



# ಕರ್ನಾಟಕ ರಾಜ್ಯಪತ್ರ

ಅಧಿಕೃತವಾಗಿ ಪ್ರಕಟಿಸಲಾದುದು  
ವಿಶೇಷ ಪತ್ರಿಕೆ

ಭಾಗ - IV-A

ಬೆಂಗಳೂರು, ಸೋಮವಾರ, ಅಕ್ಟೋಬರ್ ೧೧, ೨೦೧೦ (ಅಶ್ವಯುಜ ೧೯, ಶಕ ವರ್ಷ ೧೯೩೨)

ನಂ. ೧೦೫೨

Urban Development Secretariat

## NOTIFICATION

No. UDD 120 PRJ 2010 (P-3), Bangalore, Dated: 8<sup>th</sup> October, 2010

The draft of the following rules which the Government of Karnataka proposes to make in exercise of powers conferred by Section 24 of Mysore Tramways Act, 1906 (Mysore Act, II) is hereby published as required under Sub Section (1) to (5) of Section 26 of Mysore Tramways Act, 1906, for the information of all persons likely to be affected thereby and notice is hereby given that the said draft will be taken into consideration after thirty days from the date of its publication in the Official Gazette.

Any objection or suggestion which may be received by the State Government from any person in respect of a said draft before the expiry of the period specified above will be considered by the State Government. The objections and suggestions may be addressed to Principle Secretary to Government (Additional Chief Secretary as the case may be), Urban Development Department, Vikas Soudha, Bangalore 01.

## DRAFT RULES

### BANGALORE METRO RAIL

### (OPENING OF RAIL FOR PUBLIC CARRIAGE OF PASSENGERS) RULES, 2010

In exercise of the powers conferred by Section 24 of the Mysore Tramways Act, 1906, the State Government hereby makes the following rules, namely:-

## CHAPTER - I

### PRELIMINARY

#### 1. Short title, commencement and application.

- 1) These Rules may be called the Rules for Opening of Bangalore Metro Railway for Public Carriage of Passengers, 2010.
- 2) They shall come into force on the date of their publication in the Official Gazette.

## **2. Definitions.-**

(1) In these rules, unless the context otherwise requires,-

- a. "Act" means Mysore Tramways Act, 1906;
- b. "Authorised" means authorised by the metro railway administration;
- c. "Bridge engineer" means the Chief Engineer or any other engineer responsible for design and/or construction of bridges or viaducts;
- d. "Chief Executive Officer" means the Metro Railway administrator or the officer in-charge of the Metro Railway Operations.
- e. "Commissioner" means the Engineer appointed under Section.12 of the Act;
- f. "Form" means a Form appended to these rules;
- g. "General Rules" means Bangalore Metro Railway General Rules, 2010;
- h. "Government" means the Department of Urban Development in the Government of Karnataka;
- i. "Metro Railway" where ever the words Metro Railway used in these Rules means Tramway as defined in the Act;
- j. "Metro Railway Administration" means Metro Railway Administration as defined in the Bangalore Metro Rail Corporation General Rules 2010
- k. "Passenger" means a person travelling on the metro railway with a valid ticket or pass;
- l. "Report" means the report of the Commissioner;
- m. "Schedule" means a Schedule appended to these Rules;

## **CHAPTER - II**

### **PREPARATION FOR OPENING OF THE METRO RAIL**

#### **3. Opening of the Metro Rail.-**

(1) The metro railway administration shall ensure that the metro railway or a portion thereof to be opened for public carriage of passengers is complete in all respects as per the manuals of practice of the metro railway and for such opening all the administrative formalities are completed and that the working of metro railway is regulated by Bangalore Metro Railway General Rules, 2010.

(2) Where the Chief Executive Officer is of the opinion that the metro railway or part thereof is required to be opened for public carriage of passengers, he shall refer the matter to the Commissioner for inspection and report on the safety of that metro railway.

#### **4. Supply of documents to the Commissioner.-**

(1) The Chief Executive Officer shall, while making reference to the Commissioner for inspection and report on the safety of the metro railway under sub-rule (2) of rule 3, furnish all relevant documents to the Commissioner from the following list of documents, namely:-

- (a) Tabulated details;
- (b) Index plan and sections;

- (c) Drawings of works;
- (d) Certificate(s);
- (e) List of infringements of moving and fixed dimensions;
- (f) Working orders to be enforced at the operations control centre and at each station;  
and
- (g) Administrative note giving salient features of the project.

(2) The documents referred to in sub-rule (1) shall indicate the distances from the same fixed point in kilometers and decimals up to two digits and the fixed point shall be clearly defined in a note on the plan and section sheets of the work documents.

(3) The datum adopted shall be mean sea level as fixed by the Survey of India and heights shall be mentioned with reference to the datum in metres and decimals up to two digits.

(4) The documents referred to in sub-rule (1) shall be signed by atleast an officer equivalent to senior administrative grade rank except the certificate(s) which shall be signed by the Chief Executive Officer himself.

(5) The Chief Executive Officer shall furnish such documents to the Commissioner, as far as possible, at least one month in advance of the stipulated date of inspection.

#### **5. Contents of documents.-**

(1) Tabulated details shall consist of important characteristics of the metro railway or a portion thereof to be opened for public carriage of passengers, and in particular shall include-

- (a) Curve abstract as specified in Form I;
  - (b) Gradient abstract as specified in Form II;
  - (c) Bridge abstract as specified in Form III;
  - (d) Viaduct abstract as specified in Form IV;
  - (e) Important bridges abstract as specified in Form V;
  - (f) Ballast and permanent way abstract as specified in Form VI;
  - (g) Stations and station sites as specified in Form VII;
  - (h) Brief particulars of rolling stock as specified in Form VIII;
  - (i) Brief particulars of traction installations as specified in Form IX;
  - (j) Power supply installation abstract as specified in Form X;
  - (k) Electrical crossings over metro railway tracks as specified in Form XI;
  - (l) Traction maintenance depot abstract as specified in Form XII;
  - (m) Ventilation, smoke management and fire safety measures in tunnels and stations as specified in Form XIII; and
  - (n) Signalling/ train control and tele-communication installations as per sample in Form XIV.
- (2) Index plan and section sheets, completion drawings, etc., shall include,-

