

## Foreword

According to the requirements of Document JIANBIAO [2014] No.189 issued by the Ministry of Housing and Urban-Rural Development (MOHURD) - "*Notice on Printing and Distributing' the Development and Revision Plan of National Engineering Construction Standards in 2015*", the drafting group has conducted extensive investigation and study, summarized the practical experience, made reference to the relevant international standards and other countries' advanced norms and codes, and widely solicited opinions to revise GB 50381-2010 *Code for Construction Quality Acceptance of Urban Rail Transit Automatic Fare Collection System Engineering*.

This standard consists of 14 chapters and 3 appendixes, covering: general provisions, terms, basic requirements, cable containment installation and inspection, cable laying and testing, equipment installation and wiring, ticket and Ticket Reader-Writer, Station Terminal Equipment, Station Computer System, Central Computer System, Central Clearing System, power supply, earthing and lightning protection, AFC system commissioning and acceptance testing, quality of external appearance of project, etc.

The key changes in this revision are:

1. The testing requirements for the Ticket Reader-Writer have been added.
2. Chapter 13 on "AFC system commissioning and acceptance testing" has been added.

The Ministry of Housing and Urban-Rural Development is in charge of administration of this standard and Shanghai Metro Consultant Supervision Co., Ltd. is responsible for the explanation of specific technical contents. If there is any view or advice encountered during the process of implementing this standard, please direct them to Shanghai Metro Consultant Supervision Co., Ltd. (Address: No.75 South Wanping Road, Shanghai, 200032, China) for reference in future revisions.

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## Contents

1	General provisions	( 1 )
2	Terms	( 2 )
3	Basic requirements	( 4 )
4	Cable containment installation and inspection	( 6 )
4.1	General requirements	( 6 )
4.2	Cable containment laying	( 6 )
4.3	Connector and end of cable containment	( 8 )
4.4	Cable tray installation	( 9 )
5	Cable laying and testing	( 10 )
5.1	General requirements	( 10 )
5.2	Cable laying	( 10 )
5.3	Cable entry	( 11 )
5.4	Cable connection	( 11 )
5.5	Testing of cable characteristics	( 13 )
6	Equipment installation and wiring	( 15 )
6.1	General requirements	( 15 )
6.2	Station Terminal Equipment installation	( 15 )
6.3	Machine room equipment installation	( 16 )
6.4	Equipment wiring	( 17 )
7	Ticket and Ticket Reader-Writer	( 18 )
7.1	General requirements	( 18 )
7.2	Testing of ticket and Ticket Reader-Writer	( 18 )
8	Station Terminal Equipment	( 21 )
8.1	General requirements	( 21 )
8.2	Automatic Ticket Vending Machine	( 21 )
8.3	Booking Office Machine	( 24 )
8.4	Automatic Gate Machine	( 27 )
8.5	Automatic Value-adding Machine, Automatic Ticket Checking Machine, Portable Ticket Checking Machine	( 29 )
9	Station Computer System	( 32 )
9.1	General requirements	( 32 )
9.2	LAN of the Station Computer System	( 32 )
9.3	Testing of the Station Computer System basic function	( 32 )
9.4	Testing of emergency buttons	( 35 )
10	Central Computer System	( 37 )
10.1	General requirements	( 37 )
10.2	LAN of the Central Computer System	( 37 )
10.3	Testing of the Central Computer System basic function	( 37 )

11	Central Clearing System .....	( 41 )
11.1	General requirements .....	( 41 )
11.2	LAN of the Central Clearing System .....	( 41 )
11.3	Testing of the Central Clearing System basic function .....	( 41 )
11.4	Testing of the disaster tolerance system basic function .....	( 43 )
11.5	Testing of the networked interconnectivity.....	( 44 )
12	Power supply, earthing and lightning protection.....	( 46 )
12.1	General requirements .....	( 46 )
12.2	Power supply equipment installation.....	( 46 )
12.3	Earthing and lightning protection .....	( 47 )
12.4	Testing of power supply equipment .....	( 49 )
13	AFC system commissioning and acceptance testing .....	( 50 )
13.1	General requirements .....	( 50 )
13.2	Acceptance of system commissioning and testing .....	( 50 )
14	Quality of External Appearance of project .....	( 52 )
14.1	General requirements .....	( 52 )
14.2	Quality of External Appearance of cable containment .....	( 52 )
14.3	Quality of External Appearance of equipment and wiring .....	( 53 )
Appendix A	Sub-project, component, inspection lot and inspection item .....	( 55 )
Appendix B	Construction quality management inspection and acceptance record of AFC system.....	( 57 )
Appendix C	Quality acceptance record of project .....	( 61 )
	Explanation of wording in this standard .....	( 65 )
	List of cited standards .....	( 66 )

## 1 General provisions

**1.0.1** This standard is formulated to ensure the construction quality of the urban rail transit Automatic Fare Collection system, strengthen the implementation management and unify the acceptance standards.

