caused by the load and impact of the train.

13.2 Design Standards

Design standards for underground structures shall conform as follows,

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

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

13.2.3 Appropriate International Standards except above Design Standards shall be able to adopt.

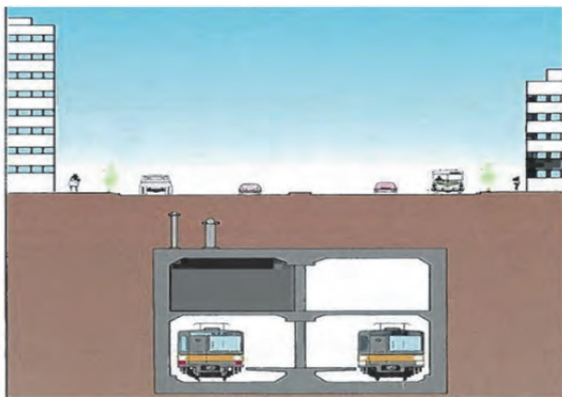


Fig.13.1 Underground Station by cut and cover Fig. 13.2 Shield Tunnel between Stations by TBM

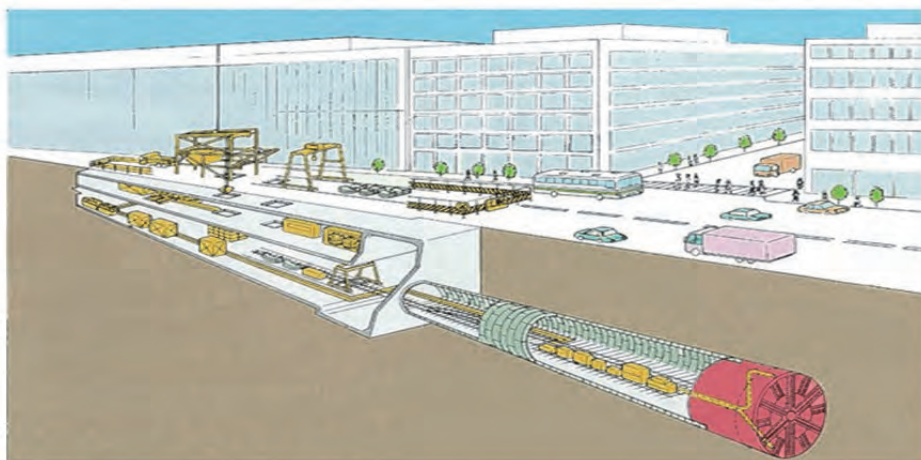


Fig. 13.3 TBM (Tunnel Boring Machine) construction method between stations

13.3 Design for measures against flooding

13.3.1 Following Structures shall be designed above critical highest flood level.

(1) Station Entrances

(2) Air Holes of Ventilation Shafts

(3) U type structure as approach between Elevated and Underground structures

13.3.2 In case of emergency, flood protection boards in front of lifts shall be equipped, because entrance of lifts are installed no higher than passage level for wheelchair users.

2. Underground Station Facilities

13.4 Station Facilities in general

13.4.1 Tunnels shall be equipped with ventilators of adequate ventilating capability. This does not apply, however, to those cases that are accessible to sufficient natural ventilation.

13.4.2 Tunnels shall be equipped with fire extinguishers, evacuation facilities and other necessary fire-prevention equipment, depending upon the structure and facility.

13.4.3 Relevant facilities or devices in tunnels shall be installed to prevent immersion and also drain appropriately.

13.5 Smoke exhaust facilities

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

(1) The required capacity of smoke exhaust facilities shall be determined according to the appropriate International Standards such as Japanese Ministerial Ordinance Article 29.

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

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

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

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

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

13.6 Evacuation guidance facilities at station

Railway station shall be provided with the following facilities.

13.6.1 At least two different evacuation passageways from the platform to the ground level

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

(2) In this case, the evacuation passageway (stairways shall be limited to those of a non-spiral structure) shall enable passengers to be safely evacuated to the ground level, and the distance to the ground level shall be as short as possible.

(3) Also, as a general rule, it shall be possible to reach the ground level only by ascending from the platform.

(4) The distance between the end of the platform to the entrance or exit of the nearest evacuation passageway shall be as short as possible.

13.6.2 Lighting facilities

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

13.6.3 Evacuation exit guide lights and passageway guide lights

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

13.7 Evacuation guidance facilities at tunnel between stations

Tunnel between stations shall be provided with the following facilities.

13.7.1 Lighting facilities

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

13.7.2 Indicators

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

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

13.8 Fire extinguishing facilities

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

13.8.1 Fire extinguishers

Fire extinguishers shall be provided at the locations in a railway station deemed necessary for fire extinguishing activities.