- (a) Index plan and section sheets as mentioned in the Schedule;
  - (b) Completion drawings of bridges/viaducts showing details of structure, loading standards adopted, etc
  - (c) Completion drawing of tunnels, if any;
  - (d) Diagrammatic plan of station yards showing layout of tracks and particulars of turn outs, gradients, of any signalling and interlocking installed and
- (3) The comments on the following matters, namely:
- (a) Moving and fixed dimensions;
  - (b) Strength of bridges/viaducts;
  - (c) Brake and communication;
  - (d) System of working;
  - (e) Electric traction equipment; and
  - (f) Type of rolling stock, proposed along with list of restrictions, shall be contained in the certificate in Form XV.
- (4) List of infringements of moving and fixed dimensions shall be prepared as specified in Form XVI and shall contain full explanations for the infringements and restrictions or precautions to be adopted because of them and the reference to the authority of the Central Government under which the infringement is permitted or allowed.
- (5) Working orders to be enforced at each station on the metro railway to be opened shall be prepared in accordance with the provisions of the Bangalore Metro Railway General Rules, 2010 and shall specify special conditions that are required to be met with and such orders shall include traction working rules.

### **CHAPTER - III**

#### **DUTIES OF THE CHIEF EXECUTIVE OFFICER**

##### **6. Deviations from manuals of practice to be notified.-**

- (1) The Chief Executive Officer shall ensure that the Metro Railway or a portion thereof proposed to be opened is operationally fit in every respect before inspection.
- (2) The Chief Executive Officer shall, while making reference under sub-rule (2) of rule 3, bring to the notice of the Commissioner any deviation in design, material and construction of the civil works, electrical, signalling/train control and telecommunication installations, rolling stock or appliances of the metro railway, instances in which moving and fixed dimensions have not been observed, or the bridges or viaduct or tunnels that are not capable of carrying the specified or standard loading without exceeding the stresses specified in relevant Indian Codes/International Codes.

##### **7. Chief Executive Officer to make special arrangements.-**

- (1) The Chief Executive Officer shall make such arrangements which are necessary to facilitate the inspection of the metro railway, which is to be recommended for opening by the Commissioner.

- (2) The Chief Executive Officer shall be responsible to make such special arrangements as the Commissioner may require for inspection of civil structures, permanent-way, rolling stock, electrical, signaling/train control and telecommunication installations on the metro railway, which is to be opened.

**8. Supply of information to the Commissioner.-** (1) The Chief Executive Officer shall supply all the information, give all the assistance to the Commissioner and supply or provide all instruments and apparatus required for taking measurements, testing of bridges/viaducts, rolling stock, electrical, signaling, telecommunication and other installations.

**9. Dismantling of any work on request by Commissioner.-**

- (1) The Chief Executive Officer, shall on receipt of a request made by the Commissioner, make arrangements to dismantle any structure on the metro railway to be opened with a view to make complete examination of the details or workmanship of the structure, as quickly and completely as possible.
- (2) The Commissioner, while requesting the dismantling of the structure, shall be responsible to see that such dismantling does 'not affect the utility or strength of the structure' unless dismantling is necessary for its proper inspection.

**10. Chief Executive Officer to accompany the Commissioner at inspection.-**

- (1) The Chief Executive Officer shall accompany the Commissioner throughout the inspection.
- (2) If, for any unavoidable reason, it is not possible for the Chief Executive Officer to accompany the Commissioner, then an official not below the rank of senior administrative grade, authorized by general or special order issued by the Chief Executive Officer, shall accompany the Commissioner and shall be present during the entire period of inspection.
- (3) During such inspection of each portion of the metro railway, the engineer or officer who is or was in immediate charge, or his representative of that portion of the metro railway during its construction may also be present.

**CHAPTER - IV**

**DUTIES OF THE COMMISSIONER**

**11. Commissioner to make full and complete examination.-**

- (1) On receipt of a reference under sub-rule (2) of rule 3 from the Chief Executive Officer, the Commissioner shall, with a view to determining whether it is fit to be so opened, inquire into all matters which appear to him relevant for the safety of public carriage of passengers on that metro railway.
- (2) The Commissioner shall satisfy himself that,-
- (a) the Bangalore Metro Railway General Rules, 2010 have been applied to the metro railway or part thereof proposed to be opened;
- (b) the moving and fixed dimensions have been observed; and
- (c) the civil works, permanent-way, electrical, signal, telecommunication, rolling stock and other appliances belonging to or working on the metro railway are designed properly or constructed in such a manner so as to guard the system against accident and failure.

**12. Provisions for handling traffic at stations.-**

(1) The Commissioner shall satisfy himself, that at every station on the part of Bangalore metro railway proposed to be opened -

- (a) adequate provision has been made for handling of passenger traffic;
- (b) arrangements have been made for easy access by road; and
- (c) adequate fire-protection and disaster management measures have been taken along with arrangements for safe evacuation of passengers.

**13. Inspection of bridges or viaducts.-**

The Commissioner shall satisfy himself that the bridges or viaducts and other elevated structures on the metro railway proposed to be opened for public carriage of passengers are so designed and constructed to conform to the loading standards as specified in Bangalore Metro Railway Bridge Manual and that the stress limits are not exceeded.

**14. Procedure for inspection of bridges or viaducts.-**

(1) For the purpose of rule 13, the Commissioner shall examine at least one bridge or viaduct of each different pattern or type, as the case may be, and satisfy himself about the adequacy with reference to the safety of

- (a) the general design of the bridge or viaduct;
- (b) designs of different parts or portions of the bridge or viaduct;
- (c) the construction and erection of the whole structure of the bridge or viaduct;
- (d) steel/girder/concrete/composite spans and their bedding at all supports; and
- (e) type and design of the pre-stressed concrete bridges or viaducts including their bearings.

(2) If the Commissioner considers it necessary, in addition to the certificate of a bridge engineer employed for the purpose, he may call for load deflection test as specified in Form XVII and other tests under the loads for which the bridge is designed.

(3) If the Commissioner is satisfied that the girders have been properly designed for the work they are intended to perform, then the open-web and plate-girders shall not require to be tested.

(4) The Commissioner may test any number of span and may test a span any number of times and at any speed as he considers desirable up to the maximum permissible speed of the -section.