**1.0.2** This standard is applicable to the acceptance of the construction quality for new construction, extension and renovation of the urban rail transit Automatic Fare Collection system.

**1.0.3** The information security of the urban rail transit Automatic Fare Collection system shall comply with the national regulations.

**1.0.4** The acceptance of the construction quality of the urban rail transit Automatic Fare Collection system shall comply with not only this standard, but also the requirements stipulated in other current relevant national standards.

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## 2 Terms

### 2.0.1 Automatic Fare Collection(AFC)system

A comprehensive automation system for vending, checking, billing, charging, statistics, clearing, and other management operations of urban rail transit based on computer, communication, network, automatic control and other technologies, and is called AFC system for short.

### 2.0.2 Station Terminal Equipment

Equipment installed at each station of the urban rail transit line for ticket transaction processing such as vending, Entry checking, Exit checking, recharging and analyzing.

### 2.0.3 Automatic Gate Machine

Equipment used for checking and processing tickets, and releasing passengers or preventing passengers from entering or exiting the Paid Area.

### 2.0.4 Blacklist

A data list for special control of reported lost tickets or abnormal tickets according to management requirements.

### 2.0.5 Automatic Ticket Vending Machine

Equipment used for automatically vending and assigning value to valid tickets with automatic payment and change processing functions.

### 2.0.6 Booking Office Machine

Equipment used for vending and assigning value to valid tickets with manual assistance, and providing ticket processing functions such as compensating, refunding, inquiring and updating tickets.

### 2.0.7 Automatic Value-adding Machine

Equipment used for automatically recharging Stored Value Tickets and checking transaction and balance information, etc.

### 2.0.8 Ticket Checking Machine

Equipment used for inquiring ticket information which includes Automatic Ticket Checking Machine and Portable Ticket Checking Machine, etc.

### 2.0.9 Station Computer System

A computer system used for station level ticket processing, operation management and passenger flow statistics.

### 2.0.10 Central Computer System

A computer system used to monitor and manage the Automatic Fare Collection system of single line or multiple lines in the urban rail transit.

### 2.0.11 Central Clearing System

A system used to issue and manage urban rail transit tickets, settle and clear tickets and accounts of different lines within the urban rail transit network, with the function of clearing with other payment cards used in the urban rail transit network.

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\*Booking Office Machine is a semi-automatic ticket vending machine, which is usually intalled at booking office, and it is called Booking Office Machine as a custom.

**2.0.12 Security Key**

Specific secret parameters used when encrypting or decrypting data.

**2.0.13 Security Access Module(SAM)**

A hardware encryption module that provides the necessary security mechanism to prevent illegal attacks on secure data stored or processed by a terminal, and is called SAM for short.

**2.0.14 Initialization**

A process to write the initial format, issuance and application information on the ticket to ensure the normal use in the system before putting it into operation.

**2.0.15 Encode Sorter**

Equipment used for initializing coding, and batch sorting of tickets.

**2.0.16 Entry**

Act of passing from the Unpaid Area to the Paid Area.

**2.0.17 Exit**

Act of passing from the Paid Area to the Unpaid Area.

**2.0.18 Single Journey Ticket**

A one-time-use ticket within a limited time.

**2.0.19 Stored Value Ticket**

Ticket with value storage function which can be recharged repeatedly.

**2.0.20 Ticket Reader-Writer**

Equipment installed in Automatic Ticket Vending Machine, Booking Office Machine, Automatic Gate Machine, Automatic Value-adding Machine, Automatic Ticket Checking Machine and Portable Ticket Checking Machine used for reading and writing of tickets for vending, checking, recharging and verifying analysis.



### 3 Basic requirements

**3.0.1** The urban rail transit Automatic Fare Collection system (AFC system) shall establish construction technical standards, quality management system, construction quality inspection system, and construction quality level evaluation and assessment system for quality management at the construction site.

**3.0.2** The division of AFC system project into sub-project, component and inspection lot, and the inspection items of AFC system project shall meet the requirements of Appendix A of this standard.

**3.0.3** The construction site of AFC system shall conduct quality management inspections, and it shall be inspected and recorded in accordance with the requirements of the construction site quality management inspection in Table B.0.1 in Appendix B of this standard.

**3.0.4** The construction quality acceptance of AFC system shall include the quality control, system testing and construction acceptance of project implementation.

**3.0.5** The appearance, specifications and models of the materials, construction accessories and equipment used in AFC system project shall comply with the design requirements, and shall possess qualified quality certificate documents.

**3.0.6** The AFC system project shall be an independent project, which shall be classified into sub-project, component and inspection lot.

**3.0.7** The construction quality acceptance procedure and organization of AFC system, as well as the quality acceptance of inspection lot, component, sub-project and AFC system project shall meet the requirements of the current national standard GB 50300 *Unified Standard for Constructional Quality Acceptance of Building Engineering*.