13.8.2 Indoor fire hydrants

Indoor fire hydrants shall be provided at the locations in a railway station deemed necessary for fire extinguishing activities, and shall be provided with an emergency power source.

13.8.3 Internal piping for distributing water for spraying equipment or sprinkler equipment

Habitable rooms (excluding rooms relating to train operation safety) shall be provided with internal piping for distributing water for spraying equipment or sprinkler equipment that have water supply ports.

A convenience store type kiosk shall be provided with sprinkler equipment that has a water supply port.

13.8.4 Internal piping for distributing water for fire fighting

Outlets for internal piping for distributing water for firefighting at a railway station shall be provided at the locations deemed necessary for fire extinguishing activities on platforms, concourses and in passageways.

However, this does not apply in the case where indoor fire hydrants equipped with water supply ports are installed, and in addition it is deemed that they are effective for performing fire extinguishing activities.

If the distance between the outlets of internal piping for distributing water for firefighting on the platforms of adjacent railway stations exceeds 500 meters, internal piping for distributing water for firefighting shall be installed in tunnel between adjacent railway stations as well.

The distance between the outlets of internal piping for distributing water for firefighting shall be so determined as to be necessary for performing fire extinguishing activities.

13.9 Fireproofing of structures

Structures shall be made fireproof according to the following stipulations.

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

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

13.9.3 Substations, distribution stations and machine rooms shall be partitioned from other areas by floors and walls having a fire-resistant construction and also fire doors.

Also, if cables and the like pass through these partitions, the penetrations of the partitions shall be filled with non-flammable material.

Fire doors shall be provided with automatic closing devices such as door closers and similar equipment.

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

13.10 Disaster prevention control center

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

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

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

13.11 Alarm facilities

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

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

13.12 Notification facilities

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

13.12.2 A railway station shall also be provided with broadcasting facilities that can be controlled from the disaster prevention control center. (The range over which announcements can be made from the disaster prevention control center shall include the platforms, concourse, passageways and other areas controlled by the station.)

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

13.13 Auxiliary wireless communication facilities

13.13.1 Communication facilities to enable communication from a train or the inside of a tunnel to the operation command center shall be provided in a tunnel between stations.

13.13.2 In this case, the communication facilities that permit communication from the inside of a tunnel to the operation command center shall be provided at intervals of no more than 250 meters inside the tunnel.

13.14 Fire doors

13.14.1 Connecting underground passages between one railway station and other station of another line (excluding cases where the same platform is used) and between the railway station and underground shopping malls etc., shall be provided with fire doors and the like (fire doors provided with hinged or sliding doors and the fire shutter).

13.14.2 Fire doors and the like shall be provided at evacuation stairways of the platform and also at other necessary locations to enable passengers to evacuate safely.

13.14.3 In this case, the fire shutters shall lower when activated by a detector down to a height of 2 meters above the floor and shall also be capable of being lowered by remote control from the disaster prevention control center.

In addition, said fire shutters shall be of a 2-stage closing construction whereby they are closed completely by an attendant at the locations where they are installed. It shall be possible to verify the lowering and closure of the fire shutter from the disaster prevention control center.

13.15 Flooding prevention equipment

13.15.1 Measures against flooding water coming into tunnels with critical highest flood level shall be required at station entrances, lift entrances, air holes of ventilation shafts and U type structure as approach between elevated and underground structures.

13.15.2 Against for worst case of flooding water coming into tunnels, protection gate at U type structure shall be considered without affected Metrorail all route.

13.16 Drainage equipment

Drainages and pumps shall be equipped for adequate capacities after calculation with leaking water from structures and flowing from station rooms and others.

13.17 Indicators

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

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

13.17.2 It is possible to evacuate from the front and the rear of the train.

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

13.18 Other facilities

13.18.1 Self-contained-compressed air breathing apparatus shall be provided at railway stations. In this case the number of units breathing apparatus permanently provided shall be at least the number of staff engaged in work such as helping passengers, guiding officers engaged in fire extinguishing and fire prevention activities and other such work.

13.18.2 In principle, dedicated ventilating facilities shall be installed at a substation.

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

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

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

13.18.6 A passageway in tunnels between stations that is used to evacuate passengers shall be of a construction that does not impede evacuation.

13.19 Manual

At each railway station, a manual stipulating the following items relating to the action to be taken by the staff in charge in the event that a fire breaks out, education and training and also collaboration with a fire fighting organization shall be prepared.

In this case, the contents of the manual shall be determined after adequate consultation with the firefighting organization.