**15. Inspection of electrical installations.-**

(1) The Commissioner shall inspect the following for electrical installations on the metro railway proposed to be opened for the public carriage of passengers, keeping in view the essentiality of services and safety of passengers, namely:

- (a) protection systems of sub-stations;
- (b) earthing and bonding of installations;
- (c) electro magnetic interferences to ensure that these are within limits; and
- (d) essential services to ensure that these would run in case of major break downs;

- (e) (i) electrical clearances;
- (ii) caution and danger notice boards for public;
- (iii) assurance registers signed by various metro railway staff of their knowledge of working in electrified area;
- (iv) maintenance facilities and manpower; and
- (v) fire fighting measures;
- (f) any other item, as he may consider fit for the safety of passengers.

**16. Inspection of rolling stock.-**

The Commissioner shall inspect the following items of the rolling stock proposed to be used on the metro railway keeping in view the safety of travelling public on metro railway system proposed to be opened, namely:

- (a) important systems like traction, braking, etc.;
- (b) safety items like deadman handle, door operations, etc.;
- (c) facilities for evacuation of passengers in case of emergencies;
- (d) system of operation;
- (e) fire prevention measures; and
- (f) any other item, as he may consider fit for safety of passengers.

**17. Inspection of signalling and telecom facilities.-**The Commissioner shall inspect the following items of the signalling and telecom facilities keeping in view the safety of travelling public, proposed to be used on metro railway system proposed to be opened, namely: -

- (a) fail-safe features of the signalling system;
- (b) communication between Train Operator and passengers; and
- (c) any other item, as he may consider fit for the safety of the passengers.

**18. Inspection of facilities for relief of passengers in emergencies.-** The Commissioner shall check the following facilities for relief of passengers in case of emergency, namely:-

- (i) in-house facilities and preparedness to combat emergencies;
- (ii) communication and arrangements with outside relief agencies;
- (iii) any other item, as he may consider fit for safety for passengers; and
- (iv) competency of metro railway official connected with train working.

**CHAPTER - V**

**THE INSPECTION REPORT**

**19. Contents of report.-**

- (1) The report shall specify that-
  - (a) he has made a careful inspection of the metro railway and the rolling stock that may be used thereon;

- (b) the moving and fixed dimensions as laid down have not been infringed;
- (c) the track structure, strength of bridges/viaducts, tunnels, general structural character of the civil works, signalling and train control system, telecommunication, traction installations and the size of, and maximum gross load upon the axles of any rolling stock, comply with the requirements laid down; and
- (d) in his opinion, the metro railway can be opened for the public carriage of passengers without any danger to the public using it.

(2) The report shall be clear and concise and shall deal with all matters which are required to be considered, particularly whether the metro railway line is designed for the specified loading and the instances of deviation or infringement of moving and fixed dimensions.

**20. Documents accompanying inspection report.**-The report shall be accompanied by the following documents, namely:

- (a) Index plan and section of the metro railway;
- (b) Results of the bridge test, when asked for by the Commissioner;
- (c) Documents required for initiation of electric traction;
- (d) Tabulated details in Forms I to XIV;
- (e) Certificate by the Chief Executive Officer in Form XV; and
- (f) List of infringements of moving and fixed dimensions in Form XVI.

**21. Submission of report to State Government.**- In respect of every reference made to him under sub-rule (2) of rule 3, the Commissioner shall submit his report to the State Government.

## CHAPTER - VI

### SANCTION TO OPEN METRO RAIL FOR PUBLIC CARRIAGE OF PASSENGERS

#### **22. Sanction to open metro railway.-**

(1) The State Government may, after considering the report submitted under rule 21 by the Commissioner, sanction the opening of the Bangalore metro railway or a portion thereof as the case may be, under section 14 of the Act as such or subject to such conditions as may be considered by it for the safety of the public.

(2) The Chief Executive Officer shall publish the date of opening of Bangalore metro railway or a portion thereof for public carriage of passengers in the local newspapers in English, Hindi and Kannada languages.

#### **23. Opening of a metro rail by the Commissioner.-**

(1) The Commissioner may also sanction the opening of Bangalore metro railway for public carriage of passengers, subject to such conditions as he may impose in the interest of the passengers. While giving sanction to the opening of metro railway, he will, however, forward his inspection report to the State Government.

(2) On receipt of the inspection report of the Commissioner, the State Government may confirm, modify or cancel the sanction given under sub rule (1) subject to such conditions, alterations or relaxation as may be considered necessary.

**CHAPTER - VII**

**INTRODUCTION OF NEW TYPE OF ROLLING STOCK**

**24. Use of new type of rolling stock.-**

(1) The metro railway administration when it desires to use new type of rolling stock different from those already running on a section of the metro railway, shall apply for sanction for the same to the State Government through the Commissioner.

(2) Any modification in the design of car which alters the system of operation and control on the rolling stock like change in the braking system, or change in the principle of traction, shall be considered as a material modification and shall constitute a change in the type and design of the rolling stock.

(3) Any modification in the car or rolling stock affecting the salient dimensions or suspension system or running gears and any other modification which affect the riding quality of the rolling stock, shall also constitute a change in the type and design of the rolling stock.

(4) For new designs of rolling stock, oscillation and or other trials are required to be conducted as per the procedure specified by State Government from time to time to determine safe speed potential and stability of rolling stock. This provision shall apply for increasing the speed of existing rolling stock by making improvements.

(5) The application under sub-rule (1) shall be accompanied by-

(a) such diagrams as necessary to give full particulars of the axle loads, wheel spacing, length over buffers/couplers and other principal dimensions of the rolling stock as specified in Form VI for which sanction is required;

(b) such calculations and stress sheets showing -

(i) the external forces on which the stress calculations are based;

(ii) the stresses which will be produced in the various bridges/ viaducts on which the proposed rolling stock will run;

(iii) the effects which the said rolling stock will have on various structures and track as compared with those caused by the rolling stock already in use, or allowed by the existing orders; and

(iv) the conclusions arrived at;

(c) the calculations, stress sheets must show, as to what allowance has been made for any secondary or deformative stresses in addition to the primary stresses caused by the external forces and what relief of stress, if any, has been included. The Commissioner may ask for necessary tests to be carried out on bridges as referred to in sub-rule (2) of rule 14;

(d) the modification, if any, necessary to signaling and telecommunication installation to ensure electromagnetic compatibility/ electromagnetic interference compatibility with rolling stock and a certificate that the same have been carried out;

(e) actual test report of electromagnetic compatibility/ electromagnetic interference measurements with rolling stock and a confirmation that the results are within specified limits and standards;

- (f) report of checks on rolling stock to ensure that it withstands the electromagnetic interference from external sources;
- (g) speed certificate based on oscillation trial results;
- (h) a safety certificate jointly signed by the Chief Engineer, Chief Electrical Engineer, Chief Signalling and Telecommunication Engineer and Chief Operating Manager of the metro railway in the Form XVIII.

