

国家双高“铁道机车专业群”系列 多语种教材  
——动车组检修技术专业

Operation and Management of High-speed Railway EMUs

# 高速铁路动车组运用与管理

(中英对照版)

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## PREFACE

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Under the initiative of the Chinese government on the "one road and one belt", the international railway market has shown an obvious revival trend. Developed countries such as Europe, America, Japan and Russia have made great efforts to develop high-speed railway network. More and more developing countries such as central and Eastern Europe, Asia, Africa and Latin America have also given priority to railway development. With the increasingly frequent technical exchanges at home and abroad, it is very necessary for technicians engaged in EMU operation and management to master professional English knowledge to promote international exchanges and cooperation and understand the latest trends. On the basis of digesting and absorbing the technical data related to EMU management and operation provided by the EMU Depot of various railway bureaus, meeting the needs of English teaching, and proceeding from the actual needs, we have compiled the book *Operation and Management of High-speed Railway EMUs*. This book is prepared to conscientiously implement the relevant requirements of the post access system for the main types of running work of high-speed railway, ensure that a solid and reliable talent guarantee is provided for the operation, safety, sustainability and stability of high-speed railway at home and abroad, and quickly improve the professional level of students' practical application and maintenance.

This textbook mainly covers many disciplines, such as train operation organization, railway signal, EMU turnover, crew system, operation safety, train accident rescue, etc.. And there are also the basic knowledge that the machinist should master, the post responsibilities of the on-board machinist, and the emergency fault handling processes and methods in this book according to the post responsibilities of the on-board machinist of the railway corporation described. In terms of maintenance, it introduces the maintenance mode, characteristics, operation and maintenance process, operation steps, series standards, special operations, maintenance system and management of high-speed railway EMUs. In view of the type changes of high-speed railway running vehicles at

present, this paper mainly introduces the relevant maintenance contents of CRH380A and CRH380B multiple units.

Huijuan Song, Longhua Zhang and Lei Shi of Zhengzhou Railway Vocational and Technical College are the editors of the book, Zhengang Song of CRCC Rail Transit Operation Ltd. is the associate editor, and Gaoshan Shi of EMUs Section of Zhengzhou Railway Bureau is the chief reviewer. The division of work is as follows: Lei Shi and Zhengang Song prepares Project 1(Chinese part); Huijuan Song prepares Project 1 (English part), Project 2 (Chinese and English part) and Project 3 (Chinese and English part); Longhua Zhang prepared Project 4 (Chinese and English part) and Project 5 (Chinese and English part).

Due to the rapid development of high-speed railway and the limited level of editors, it is inevitable that there are omissions and inadequacies in the book. Please criticize and correct them.

Editor  
March 2022

# 前言

在中国政府“一带一路”的倡议下，国际铁路市场呈现明显的复兴态势。欧美发达国家、日本、俄罗斯等大力发展高速铁路网，中东欧、亚、非、拉美等地区的越来越多的发展中国家也把铁路作为优先发展领域。随着国内外技术交流的日益频繁，对于从事动车组运用管理相关工作的技术人员来说，熟练掌握专业的英语知识对于促进国际交流与合作、了解国内外最新动态，是十分必要的。为了认真贯彻落实高速铁路主要行车工种岗位准入制度的相关要求，确保为国内外高铁运营及安全持续稳定提供坚实可靠的人才保障，快速提升学生的实际运用和检修的专业水平，在消化吸收各铁路局动车段提供的动车组管理及运行相关技术资料的基础上，满足英语教学需求，从实际需要出发，我们编写了《高速铁路动车组运用与管理》一书。

本教材主要涉及行车组织、铁路信号、动车组周转、乘务员乘务制度、运用安全、行车事故救援等多个专业，并且根据中国国家铁路集团有限公司（简称：国铁集团）随车机械师岗位职责讲述了机械师应掌握的基础知识、包括随车机械师岗位职责以及应急故障处理流程和方法。维修方面介绍了高速铁路动车组维修模式、特点、动车组运用及检修流程、作业步骤、系列标准、专项作业及动车组检修体系和管理方面的内容。针对目前高速铁路运行车辆的类型变化，着重介绍了 CRH380A、CRH380B 型动车组的相关检修内容。

全书由郑州铁路职业技术学院宋慧娟、张龙华、时蕾任主编，中铁建轨道运营有限公司宋振刚任副主编，郑州铁路局动车段段长石高山任主审。编写分工如下：时蕾、宋振刚编写项目一（中文部分）；宋慧娟编写项目一（英文部分）、项目二（中英文部分）、项目三（中英文部分）；张龙华编写项目四（中英文部分）、项目五（中英文部分）。

由于高速铁路发展较快，且编者水平所限，书中难免有遗漏和不妥之处，恳请读者批评指正。

编者

2022 年 3 月



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## Project 1

# Overview of Motor Train Unit (EMU) Application and Maintenance

[Ideological and Political Classroom]

Fuxing EMU runs on the vast land of the motherland

"Fuxing EMU runs on the vast land of the motherland." The cordial speech of President Xi Jinping in the 2018 New Year's greetings is the encouragement and encouragement to the railway work, and is highly affirmed for the past few years, especially since the 18th National Congress of the Communist Party of China achievements in railway work.

In the past few years, the travel experience and happiness index of passengers have become higher and higher. The railway department continues to innovate service forms. From the basic requirements in the past to a series of new service measures such as high-speed rail WiFi, motor car takeout, wechat payment and face brushing in the station, it has increasingly met people's needs to go fast and well. The seemingly change in transportation demand is actually a higher requirement for railway transportation supply and enterprise development quality. Only when we always keep the people-centered development thought in mind can we do so.