- (1) Items relating to action to be taken by the staff in charge in the event of a fire
- (2) Implementation method etc., of education and training for the staff in charge (this training mainly refers to training in initial fire extinguishing activities, evacuation guidance, etc.)
- (3) Providing effective information concerning firefighting activities to the firefighting organization

XIV. FALL PREVENTION FACILITY

14.1 Introduction of Fall Prevention Facility

14.1.1 The railway operator can introduce the safety facility (hereafter “Fall Prevention Facility”), such as Platform Screen Door, which prevents that a passenger falls from the platform or a passenger contacts with the running train in each station, when it is judged to be required, in order to ensure the passenger's safety. When the railway operator operates the train with single driving staff or without driving staff, the introduction of Fall Prevention Facility shall be obligated.

14.2 Construction gauge corresponding to Fall Prevention Facility

14.2.1 The railway operator shall define the construction gauge corresponding to Fall Prevention Facility when the facility is decided to be introduced.

14.3 Strength of Fall Prevention Facility

14.3.1 The Fall Prevention Facility shall have sufficient strength which can withstand passenger's leaning force against the facility and a strong wind.

14.4 Ensuring the safety of Fall Prevention Facility

14.4.1 The Fall Prevention Facility shall be introduced taking into fully consideration about the measures for the following risks so that the passenger does not get injured with this facility. In addition, other risks caused by the installation of this facility shall be examined carefully and counter measures shall be taken for the envisaged risks.

- (1) Contact to the train by putting long things, such as a bamboo pole, against Fall Prevention Facility
- (2) Contact to the train by a passenger leaning out from Fall Prevention Facility
- (3) Contact to the Fall Prevention Facility by a passenger leaning out from the window of the train
- (4) Falling a foreign substance by a passenger placing a can etc. on Fall Prevention Facility
- (5) The dangerous foreign substance (thin string etc.) stuck to the door in Fall Prevention Facility
- (6) Leaving a passenger between Fall Prevention Facility and the train

14.5 Correspondence to the case a train stops at inappropriate position

14.5.1 The Fall Prevention Facility shall have the system that passengers can escape from a train to the platform even when the train stops at inappropriate position.

14.6 Correspondence to the electric power failure

14.6.1 The Fall Prevention Facility shall have the system that passengers can escape from a train to the platform even when the electric power is down.

14.7 Measures against difference of electrical potential

14.7.1 The Fall Prevention Facility shall have the measures so that a passenger does not receive an electric shock caused by the difference of electrical potential between the facility and the train.

14.8 Reliability

14.8.1 The Fall Prevention Facility shall have sufficient reliability so that the train operation may not be affected.

XV. MEASURES AGAINST ACCIDENTS, ETC.

15.1 Cautions in Abnormal Meteorological Conditions

15.1.1 When there is a risk of a disaster due to rainfall, earthquakes, etc. or when meteorological information thereon has been received, those who engage in train or rolling stock operation or maintenance of tracks, etc. shall pay special attention to train or rolling stock operation and make heightened precautions thereto.

15.1.2 Handling of such as detailed operation control shall be established for precautions to or patrol of tracks and restrictions on running speed at the time of rainfall, earthquakes, etc.

15.2 Stop Arrangement for Train Protection

When the need to urgently stop a train arises due to track breakdowns and such, arrangements to stop a train immediately shall be conducted.

(1) Ground officials

(a) Indicate a stop signal using radio communication

(b) Indicate a stop signal using a portable fusee or portable flash mechanism for special signals

(2) Drivers and conductors

Indicate a stop signal using a fusee for rolling stock and radio communication

15.3 Measures for Fire Outbreaks on Trains, Underground Stations, etc.

For the prevention of hazards, and the safety and prompt evacuation of passengers when a fire breaks out on a train, which is running in an underground station, etc., or in an underground station, etc., the following rules shall be stipulated.

(1) In the event a fire breaks out on a running train, the train shall be driven to the next station or out of the tunnel in principle.

(2) The relevant trains shall be stopped at their nearest stations and shall be kept there.

(3) In the event a train on fire is parked at a station or a station is on fire, trains approaching the concerned station shall not be stopped at the concerned station in principle.

ATTACHMENT

List of Codes and standards

Comply

AUTOMATIC FARE COLLECTION (AFC)

- ISO/IEC 15408 Evaluation criteria for IT security
- ISO/IEC 18092 Telecommunications and information exchange between systems
- ISO/IEC 14443 Identification cards

Reference

CIVIL, UNDERGROUND STRUCTURES AND FACILITIES

- Design Standards for Railway Structures (issued in Japan)
- AASHTO (American Association of States Highway and Transportation Officials) Specification
- BS (British Standard)
- IRC (Indian Railway Code)
- Any other internationally recognized codes and standards
- Bangladesh National Building Code (BNBC)

ROLLING STOCK

- JIS R 3205 laminated glass
- JIS R 3206 reinforced glass
- JIS R 3213 safety glass
- JIS E 4603 Electric Measuring Speedometers for Railway Rolling Stock
- ISO 5660-1:2002 Reaction-to-fire tests