(6) The proposal shall be scrutinized by the Commissioner and the recommendations thereon shall be submitted to the Central Government for its orders.

(7) No new type of rolling stock which causes change in the electromagnetic compatibility/electromagnetic interference behaviour or stresses exceeding the design criteria specified and approved by the State Government for existing structures or excessive stresses in track shall be ordered unless sanction of the Central Government has been received through the Commissioner for doing so.

### **CHAPTER - VIII**

#### **ALTERATIONS OR CHANGES IN THE EXISTING METRO RAIL**

##### **25. Notice of alterations or changes.-**

(1) Where it is proposed on Bangalore metro railway or a portion thereof which had been opened after inspection, to construct any deviation lines, stations, or to make an addition, alteration or reconstruction materially affecting the character of any work and such work forms part of, or is directly connected with the working of the metro railway, the metro railway administration shall give notice to that effect to the Commissioner.

(2) Before any such work, the execution of which may affect the running of trains carrying passengers is taken in hand, the metro railway administration shall furnish to the Commissioner for his approval drawings or particulars of work and any temporary arrangements necessary for carrying it out.

##### **26. Opening of new or strengthening bridges or viaducts.-**

(1) No bridge or viaduct shall be reopened to traffic, after strengthening without the approval of the Commissioner even though it is able to carry the load without exceeding the maximum permissible stresses as specified in the relevant India Codes/International Codes.

(2) No load shall be imposed on Bangalore metro railway bridge or viaduct which would cause in any member thereof stress greater than those specified in sub-rule (1) without the sanction of the Commissioner.

(3) Closure of an existing bridge shall require the sanction of the Commissioner.

##### **27. Use of new type of signalling equipment.-**

(1) The metro railway administration, when it desires to use a new type of signalling equipment which is not of approved type, shall apply for sanction to the Commissioner:

(2) The application under sub-rule (1) shall be accompanied by-

(a) a list of the requirements which the equipment fulfils together with the results of the tests conducted;

(b) a certificate from the Chief Signal and Telecommunication Engineer in the Form XIX;

- (c) a statement giving details of the tests, trials and verification conducted by suppliers, metro railway, etc., on the performance of the equipment;
- (d) safety assessment report from an independent safety assessor, where applicable;
- (e) certificate, if any, from other metro railway where equipment is in use for passenger carrying services;
- (f) the relevant system details as may be necessary to give full particulars of the principle of operations and safety features incorporated; and
- (g) a copy of the instructions jointly approved by Chief Operations Manager and Chief Signal and Telecommunication Engineer, to be issued for operation of the equipment by the Operating Staff, including those instructions for working under abnormal or failure conditions.

**28. Alterations or changes in electric traction equipment and use of new traction equipment.-**

(1) The metro railway administration when it desires to use new type of electric traction system which is not of approved type or alter or make changes in electric traction equipment when it materially affects its design characteristics and is directly connected with the train operation, such metro railway administration shall apply for new type of traction system, such alteration or change in electric traction equipment to the Commissioner.

(2) The application under sub-rule (1) shall be accompanied by-

- (a) a list of requirements which the equipment fulfils;
- (b) a statement whether the equipment complies with the relevant Indian specifications or International specifications;
- (c) a statement giving detail of the tests, trials and verification conducted by suppliers, metro railway, etc., on the performance of the equipment;
- (d) certificate, if any from other metro railway where equipment is in use for passenger carrying services; and
- (e) the relevant system details as may be necessary to give full particulars of the principle of operation and safety features incorporated.

**CHAPTER - IX**

**SIGNALLING/TRAIN CONTROL AND TELE-COMMUNICATION INSTALLATIONS**

**29. Signals.-**

(1) The signals to be provided for controlling the movements of trains on Bangalore metro railway shall be,-

- (a) Cab Signals;
- (b) Fixed Signals (where provided) and
- (c) Hand signals

(2) The signalling and train control systems shall permit different modes of train operation depending upon its design, namely:-

- (a) automatic train operation (where provided) (ATO);

- (b) Automatic train protection manual mode (ATP).
- (c) run on sight (ROS);
- (d) restricted manual (RM);
- (e) cut-out.

(3) Under special circumstances and during initial stages, train services on Bangalore metro railway may be run with the concurrence of the Commissioner, and the approval of the Chief Executive Officer, by any of the following system of working, namely:

- (a) automatic block system;
- (b) absolute block system:

Provided that the Chief Executive Officer will give approval only after obtaining the necessary sanction therefore from the Commissioner.

(4) The requirements of the various modes of train operations given above shall be in accordance with provisions laid down in Bangalore Metro Railway General Rules, 2010.

(5) The Signalling and train control systems provided on the section shall be optimum for the planned level of safety and requirement of traffic.

(6) The design of signalling and train control system shall be such as to enable the driver to easily distinguish between various modes of train operation.

(7) The locations of trains running on the section and aspects of the signals where provided and in use shall be displayed in the operations control center and station control rooms.

(8) The cab signal and fixed signals where provided but not in use will have specific indication to that effect.

(9) The standard of safety of signalling and train control system provided shall generally be in accordance with the recommendations of the European Committee for Electromechanical Standardisation or its equivalent national standards/international standards.

### **30. Points.-**

- (1) All points on passenger lines shall be power operated.
- (2) The point operating mechanism on passenger lines shall be of nontrailable designs.
- (3) Spring points shall not be used.
- (4) Movable crossings and movable diamond crossings on passenger lines shall be provided with complete facing point equipment of approved type.
- (5) The requirements of points as stipulated in Bangalore Metro Signal Engineering Manual shall be followed.