Looking forward to the future, the development of China's railway is expected. With the high-speed railway, continue to expand the coverage of high-speed railway and make the transition of eight horizontal and eight vertical, which will further narrow people's "life circle" and enable more and more people to enjoy the fast and convenient high-speed railway. "Going out" is no longer a difficult problem, and tired trip has passed by. China Railway will start a new journey, and the continuously powerful independent innovation Fuxing EMU will lead the "made in China"; The continuous improvement of high-speed railway network will make the connection between large and medium-sized cities closer; The continuously open Chinese railway will contribute to China's strength in sharing; The continuously strengthened responsibility mission of "traffic power and railway first" will witness the historical responsibility of China's railway.

I have seen that the "Fuxing" carrying the Chinese dream of the great rejuvenation of

the Chinese nation and the new yearning of the Chinese people for a better life is heading for another spring of the new era with full confidence and speed.

### [Project Description]

At the end of this project, students are expected to understand the basic situation and characteristics of EMU application at home and abroad; understand the basic tasks of EMU application and maintenance. Through the analysis of the application and maintenance organization of EMU, students can recognize the responsibilities and management contents of organizations at all levels.

## **Task 1** Overview and Basic Task of EMU Operation

### [Task Description]

1. Understand the Basic Situation and Characteristics of EMU Operation.
2. Clarify the Basic Tasks of EMU application and maintenance.

### I . Basic Situation and Characteristics of EMU Operation

#### 1. Basic situation and characteristics of EMU operation abroad

The application of EMU varies greatly due to different national conditions. There are 4 types of high-speed railway construction management modes abroad. The first one is the newly-built high-speed railway special line which is used to transport passengers rapidly. For example, Japan's Shinkansen and France's high-speed railway are passenger special lines, which are operated during the day and maintained at night. Second, the newly-built high-speed railway double line which implements passenger and freight co-line operation, such as the Rome—Florence high-speed railway has a passenger speed of 225 km/h and freight speed of 120 km/h. Third, part of newly-built high-speed railway and part of the existing line mixed operation, such as the Berlin—Hannover line, which undertakes the task of transporting passengers and goods. Fourth, swing trains are used on existing lines, which is common in European countries. In the United States, the speed of swing trains on the "Northeast Corridor" also reaches 240 km/h. Different construction management modes make EMU operation management modes are not the same.

#### ( 1 ) Japan Shinkansen EMU operation.

Japan Shinkansen railway started operation in 1964, and after many years of practice, the Shinkansen Railway has gradually summed up and developed a set of train operation organization methods with Japanese characteristics. The basic process of the organizational method is as follows. Firstly, the train operation plan that reasonably and accurately reflects

the transportation demand is formulated, and then various means are used to ensure the implementation of the train operation plan. When the train operation fluctuates, the necessary methods are used to restore the stable operation of the train as quickly as possible. As shown in Fig. 1-1, the operation, maintenance and standby of the Shinkansen line are reasonably coordinated with the operation diagram, and the skills of avoiding and crossing are skillfully used.