### **31. Interlocking.-**

- (1) The operation of signalling gears shall be from a panel or VDU/key board or any other approved means enabling operation of routes and also individual operation of points and signals.
- (2) The apparatus provided for operation of points and signals shall be interlocked for all passenger running lines.

(3) The standard and requirements of interlocking shall be as per Bangalore Metro Signal Engineering Manual.

**32. Track circuits.**- (1) All passenger running lines shall be equipped with means of continuing detection like track circuit etc., to detect the presence or absence of a vehicle.

**33. Sidings.**- Sidings shall be arranged in such a manner that shunting operations upon them shall involve the least possible use of or obstruction to, running lines.

**34. Provision of isolation at stations.**-

(1) All passenger lines shall be isolated from all sidings connected thereto.

(2) Isolation may be accomplished by -

- (a) connection to a long line or siding; or
- (b) provision of a short dead end siding; or
- (c) provision of trap; or
- (d) any other authorised means.

**Note.**-When a trap is provided, the trap switch should be located with the heel of the switch in rear of the fouling mark and preferably on the straight. The switch should be in the rail away from the line to be protected.

**35. Emergency communication.**- Necessary means of communication like mobile radio communication shall be provided to enable the drivers to contact operation control centre and station control room in case of emergency.

**36. General.**- Necessary measures like protective devices or design features shall be adopted to safeguard the signaling/ train control and tele-communication installations against the harmful effect of electromagnetic inference, stray currents and earth leakage current, etc., from 750 V DC third rail traction system as adopted on the section.

## CHAPTER - X

### DESIGN AND INSPECTION OF EQUIPMENT FOR ELECTRIC TRACTION

**37. Design of electric installations.**-

(1) The design of all electric installations, namely transmission and distribution cables, sub-stations, and third rail dc traction system etc., shall be according to International Standards or approved standards laid down by the Central Government and the Indian Electricity Rules, 1956, or any other law for the time being in force and wherever any departure from accepted norms becomes necessary, approval of the Central Government shall be obtained.

(2) Adequate protective arrangement shall be made to ensure that the public cannot come in contact with the electric equipment on line within the metro railway premises.

(3) Suitable protective screens/shrouds shall be provided where live conductor rails pass under or over bridges.

(4) When the distribution system involves third rail carried on pedestals and return circuit via running rails or earth, all such structures, and associated tracks shall be effectively earthed and bonded or other precautions taken to ensure that. Contact with any part of the structure will not be dangerous to the public and the metro railway staff. In traction, bonding and earthing shall be as

per the approved code for bonding and earthing in respective areas. In case of elevated concrete structures continuous earth bonding shall be provided by earthing the reinforcement of structures.

(5) Earthing arrangements at power supply installations shall strictly conform to the International Standards or Indian Electricity Rules, 1956 and accepted codes of practices for bonding and earthing for traction. Adequate stray current control/protection system shall be provided under DC traction systems to avoid corrosion to steel reinforcement and other metallic parts of the tunnels and nearby structures. All precautions shall be taken to avoid electro-magnetic effect in the environment as per relevant standards.

(6) The earthing system for DC traction shall conform to requirements of IS-3043 and EN-50122 Part-I and the maximum rail potential during permanent condition shall not exceed 120 V for main lines and 60 V for depot area in accordance with EN-50122 Part-I.

(7) No earth wire shall cross any track and where structures to be connected to an earth-wire are located on opposite sides of a track, separate wire runs shall be used for connecting the structures. In complicated areas, structures may be connected to individual earthing stations.

(8) The Chief Electrical Engineer of Bangalore Metro Rail Corporation functions as the Electrical Inspector to the Government of India for Bangalore Metro Rail Corporation jobs.

(9) Lightning arrestors of standard or approved types shall be provided wherever they are necessary.

(10) All component parts of the equipment which carry live conductors shall be provided with devices approved by the Electrical Inspector to the Government of India to prevent unauthorised persons climbing them. Anti-climbing devices shall also be provided, wherever necessary, on structures carrying high tension equipment within metro railway premises.

(11) On both sides of the roads at road-under-bridges, height gauges of suitable design shall be provided to ensure that no part of any road vehicle or its load shall come in contact with the road-under-bridge girders.

(12) Warning notices shall be erected in conspicuous positions indicating the existence of live electrical equipment.

### **38. Display of caution boards and notices. -**

The following caution boards and notices of standard sizes written in Kannada, English and Hindi shall be displayed at the various locations indicated below:

- (a) Treatment for Electric Shock boards giving instructions for treatment of electric shock at all railway stations control rooms, Metro train depots, receiving sub-stations, traction sub-stations, auxiliary sub-stations, offices of maintenance engineers for works, signals, overhead electrical equipment and cabs or moving vehicles, etc;
- (b) General "caution notices" regarding danger of high voltage traction rails for public at various entrances to metro railway stations and for staff at prominent places;
- (c) "Warning" boards for high tension equipment on the sections;
- (d) Boards for "switching on" and "switching off" of power on the sections;
- (e) "Danger" boards and restricted clearance boards at identified locations;
- (f) Power Block limit boards;

**39. Approval for energization of high tension lines.-**

(1) Application shall be submitted at least a fortnight before energization of high tension lines or third line conductor to the Electrical Inspector of the Government for Bangalore Metro Rail Corporation for the following, namely:-

- (a) formal approval, if not already received to the design and layout of all high voltage equipment including receiving substations, 66kv transmission cables, 33 KV power distribution feeders, 750 V DC feeders, traction sub stations, auxiliary substations etc.;
- (b) approval for energization of high tension installations mentioned above;
- (c) the application should be accompanied by relevant documents.

(2) On receipt of an application under sub-rule (1), the Electrical Inspector shall scrutinize and inspect the design and installations in respect of the following, namely:-

- (a) the layout and design for receiving sub-stations, traction substations, auxiliary sub-stations, third rail conductor system and other installations for compliance with the Electricity Act, 2003, the rules made there under and the relevant Indian standards or International standards; and
- (b) inspection of completed installations, either personally or by deputing his officers for compliance with the safety requirements.

(3) After conducting the inspection under sub-rule (2), the Electrical Inspector shall convey his approval for the energization of 66/33 KV high tension equipment or 750 V DC conductor rail, at receiving sub-stations, traction sub-stations, auxiliary sub-stations, track cabins and subject to such conditions as he may consider necessary.

**40. Procedure for energization of traction installations.-**

- (1) (a) After obtaining the sanction of the Electrical Inspector to the Government of India for energization under rule 39, the sub-stations should be commissioned sufficiently in advance for the energization of 750 v dc conductor rail system.
- (b) Before energization of the sub-stations, full communication facilities should be available and power supply authorities should be ready to give power supply;
- (c) On the date on which energisation of 750 v dc conductor rail system takes place, necessary clearance certificate should be obtained from the Electrical Construction Officers and others who had been hitherto working in the sub-station premises and on the section to the effect that their staff had been withdrawn and the sub-station including the section could be energized;
- (d) After final measuring of the whole installation and check on the satisfactory operation of all equipment including protective relays, the traction sub-stations and other installations may be energized;
- (e) Energization of electrical equipment and current collection system shall be progressively undertaken starting with 66/33 KV equipments at the receiving sub-station, 33 kv feeders from the receiving sub-stations to the traction substations and auxiliary sub-stations, and 750 V dc feeders from the traction sub-station to the conductor rail system followed by one subsector after another; and
- (f) Before running electric rolling stock, a confirmatory field test by the proper operation of the protective relays shall be conducted.

(2) In addition to giving wide publicity through newspapers and other media, the Station Manager shall warn all passengers about the danger of 750 V DC conductor rail and third rail equipment on the section and not allow them to walk on the section.

(3) All relevant documents and certificates as mentioned in, and notifications issued under the Act., along with the approval of Electrical Inspector for energisation shall form a part of complete documents to the Commissioner while making reference to the Commissioner under sub-rule (2) of rule 3 for opening of the metro railway for public carriage of passengers.

(4) (a) The inspection of the entire section shall be carried out by means of motor trolley Inspection Car by the Commissioner.

(b) An officer of Electrical Department (minimum senior administrative grade) nominated by the Chief Executive Officer should accompany the Commissioner throughout the inspection.

(c) The engineer-in-charge of the section during the construction should also be present.

(d) During inspection, particular attention shall be paid to the safety and operational aspects of the train movements and to see that staff are in possession of statutory rule books, instruction books, registers, forms, etc. and the Transportation, Electrical, Permanent Way and Signalling and Telecommunication staff are fully acquainted with the duties to be carried out after electric traction is introduced.

(5) The signaling/train control and telecommunication requirements in electrified sections shall be in accordance with the relevant standards.

(6) Subject to inspection being satisfactory, an 'all concerned message' may be issued by the Commissioner, communicating his authorisation for the introduction of commercial services under electric traction.

**Notes.**- A catechism dealing with the requirement of signal and telecommunication installations for 750 V DC electrified section are enclosed as Appendix A to these rules.

**SCHEDULE**  
[See rule 5 (2) (a)]

**INDEX PLAN AND SECTION SHEETS**

1. A set of plans and sections for Bangalore Metro Railway Project should consist of -
  - (i) Index Plan and sections;
  - (ii) Detailed Plans and sections;
  - (iii) Plans of Station yards; and
  - (iv) Detailed drawings of structures.
2. The index plan and section should be drawn to a scale of 0.5 km to a cm horizontal and 10 metres to a cm vertical, the plan being drawn above the section on the same sheet.
3. The index plan should be traced from topographic survey sheets. The centre line of the proposed metro line should be indicated by a full red line with position of each station by a red block and name of the station also in red. The radius and degree of all curves should be figured.
4. The index section should show the formation level/deck level of elevated structures by a red line; the gradients should be figured and the height of the formation/deck level above mean sea level

entered at each change of the gradient. The position, of each station with its name and distance from the fixed point, position and size of the bridge/viaduct spans should be indicated.

5. Throughout each set of plans and sections, the kilometrage shall be reckoned from the same "fixed point" and datum should be mean sea level. Each sheet should be plotted in the direction of the through kilometrage so that the kilometrage may be read from left to right.

6. On each sheet should be noted the name, i.e., Bangalore Metro Railway, gauge and scale along with direction of the magnetic North.

7. The index plan and section and the (first and the last sheets of) the set of detailed plans and sections should be signed by the engineer in charge.

8. Plans of station yards having yard lines other than Up/Down lines only may be submitted.

9. Drawing of structures to be submitted should be the completion/as built drawings.

**Form - I**

[ See rule 5 (1) (a) ]

**CURVE ABSTRACT**

Section: Bangalore Metro Railway  
 Length: Gauge: 1435 mm

Degree of curvature and radius	Number of each	Length in kms of Primary curve
Total		

Ratio of curved length to total length of line.

**Form - II**

[ See rule 5 (1) (b) ]

**GRADIENT ABSTRACT**

Section: Bangalore Metro Railway  
 Length: Gauge: 1435 mm  
 Up and Dn line

Gradient (compensated)	Number of each	Length in km	Percentage to total length of line
Total			

Longest continuous length of steepest Gradient:

Followed by a gradient of.....

for a length of ..... km

**Form - III**

[ See rule 5 (1) (c) ]

**BRIDGE ABSTRACT**

Section:		Bangalore Metro Railway			
Length:		Gauge: 1435 mm			
Type of Bridge	Clear span in metres	Total no. of spans	Waterway in lineal metres	Loading standard for which designed	Remarks

**Form - IV**

[ See rule 5 (1) (d) ]

**VIADUCT ABSTRACT**

Section:		Bangalore Metro Railway			
Length:		Gauge: 1435 mm			
Type of Viaduct	Clear span in metres	Total no. of spans	Opening in lineal metres	Loading standard for which designed	Remarks

**Form - V**

[ See rule 5 (1) (e) ]

**IMPORTANT BRIDGES ABSTRACT**

Section:		Bangalore Metro Railway			
Length:		Gauge: 1435 mm			
Type of Bridge	Clear span in metres	Total no. of spans	Waterway in lineal metres	Loading standard for which designed	Remarks

**FORM - VI**

[See rule 5 (1) (f) ]

**BALLAST AND PERMANENT WAY ABSTRACT**

Section: Bangalore Metro Railway

Length: Gauge: 1435 mm

1. The permanent way consists of UIC 60 Kg, head hardened new rails of make....., 18 metres long, continuously welded laid on prestressed monoblock concrete sleepers/Ballastless slab track. The track at grade on main line on viaduct and in tunnels is laid on plinth type ballastless track with rails supported on base plate at a spacing of .....mm centre to centre with Vossloh Fastening System. The remaining track at grade on mainline is laid with rails as above with vossloh fastening system. The track in yard and depot is laid with minimum cushion of 250 mm stone ballast of 50mm size under the sleepers on well compacted formation with blanketing layer.