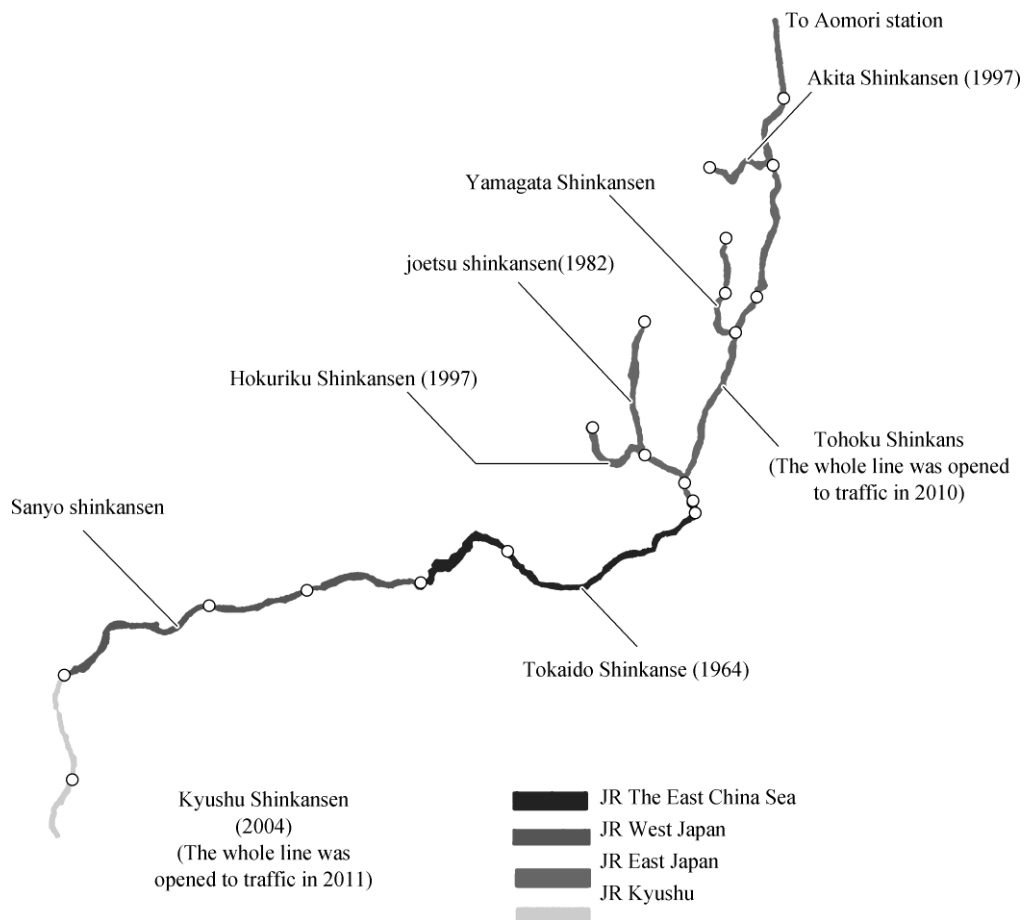


Fig. 1-1 Map of Shinkansen EMU in Japan

## ( 2 ) German ICE EMU operation.

Since the 1970s, Germany has gradually formed an inter-city express train system (IC system) in all directions that connects more than 30 important cities and transportation centers (As shown in Fig. 1-2). Some sections of German high-speed railway are transformed from existing lines, and all high-speed lines are operated by passenger and freight trains. The basic organization model of German high-speed railway is the mixed operation of passenger trains with different speeds during the day and mixed operation of

passenger trains and freight trains at night. The reason why Germany adopted this model is mainly that Germany has a relatively rich interval transit capacity, and the technical level of existing railway trains and high-speed trains are not very different.

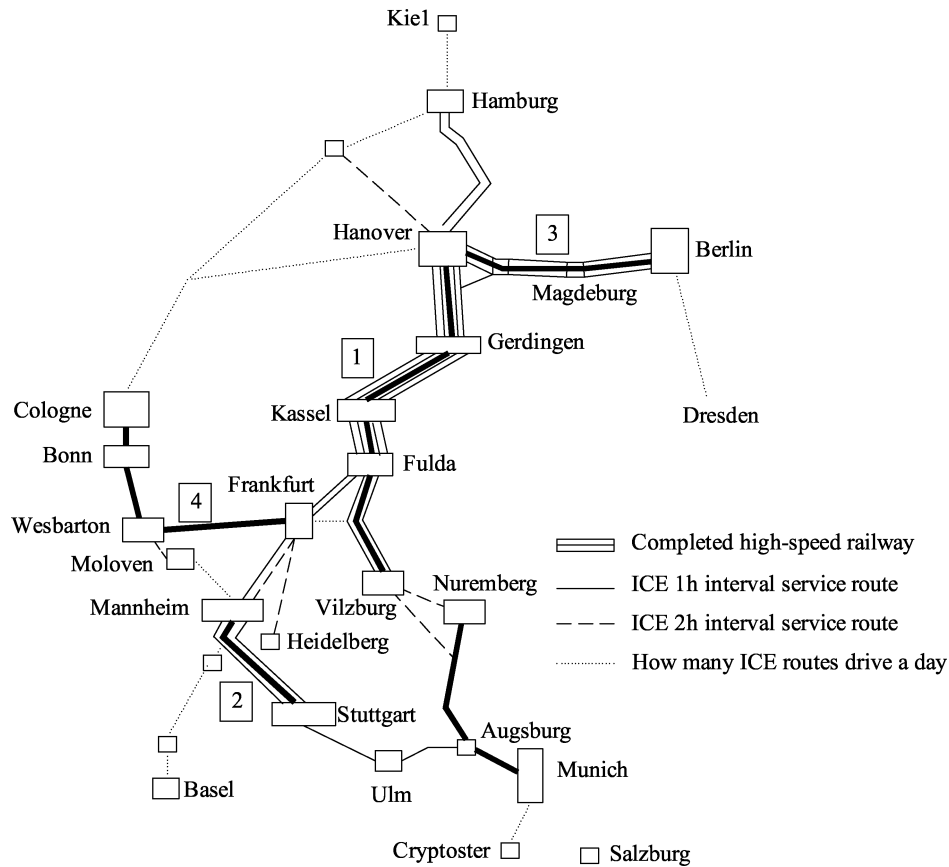


Fig. 1-2 Map of high speed railway in Germany

### ( 3 ) France TGV EMU operation.

In terms of construction mode, French high-speed railway adopts the mode of partially constructing new lines and partially transforming old lines, radiating in all directions from the center of Paris, and is a special railway for passenger trains. Each high-speed line only runs the same type of high-speed trains, so train operation organization is relatively simple. The train operation line is parallel, and the train only stops at different stations and times. The whole train diagram is parallel. To meet the needs of passenger flow, high-speed trains running on high-speed lines can go down to existing lines.

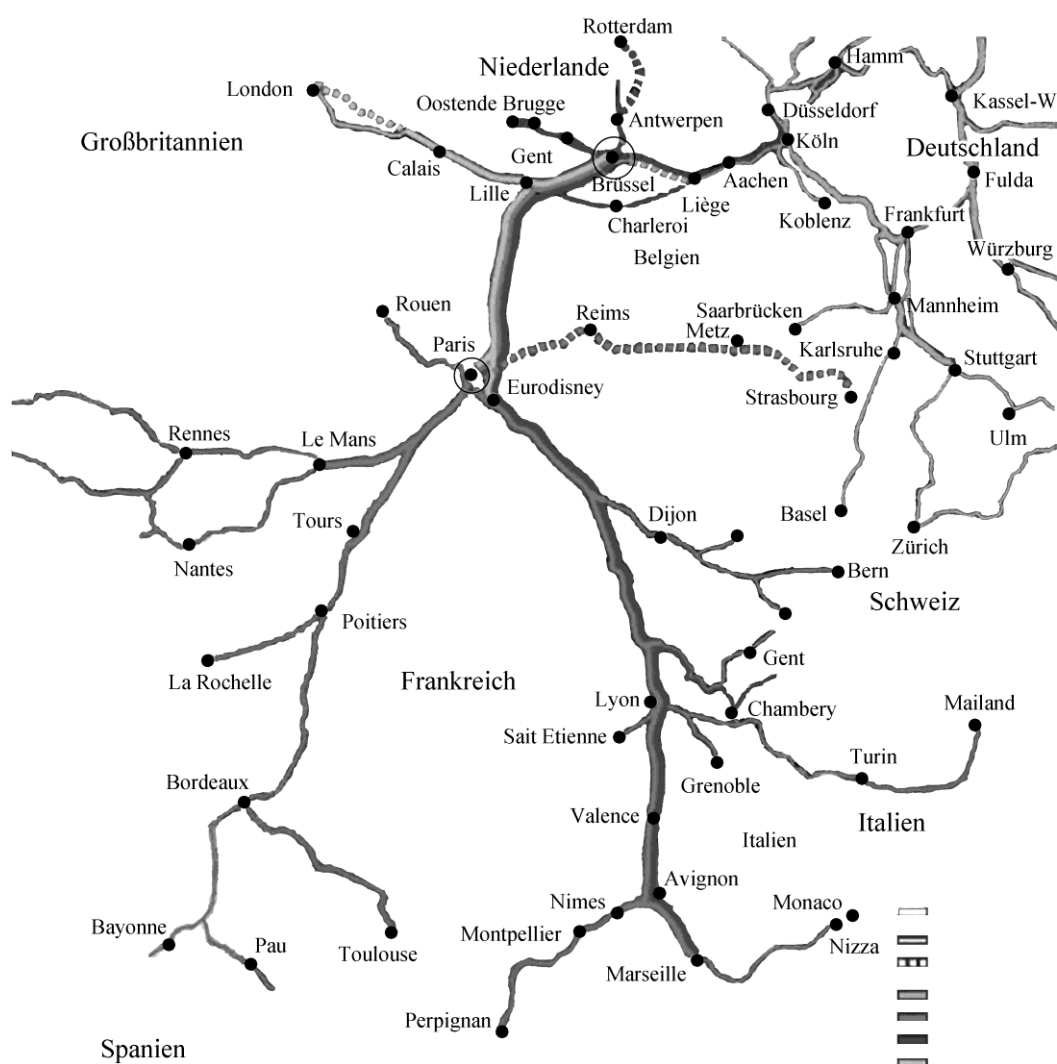


Fig. 1-3 Map of high speed railway in France

## 2. Basic situation and characteristics of EMU operation in China

### ( 1 ) Basic situation of high speed railway lines in china.

China's high-speed railway has entered a stage of rapid development since Beijing—Tianjin Intercity which is the first 350 km/h high-speed railway put into operation on August 1st, 2008. On December 26th, 2009, the Wuhan—Guangzhou section of Beijing—Hong Kong high-speed railway with the longest operating distance and the most complex project type in the world was put into operation. By the end of 2020, the operating length of high-speed railway and passenger special line in China has reached 39,000 km, accounting for more than 70% of the global high-speed railway operating distance. In 2020, the objectives required in the medium and long-term railway network planning issued on July

13rd, 2016 have been completed ahead of schedule. It is required in the document that "the scale of railway network will reach 150000 km, including 30,000 km of high-speed railway, covering more than 80% of large cities; by 2025, the scale of railway network will reach 175,000 km, including about 38,000 km of high-speed railway". According to the plan, by 2030, it will basically realize internal and external interconnection, smooth inter-regional multi-channel, provincial capital high-speed rail connection, rapid access to prefectures and cities, and basic coverage of the county.

## (2) Basic characteristics of EMU operation in China.

So far, many passenger special lines have been built and completed in China, with a total investment of hundreds of EMUs, forming a beautiful scenery in railway transportation. China's EMU has many characteristics in operation:

① High operation speed: In the trial operation of the Beijing—Shanghai line, China's high-speed railway EMUs ran the world's highest operating speed (486.1 km/h), the highest operating speed on the Wuhan—Guangzhou high-speed railway is 394 km/h, and the continuous operating speed of EMUs on the Beijing—Tianjin Intercity and Beijing—Shanghai railway can also reach more than 350 km/h.

② Huge traffic volume: Affected by China's national conditions, under the existing railway conditions, China's high-speed railway multiple units reduce the train tracking interval as much as possible, increase the train passenger capacity as much as possible, and realize the shortest train tracking interval of 3 minutes.

③ High operational reliability: The critical instability speed of CRH series EMUs in China exceeds 550 km/h, which has excellent dynamic performance and excellent stability. In addition, CRH series EMUs are also equipped with new operation monitoring devices, which can realize real-time detection and control of their own parameters and performance changes. Moreover, the EMU also has the function of fault-oriented safety, and the train operation safety has a reliable guarantee.

④ Intelligent control: China's high-speed railway EMUs are connected into a system through a complete network. The highly intelligent computer control technology realizes the real-time control of the operation system and auxiliary system, so that the ground monitoring system can collect all aspects of information to judge the vehicle operation and status.

⑤ All-weather operation: When the wind speed is below grade 8, China's high-speed railway can operate continuously at the established speed of 350 km/h. It is also suitable for all kinds of bad weather such as wind, sand, rain and snow to achieve all-weather operation in the real sense.