2. All the turnouts to be negotiated are 1 in 9 and 1 in 7 with thick web curved switches, canted with CMS crossings, weldable type. Certified that tested and approved new Permanent way Materials have been used in this section and they comply with the accepted specifications.

**Note.**-(a) A brief description to be given of the rails, fastenings, sleepers and ballast provided. Details of dimensions of rails, fittings etc., should not be given in the case of standard section.

(b) In the case of new rails and fish plates manufactured in India, the name of producer should be given. If they are imported, the name of the country of origin should be indicated.

(c) A certificate should be submitted by the Chief Engineer that the materials are of tested and approved quality and comply with the accepted specifications.

**Form - VII**

[ See rule 5 (1) (g) ]

**STATION AND STATION SITES**

Section: Bangalore Metro Railway

Length: Gauge: 1435 mm

Name of station	Kilometrage from fixed point	Inter station distance	Remarks

**Form - VIII**  
[ See rule 5 (1) (h) ]

**BRIEF PARTICULARS OF ROLLING STOCK**

Section:

Bangalore Metro Railway

Length:

Gauge: 1435 mm

Sl.No	Description	Details	Remarks
(1)	(2)	(3)	(4)
1.	Rolling stock features (a) Composition (b) Train Control System (c) Maxi <sup>m</sup> Design Speed (d) Maxi <sup>m</sup> Operational Speed (e) Jerk rate (f) Maximum Tractive Effort		
2.	Physical Dimensions (a) Car Weight (b) Length over Body (c) Maximum Width over Body (d) Height of Floor from TOR (e) Total Height		
3.	Bogie Details (a) Bogie Wheel base (b) Distance between Bogie Centres (c) Wheel Diameter (d) Type of Suspension		
4.	Braking Details (a) Type of Braking System (b) Maximum Braking effort (c) Service braking effort*  From maximum operational speed to stand still, for fully loaded train on level tangent track.  (d) Parking Brake		

5.	Electro Magnetic effect on Environment (a) Electro Magnetic Interference		
6.	Safety Features (a) Communication between Operator and passengers (b) Provision of Dead Man Handle (c) Communication between operator and Central Control and Station Control. (d) Fire prevention, detection and suppression system (e) Other Safety Features		

Certified that the design has been checked for being within the Kinematic Envelope (KE) under all conditions.

**Form - IX**  
[ See rule 5 (1) (i) ]

**BRIEF PARTICULARS OF TRACTION INSTALLATIONS**

Section: Bangalore Metro Railway

Length: Gauge: 1435 mm

	750 V DC Traction System.
1.	Salient Features of the Design specially covering following aspects:- (a) Current carrying capacity of the system. (b) Boundaries like wind speed, Tension, Temperature range. (c) Speed Potential. (d) Protection arrangements. (e) Power supply system from GSS to Receiving sub-stations (RSS). (f) Power distribution system from Receiving Sub-stations to Traction Sub-stations(TSS) (g) DC Power Feed from TSS to conductor rail. (h) Power distribution system from RSS to Auxiliary Sub-stations (ASS). (i) Traction Scada System. (j) Earthing and Bonding System.
2.	Certificate that all warning boards and notices as per statutory requirements have been provided at specified locations.

**Form - X**

[ See rule 5 (1) (l) ]

**ELECTRICAL CROSSING OVER METRO RAILWAY TRACKS ABSTRACT**

Section: Bangalore Metro Railway  
 Length: Gauge: 1435 mm

S.no	Location	Brief technical particulars including voltage	Whether with guards or w/o guards	Owned by	Whether clearance as per the regulations for electrical Wings available	Remarks

**Form - XI**

[ See rule 5 (1) (m) ]

**TRACTION MAINTENANCE DEPOT ABSTRACT**

Section: Bangalore Metro Railway  
 Length: Gauge: 1435 mm

Sl. No.	Location	Name of nearest metro station	Remarks

**FORM - XII**

[See rule 5 (1) (n)]

**VENTILATION, SMOKE MANAGEMENT AND FIRE SAFETY MEASURES IN TUNNELS AND STATIONS**

Section: Bangalore Metro Railway  
 Length: Gauge: 1435 mm

- I. Salient features of the design specially covering following aspects:
  - (a) Emergency ventilation and smoke management system in tunnels and stations;
  - (b) Emergency Evacuation procedure from tunnels or stations;
  - (c) Fire detection/suppression system in tunnels or stations;
  - (d) Fire alarm and public address system in emergencies;
  - (e) Emergency lighting and power supply; and
  - (f) Access routes for fire fighting personnel.
2. Certified that all test certificates from equipment suppliers and commissioning authorities are in order and clearances from statutory authorities have been obtained.
3. Certified that arrangements have been made to attend to any emergency arising out of Fire or Smoke within the station, train or tunnel.

**FORM - XIII**

[See rule 5 (1) (O)]

**BRIEF PARTICULARS OF SIGNALLING/TRAIN CONTROL AND TELECOMMUNICATION SYSTEM**

Section: Bangalore Metro Railway

Length: ... kms

Gauge: 1435 mm

**Signalling/Train Control System.**

1. Continuous Automatic Train Control system has been provided on ..... section for movements of trains between stations and between the depot and running lines.
2. The Continuous Automatic Train Control system works on the principle of target speed with cab signals by means of continuous transmission from track to train through coded Audio Frequency Track Circuit, ensuring safe movement of trains by continuously generating a safe operating envelope defined by the Limit of Movement Authority and the Maximum Safe Speed
3. The Continuous Automatic Train Control system provides the following modes of train operation:
  - (i) Automatic Train Operation (ATO)
  - (ii) Automatic Train Protection. Manual mode (ATP)
  - (iii) Run on Sight (ROS)
  - (iv) Restricted Manual (RM)
  - (v) Manual Cut-out (Bye pass)
4. Train operation on main lines is controlled from Operation Control Centre which normally operates under Automatic Train Control system with routes being set and trains interval regulated by computer control. Facility for manual setting of routes and individual operation of point if required has also been provided. Automatic Train supervision system at Operations Control Centre monitors and controls and regulates train operations.
5. A Local Control by means of video display unit work station has been provided in the station control room to enable the Traffic Controller to hand over control of the signals at specific station if required.
6. .... stations on the section have been provided with Computer based Interlocking system.