## II Basic Tasks of EMU Operation Management

EMU is significant equipment to complete the production task of passenger transportation. The operation of EMU is an important part of railway transportation. The operation management of EMU adopts modern management means, establishes and improves accurate and rapid response communication network, information acquisition and data processing system, implements network management, and realizes orderly and controllable. Therefore, China National Railway Group Co., Ltd. has prepared the rules which are short for " Transport Regulations " for the operation and maintenance of Railway Multiple Units, which puts forward overall requirements for the operation and management of multiple units, and requires the operation personnel of multiple units at all levels to have a high sense of responsibility and realistic spirit and love their own work. Transport Regulations require EMU operators to work to achieve high standards and strict requirements as well as keep improving technology. It also requires EMU operators to take the overall situation into account, joint labor cooperation, obey orders and deep into practice to do a solid job.

The basic requirements of EMU operation management are :

- ① To manage and make good use of EMU, to complete transportation and production tasks with high quality and efficiency;
- ② To ensure traffic and personal safety by strengthening safety management ;
- ③ Strengthen the construction of the staff team, and constantly improve the political quality, technical quality and cultural knowledge level of workers
- ④ Adhere to the reform and opening up, promote advanced experience, follow the economic law, promote asset returns, and constantly improve the efficiency of EMU use.

Adhering to the principle of quality first and service for transportation, carrying out the policy of paying equal attention to repair and maintenance, giving priority to prevention, continuously strengthening basic work, perfecting the management system of operation and maintenance, and providing good quality EMU are the basic tasks of EMU operation and maintenance.

### [Task Detection]

- 1. Summarize the characteristics of EMU operation.
- 2. Analyze and compare the operation and management modes of EMUs in Japan, Germany and France according to the operation and management of EMUs abroad.
- 3. What are the basic tasks of EMU Operation Management?

## 2 Organization and Content of EMU Operation Management

### [Task Description]

1. Clarify EMU Operation Organization and management content.
2. Know the usage and management classification of EMUs.

### I . System and Responsibilities of EMU Operation Management Department

The characteristics of railway operation management in China are as follows : ①To carry out the principle of ' unified command and hierarchical management ' so as to give full play to the function of operation management organizations at all levels; ②To implement of the responsibility system for safe production. Implement the requirements of ' Party and government responsibility, one post and two responsibilities, joint management, negligence responsibility' and 'leadership responsibility, professional responsibility, division of labor responsibility, post responsibility'. Use management organization as shown in Fig. 1-4.

EMUs implement the three-level professional management of China National Railway Group Co., Ltd., railway bureau and EMU ( passenger train )depot.

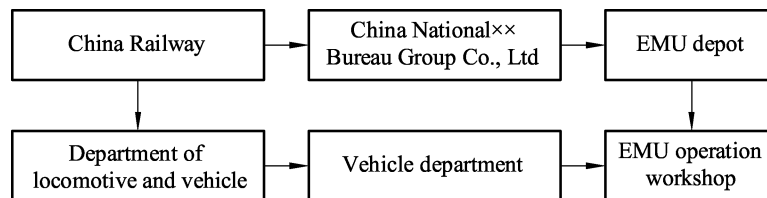


Fig. 1-4 Organizations of EMU operation management

#### 1. China National Railway Group Co., Ltd.

China National Railway Corporation Limited which is short for "China Railway" is responsible for clarifying the management interface of EMU related disciplines; According to the transportation needs, the layout of operation and maintenance capacity of EMUs on the whole road shall be planned, and the allocation of transportation capacity resources shall be coordinated. China Railway formulates top-level management regulations on operation and maintenance of multiple units, supervise the implementation, and guide the transportation enterprises affiliated to the head office to carry out operation and maintenance.

#### 2. China Railway ×× Bureau Group Co., Ltd.

Bureau Group Co., Ltd. is the liability subject of the professional management of

EMUs. It is responsible for formulating the professional management measures of EMUs, clarifying the management functions of transportation-related professional departments, and assuming the safety and quality responsibilities for the operation and maintenance of its EMUs. According to the relevant management regulations such as maintenance rules and EMU technical manuals, they formulate relevant management measures and technical standards and organize the implementation.

### 3. Multiple unit train depot

Multiple unit train (passenger car)depot (hereinafter, all passenger car depots and Multiple unit train depots managed with motor car units are referred to as Multiple unit train depot, which is no longer distinguished)is the liability subject of the operation and maintenance of EMUs. Multiple unit train depot shall standardize the staffing and management of various departments in the depot, optimize the production organization and process, and coordinate the joint labor unit to jointly do a good job in the operation and maintenance of EMUs.

## II. Management of EMU

### 1. Technical management of EMU

Adopt the maintenance technology management system and organization of the head office, Railway Bureau and Multiple unit train depots, and clarify the division of responsibilities. The head office is responsible for organizing the formulation of EMU Operation and maintenance rules and other relevant management regulations; The railway administration is responsible for organizing the formulation of operation and maintenance methods for EMUs, and clarifying the maintenance items, maintenance cycle, maintenance contents, technical requirements and maintenance process; The motor car depot is responsible for organizing the preparation of operation instructions for the operation and maintenance of motor car units, and clarifying the operation contents, operation steps, operation standards, tooling and equipment, safety matters, etc.

The Railway Bureau shall allocate and strengthen professional and technical personnel according to the actual operation and maintenance of EMUs. The vehicle department shall be equipped with the director in charge of EMU and full-time management personnel such as operation, maintenance, safety, regulations, equipment and training. The technical responsibility system of the chief engineer shall be implemented in the multiple unit train depot, and full-time (Part-time)management personnel such as EMU operation, maintenance, machinery, axle, electrical, network, traction, braking, air conditioning, safety,

regulations, equipment, training and informatization shall be equipped. Managers at all levels should strive to improve their technical literacy and abide by technical discipline.

The technical regulations for the operation and maintenance of EMUs shall be subject to hierarchical management. China National Railway Group Co., Ltd. is responsible for organizing the formulation of EMU Operation and maintenance standards and publishing them in the EMU management information system; The railway Bureau is responsible for organizing the formulation of operation and maintenance measures for EMUs, which shall be issued in the form of bureau documents; The multiple unit train depot is responsible for organizing the preparation of operation instructions for operation and maintenance of motor train units, which shall be issued in the form of departing documents.

The use of maintenance methods must be combined with the actual optimization of maintenance projects, content and period. When the project, content is deleted, and the period is extended, it is reported for approval according to regulations.

The operation instructions shall specify the operation contents, operation steps, operation standards, tooling equipment, testing instruments, safety matters, etc. It shall require concise words and strong operability, and timely repair, build, supplement and scrap according to the actual situation and issue them regularly. When the maintenance parts, equipment and facilities change, multiple unit train depot shall organize the verification of the operation instructions.

The railway Bureau shall standardize the management of outsourced maintenance, formulate and apply the management measures for outsourced maintenance, and clarify the requirements for handling process, qualification review, quality card control, etc.

## 2. Repair system of EMU

The EMU implements a planned preventive maintenance system based on the running kilometer cycle (the running kilometer is subject to the EMU management information system) and supplemented by the time cycle. It is divided into five levels of repair. Level I and Level II maintenance is operation maintenance, which is carried out in the motor train station. Level III、Level IV and level V maintenance are high level maintenance, which shall be carried out in the maintenance unit with corresponding vehicle maintenance qualification.

## 3. Allocation management of EMU

EMUs are uniformly managed and allocated by China Railway, and the allocation system is implemented. The so-called allocation system refers to the system that China Railway allocates EMUs to each Railway Bureau and EMU Depot for use and storage according to the needs of transportation tasks and transportation equipment conditions, so as to complete transportation and production tasks.

#### 4. Road EMU

Road EMUs include EMUs for special purposes such as inspection, maintenance, test and official business, which shall be allocated by the China Railway.

The road EMUs allocated to non Railway Bureau units shall be entrusted to the Railway Bureau for custody and the custody agreement shall be signed.

The maintenance of road EMU vehicles and on-board electrical equipment shall be the responsibility of the allocated (Escrow)Railway Bureau, and the maintenance of professional equipment and facilities such as detection, maintenance and test shall be the responsibility of the property right unit.

Before the road EMU performs the tasks of road network inspection, maintenance and test, the user unit must communicate with the allocated (Escrow)Railway Bureau to formulate level I and level II maintenance plans to ensure that the maintenance does not exceed the time limit. The Railway Bureau designated by the inspection plan shall be responsible for the level I maintenance and servicing operations; The assigned (Escrow)railway bureau is responsible for the level II maintenance.

The Special Transportation Office of the China Railway is responsible for the operation, maintenance and repair of the official EMU. When the operating EMU is changed to road EMU, it must be reported to the China Railway for approval.

#### 5. EMU retirement

When EMUs are identified to have one of the following conditions, they can complete the whole or part of the vehicle scrap procedures.

( 1 ) The operation of the whole EMU exceeds the design life and cannot continue to be used after technical appraisal. (As shown in Tab. 1-1)

Tab. 1-1 Design Life List of EMUs

Number	EMU Model	Design Life(year)
1	CRH1A/1B/1E	25
2	CRH1A-A CRH1E(1229-1233)	20
3	CRH2A/2B/2E/2G/2C	20
4	CRH3C	30
5	CRH5A	20
6	CRH5G	20
Continue		
7	CRH380A(L)	20
8	CRH380B(L)	20

9	CRH380CL	20
10	CRH380D	20
11	CRH6A/F	20
12	CRH3A	20
13	CR400AF/BF	30

(2) The repair cost exceeds 70% of its replacement price in case of an accident or accidental disaster of the whole or part of the EMU; Or the car body structure is deformed and damaged seriously and cannot be repaired.

Retirement procedure:

① The scrapping identification of EMUs shall be organized by the allocation Bureau. In case of scrapping at the place of accident, the allocation bureau can entrust the local railway bureau. In case of manufacturing and repair enterprises, the allocation bureau shall entrust the manufacturing and repair enterprises to organize appraisal, and the allocation bureau shall send personnel to participate.

② If the appraisal committee has identified that it meets the conditions for scrapping, the property right unit shall follow the prescribed procedures and report it to the China Railway for approval.

③ The scrapped EMUs approved by the China Railway are not allowed to rent, sell or transfer the whole or part of the vehicles.

### III EMU Inspection and Repair

#### 1. EMU maintenance plan

The operation and maintenance plan of EMU shall be prepared monthly, weekly and daily, and the high-level maintenance plan shall be prepared annually and monthly. The < EMU buckle repair list > shall be filled in before EMU is sent for high-level maintenance. The EMU level II maintenance monthly plan shall be prepared by the EMU Depot and reported to the Railway Bureau for filing. The level II maintenance weekly plan and operation maintenance daily plan shall be prepared and organized by the motor train station. The one level maintenance time of EMU in the inspection shed shall not be less than 4 hours. EMU depot shall strengthen the management of EMU maintenance plan and strive to improve the fulfillment rate of EMU maintenance plan. The group items that are not fulfilled as planned shall be adjusted in time and shall not be out of repair.