**Tele-communication System**

1. A Digital Mobile Train Radio Communication System based on Terrestrial Trunked Radio specifications has been provided on the section to provide radio communication between traffic controller, depot controller and the train operator.
2. A telephone system interconnecting stations, OCC and depots has been provided.



**FORM - XVI**  
[See rule 14 (2)]

**DEFLECTION TEST OF BRIDGES**

Section:			Date of Test:					Bangalore Metro Railway			
Length:			Description of Test Load:					Gauge: 1435 mm			
Bridge No.	Kilo - Metrage	Material Of Girdes	Clear Span between Bearing plates	Overall Depth Of Girders	Speed Of Train	Test Load EUDL	Deflection In M.M.	Design Load EUDL For B.M.	Ratio of Design Load B.M.to Test Load B.M.	Reduced Deflection Under Design Load (for slow Speed Tests) = (8x10)	Theoretical (calculated) Deflection (approx) Under Designed load
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)

**FORM - XVII**

[See rule 24 (5) (h)]

**CERTIFICATE**

Based on the reports of "oscillation" trials (Copy enclosed) it is certified that it is safe to run (particulars of EMU/rolling stock proposed to run) not exceeding units (in case of EMUs) coupled together on the section (station) to. (station) from (km) to (km) of the metro railway at a maximum speed of (Km/h) subject to the following speed restrictions and conditions.

**SPEED RESTRICTIONS**

S. No.	From km to km	Nature of Speed restriction	Brief reason of restriction

**SPECIAL CONDITIONS**

To be signed by

Chief Engineer

Chief Signal and Telecom Engineer

Chief Electrical Engineer

Chief Operations Manager

**FORM - XVIII**

[See rule 27 (2)(b)]

**CERTIFICATE**

Certified that it is safe to use (particulars of the equipment) at the station/on the section of the metro rail with the following precautions:

1. ....
2. ....
3. .... etc.

Chief Signal and Telecommunication Engineer

**Note.** – The application should be scrutinized by the Commissioner who, if satisfied, will communicate his sanction to the metro rail administration. In case he is not fully satisfied, he will give his comments and recommendations for suitable further action.

**APPENDIX - A**

(See rule 41)

**CATECHISM FOR SIGNALLING AND INTERLOCKING  
INSTALLATIONS SIGNALLING AND TRAIN CONTROL**

Have the requirements and recommendations for signalling and train control systems vide Chapter IX of these rules and appendix thereto pertaining to Signalling and Train Control Systems installed on the section being complied with?

**SIGNAL**

1. Do the signals comply with the requirements as laid down in Bangalore Metro Rail General Rules, 2010.
2. Have all the signal posts been placed on the left side of the track of the approaching train to which they refer? If otherwise, for what reason?
3. Are all running signals controlling placed in such a position and at such a height above rail level so they can be clearly seen by the drivers in sufficient time and be readily distinguished by night or by day from subsidiary signals?
4. In case of slotted or controlled signals, can the signals be freely returned to danger by either of the controlling agencies?
5. Are signals not commissioned have their aspects covered and the cover displaying two crossed white bars on a black background, the bars not being less than 30 cms x 10 cms?

**POINTS**

1. Are the locking of facing points such that the points cannot be or become unlocked while a train is passing over them, i.e., electrically controlled by track circuits or alternative devices?
2. Are detectors (internal/external) fitted to all facing points and do they efficiently detect with switches the signals controlling the movement of train over them?

3. Are switches adjusted to come tight against stock rails? Does the insertion of 5 mm obstruction piece between the switch and stock rails 150 mm from the toe of the switch prevent the points being locked and prevent the relevant signal being taken 'OFF', the giving of which is preceded by the locking of the points?

### **STATION CONTROL ROOM**

1. Are all signals, points and track circuits electrically/electronically repeated on the Station Control Panel/Work Station as and where provided?
2. Is the Station Controller provided with necessary means the stopping of train at his station?
3. Have instructions for working been issued to all staff and included in Metro Railway Working Instructions and are they correct and efficient?

### **TESTS IN STATION CONTROL ROOM**

It is essential that the interlocking of all signals with points must be so effected as to ensure the following conditions, which may be tested from Station Work Station.

1. Is it possible to take off conflicting signals at the same time?
2. Is it possible to take off a signal until:
  - (a) all points on the running line including overlap are correctly set and the points locked where required?
  - (b) all points, giving access to the running line from sidings are set against the running line?

### **OPERATION CONTROL CENTRE**

Are all signals, points and track circuits electrically / electronically repeated on the Operation Control or Work station as and where provided?

### **CAB SIGNAL**

1. Are the various modes of train control clearly distinguishable on the Driver's Human Machine Interface (HMI).
2. Under Cab Signalling System of working, is Automatic Train Protection System able to bring the train to a stop before an obstruction?

## **APPENDIX - B**

(See rule 41)

### **A. ADDITIONAL CATECHISM FOR SIGNALLING/TRAIN CONTROL AND TELECOMMUNICATION**

1. Have the requirements and recommendations for signaling/train control and telecommunication installation in accordance with the instructions issued for the installation of signaling/train control and telecommunication equipment in 750 V DC traction system as adopted on the section, been complied with ?

If not, in what respect the arrangements provided fall short of them?

**STATEMENT OF DEVIATIONS - SIGNALLING/TRAIN CONTROL AND  
TELE-COMMUNICATION SYSTEM**

	Existing Parameters	Prescribed Parameters	Deviation / Infringement	Remarks	Approval / Sanction
Signal					
Points					
Track circuits					
Electric Signalling Equipment					
Batteries					
Earthing					
Mobile Train Radio					
Communications					
General Safety					

By order and in the name of Governor of Karnataka,

**KOUSALYA**  
Under Secretary to Government  
Urban Development Department