#### 2. One-level maintenance of EMUs

Level I maintenance refers to the maintenance operation of rapid routine inspection,

test and fault treatment for the roof, bottom, sides, inner and driver's cab of EMU in operation, which must be inspected and implemented in the depot of the EMU. The number of operation teams shall be reasonably determined in combination with the intensive entry (exit) of EMUs and the workload of each shift. EMUs staying for more than 48 hours must undergo level I maintenance before going online. In principle, one level maintenance of EMU shall be carried out in this substation, except for the following cases.

(1) EMU diagram designated outside maintenance. The allocation section must sign the entrusted maintenance agreement with the maintenance section to clarify the quality, safety responsibility, maintenance cost and other relevant contents.

(2) In case of bad weather and other special conditions, one level maintenance of EMU may be overdue, and it is necessary to enter the foreign EMU station for maintenance. The responsible bureau shall timely submit an application for maintenance to the local railway bureau. The local railway bureau shall actively organize and arrange, and the responsible bureau shall cooperate well.

When the EMU enters the external station for maintenance, the allocation section must sign the entrusted maintenance agreement with the maintenance section to clarify the quality, safety responsibility, maintenance cost and other relevant contents. After level I maintenance, the completion form shall be filled in <EMU level I maintenance completion list>.

### 3. Two-level maintenance of EMUs

Level II maintenance refers to the periodic maintenance, inspection and test of all systems and parts of EMU, without omission or overdue. When detaining the train for centralized maintenance, <EMU buckle repair list> must be filled in, and <EMU buckle repair completion list> must be filled in after the repair. The multiple unit train depot shall reasonably combine the maintenance items of "the same cycle, close parts and similar nature", evenly arrange the maintenance plan and optimize the production organization. Level II maintenance can be carried out by detaining maintenance or combined with level I maintenance.

### 4. EMU temporary repair

When the EMU needs to be detained for temporary repair due to failure, <EMU buckle repair list> must be filled in, and <EMU buckle repair completion list> must be filled in after repair.

### 5. Installation and transformation of EMU

The structural change, parameter adjustment and software upgrading of EMU shall be

approved according to relevant regulations. The installation and transformation can be carried out in EMU manufacturing and repair enterprises or multiple unit train depot and motor train station with transformation conditions.

#### 6. Information management of EMU

EMU management information system which is short for information system bellow shall be designed, constructed and used synchronously with multiple unit train depot and motor train station to form a comprehensive and highly integrated information platform to realize modern management and scientific decision-making.

The information system shall comply with relevant national and railway information security regulations. The information system shall meet the four-level management and production requirements of the China Railway, Railway Bureau, multiple unit train depot and motor train station. The automation equipment and other relevant systems of multiple unit train depot and motor train station shall realize information interaction with the information system. The railway Bureau shall formulate management measures for the use and maintenance of information systems and actively promote the construction, use and maintenance of information systems; Relying on the information system, through the accumulation and analysis of application and maintenance data, constantly standardize the business process, improve the maintenance process and optimize the maintenance system.

#### 7. Technical diversion of EMU

Technical changes such as EMU structure change, performance parameter adjustment, software optimization and upgrading shall be approved in accordance with relevant regulations. Technical changes can be carried out in EMU manufacturing and repair enterprises or multiple unit train depot and motor train station with implementation conditions.

### IV. EMU Operation

#### 1. EMU train diagram

The train diagram of multiple units is the main basis for the operation of multiple units. To ensure the normal implementation of the train diagram, the EMU type, quantity, main technical parameters, maintenance operation standards, maintenance, storage, service capacity and other factors of the EMU shall be fully considered when compiling the diagram. The number and location of hot standby EMUs shall be relatively fixed, which shall be determined by the Railway Bureau. The railway bureau's vehicle department should actively participate in the demonstration of EMU train operation scheme and the outline of



train bottom routing and strictly implement EMU technical operation standards to ensure safety moreover optimize EMU Operation and Improve Efficiency. The multiple unit train depot shall scientifically prepare the EMU operation plan according to the EMU Operation Diagram, the maintenance, storage, servicing capacity and maintenance standards of the motor train station, and improve the on-line rate, reasonably use the EMU, and minimize the intensive maintenance of high level maintenance. The multiple unit train depot shall scientifically arrange the crew plan of the on-board machinist of the EMU, reasonably arrange the on-duty routing, and overwork is strictly prohibited. Each railway bureau shall draw the trial operation route of EMU according to the actual situation, and the trial operation can be carried out by using the comprehensive inspection, weekend, peak and other operation lines according to the test items when conditions permit.

## 2. EMU marshalling

Single-row EMU is a fixed formation, and its operation state cannot be disassembled. Two identical short train units (8 units) can be coupled. The reconnection and unmarshalling of multiple train units shall be carried out in accordance with the <measures for reconnection and unmarshalling of multiple train units>. It is forbidden to add various types of locomotives and vehicles to the EMU (Shunting machine or dual-purpose vehicle of highway and railway when there is no power shunting, locomotive and return transition vehicle when there is rescue or no power return). EMU shall not be incorporated into other trains.

## 3. Pick-up and drop EMU

When locomotive shunting operation is adopted, the on-board mechanic or competent personnel of multiple unit train depot shall be responsible for the connection and disassembly of transition coupler, special air duct and electrical connecting line, and open the door. The shunting personnel shall be responsible for the connection and disassembly of coupler and hose.

## 4. EMU running

It is strictly prohibited to put on-line operation of overdue EMUs.

Passenger train inspection is not arranged for EMU at departure, arrival and passing stations for technical operation. Railway Bureau shall actively promote the use of dynamic image detection system for EMU operation faults, aiming to effectively improve the operation safety prevention ability of EMU.

The infrared hotbox detection system must detect the axle temperature of the operating EMU. When the system detecting the axle and alarming, Infrared ray attendant should alarm the train dispatching but should not stop the train. The train dispatching shall

immediately notify the driver of the EMU, and the driver of the EMU shall immediately notify the on-board machinist of the EMU. The on-board machinist of the EMU shall determine whether the EMU continues to run according to the detection situation of the on-board axle temperature detection system. The driver of the EMU shall give feedback on handling situation to the train dispatching, and the train dispatching shall give feedback to the infrared duty officer.

In case of fault during the operation of EMU train, the EMU driver shall handle it in time according to the prompts of on-board information monitoring device; When it needs to be handled by the on-board mechanic of EMU, the on-board mechanic of EMU shall be notified. When it is confirmed that it cannot operate normally after disposal, the driver of the EMU shall select the mode of maintaining operation or stopping according to the prompt of the on-board information monitoring device and the requirements of the on-board mechanic of the EMU, and report to the train dispatcher.

After discovering or receiving the notice of vehicle equipment fault, the on-board mechanic of EMU shall timely identify the fault, correctly handle it according to the EMU emergency fault handling manual, and report the fault information as required. The responsible person shall input the fault information into the EMU management information system within 1 hour after the fault occurs.

Before the on-board mechanic of EMU gets off the train to check and deal with the fault, he shall apply for the speed limit of the adjacent line according to relevant regulations.

EMU and locomotive can be used for rescue, and EMU rescue is preferred. The specific implementation shall be in accordance with the measures for mutual rescue of multiple units.

CRH2C and CRH380A EMUs are not allowed to be overcrowded, and the overcrowding rate of other EMUs shall not exceed 15%. Evacuation shall be carried out when personnel are too concentrated during operation.

## 5. EMU shunting

In principle, EMU shunting adopts the power mode. The locomotive department shall set EMU ground service drivers in multiple unit train depot and EMU station to be responsible for shunting operation.

When locomotive shunting operation is adopted, the on-board machinist of EMU or competent personnel of multiple unit train depot (station) are responsible for the connection and disassembly of transition coupler, special air duct and electrical connecting line, and opening the door. Shunting personnel are responsible for the connection and disassembly of coupler and hose.

The speed limit of EMU through maintenance and detection equipment shall be implemented according to the specific equipment technical conditions. The speed limit of main equipment is as follows:

Tread diagnosis equipment: passing speed limit: 30 km/h; The detection speed limit is 8–12 km/h.

Non-wheel dropping lathe, bogie replacement and wheel dropping equipment: the speed limit is 5 km/h.

Car washing machine: the speed limit is 3–5 km/h during self-running; The speed limit of tractor traction is 1.5–3 km/h.

Track bridge: speed limit 10 km/h.

## 6. EMU return

The EMU shall be returned when required by new allocation, allocation, rental, maintenance, etc. The return of EMU is generally carried out by special train. According to the usable state of EMU power, it can be divided into powered return and unpowered return, also known as live return and unpowered return. The return specification of EMU is quite different from that of locomotives and vehicles on existing lines. See relevant contents of project III for details.

The return of EMU shall be handled as per passenger train, and the powered return controlled by ATP shall be adopted in principle. When the high-speed railway line is parallel to the existing line, the return of high-speed railway line shall be arranged as far as possible. Two short marshaling (8-car marshaling) EMUs of the same type can be reconnected and sent back. When there is no power return, the maximum speed limit is 120 km/h. During return, emergency braking shall be avoided as far as possible; In case of emergency braking, the driver of the EMU shall notify the on-board mechanic of the EMU to get off the train and confirm that the transition coupler is in good condition before driving. When it is necessary to attach a return transition vehicle, the transition vehicle shall be determined through consultation between the user unit and the host enterprise, and personnel shall be sent to escort to ensure the safety of return.

## 7. EMU delivery-receiving

When the EMU is newly manufactured, advanced maintenance, transferred and leased, it is necessary to handle the handover of technical status, onboard tools and spare parts, technical resume, technical data (only newly manufactured and delivered), maintenance records (the latest level II maintenance records), etc. The vehicle department shall take the lead in organizing the pick-up and delivery of EMUs. When newly manufactured, transferred and leased between bureaus, the access bureau shall establish a receiving team

composed of locomotive, electrical and vehicle disciplines; During advanced maintenance, the allocation bureau shall establish a receiving (sending) train group composed of locomotive, electrical and vehicle disciplines.

#### 8. EMU commissioning

In case of the following circumstances, EMU trial operation shall be arranged

Simulation and special commissioning shall be organized and arranged by the head office. Newly built, advanced maintenance, temporary repair and trial operation shall be organized by the Railway Bureau. The order shall be requested by the multiple unit train depot and arranged by the dispatching office. In case of inter Bureau trial operation, the dispatching office of Railway Bureau shall apply to the head office for dispatching order according to the application of vehicle department. Before trial operation, the multiple unit train depot shall organize relevant departments to carry out maintenance and servicing of motor car units to ensure that they are in good technical condition. In case of the following circumstances, EMU trial operation shall be arranged.

(1) Simulation test run (before the new EMU is officially put into operation or when the new line is opened).

(2) After the newly manufactured EMU leaves the factory and the advanced maintenance is completed.

(3) After temporary repair and replacement of bogie, wheel set, universal shaft, main transformer and traction motor.

(4) Special commissioning.

#### [Task Detection]

1. Briefly describe the system and responsibilities of EMU Operation Management Department.

2. What is the allocation principle of EMU?

3. What are the classifications of EMU management?