**3.0.8** The construction quality acceptance of AFC system shall include quality control data verification, entity quality and main function verification, and Quality of External Appearance\* inspection of project, and the following acceptance records shall be filled in:

1 The quality acceptance of inspection lot shall be carried out and recorded in accordance with the requirements of inspection lot quality acceptance in Table B.0.2 in Appendix B of this standard.

2 The quality acceptance of component shall be carried out and recorded in accordance with the requirements of component quality acceptance in Table B.0.3 in Appendix B of this standard.

3 The quality acceptance of sub-project shall be carried out and recorded in accordance with the requirements of sub-project quality acceptance in Table B.0.4 in Appendix B of this standard.

4 The quality acceptance of project shall carry out sampling inspection on the quality control records, safety and main use functions, and Quality of External Appearance of the sub-project, and it shall be carried out and recorded in accordance with the requirements of project quality acceptance in Table C.0.1 in Appendix C of this standard.

5 The acceptance of project quality control data verification shall be carried out and recorded in accordance with the requirements in Table C.0.2 in Appendix C of this standard.

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\* Quality of External Appearance means external quality and functional status of the project which is reflected by observing and necessary testing.

6 The safety and function inspection data verification as well as the spot-check acceptance of main functions for project shall be carried out and recorded in accordance with the requirements in Table C.0.3 in Appendix C of this standard.

**3.0.9** During the construction quality acceptance of AFC system, the AFC system project that does not comply with the requirements in this standard, and the sub-project or project that cannot meet the requirements for safety use even after rework or reinforcement measures, shall not be accepted.

**3.0.10** The application and administration of cryptography of the AFC system shall comply with the national cryptography management regulations.

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## 4 Cable containment\* installation and inspection

### 4.1 General requirements

**4.1.1** The specification, model and quantity of the cable containment and its embedding, installation, laying location and routing shall meet the design requirements.

**4.1.2** Cable containment, junction boxes, branching boxes and terminal boxes to be embedded underground should be sealed and waterproof. A sealing test should be conducted after installation, and the overall Degree of Protection should not be lower than IPX7.

### 4.2 Cable containment laying

#### I Main items

**4.2.1** The quality of the embedded cable containment shall be in accordance with the following requirements:

**1** The metal conduits shall not be connected by butt fusion welding technique, and galvanized steel conduits or steel conduits with a wall thickness of less than or equal to 2mm shall not be connected by casing fusion welding.

**2** The galvanized cable containment, as well as flexible conduits shall not be fused to bridge earthing wires. When the cable between the two earthing kits bridged by the special earthing kit is a copper core flexible conductor, the cross-section area of the copper core flexible conductor shall not be less than 4mm<sup>2</sup>.

Inspection scope: 100%.

Inspection method: visual inspection and measurement.

**4.2.2** The metal cable containment, branching boxes and junction boxes shall be electrically connected and earthed reliably. The earthing resistance value of metal cable containment, branching boxes and junction boxes shall comply with the design requirements.

Inspection scope: sampling 10%.

Inspection method: visual inspection and measurement.

**4.2.3** When the cable containment passes through the expansion joint and settlement joint of the building, the flexible connectors shall be used.

Inspection scope: 100%.

Inspection method: visual inspection and measurement.

**4.2.4** For cable containment, junction boxes and branching boxes embedded underground, as well as their protective cover, the mechanical strength shall be able to withstand a pressure of 4kN/m<sup>2</sup> and above.

Inspection scope: sampling 10%.

Inspection method: visual inspection, measurement and check of in-situ check records.

**4.2.5** The cable containment, junction boxes, branching boxes and all conduits shall be free from water

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\* Cable containment is a rigid structure to support and protect cables, including cable trough, cable tray, cable duct, etc.

and debris.

Inspection scope: 100%.

Inspection method: visual inspection.

## II General items

**4.2.6** The installation quality of cable containment, junction boxes and cable branching boxes shall be in accordance with the following requirements:

1 The cable containment, junction boxes and branching boxes shall be smooth, internally clean, burr-free, rust-free, and of the correct dimensions.

2 The connection of the cable containment, junction boxes and branching boxes shall be tight and firm, and there shall be no visible deformation after connection.

Inspection scope: sampling 10%.

Inspection method: visual inspection, measurement and check of in-situ check records.

**4.2.7** The bending angle of prefabricated metal elbow conduits shall not be less than 90°, the bending radius shall not be less than 10 times the outer diameter of the pipe, and the conduits in bending position shall be free from cracks and deformation.

Inspection scope: sampling 10%.

Inspection method: visual inspection, measurement and check of in-situ check records.

**4.2.8** The depth of the metal cable containment shall not be less than 15mm from the surface of the building or structure. The metal containment shall be arranged orderly, the spacing between fixed points shall be even, and the installation shall be secured. Conduit clips shall be provided within 150mm–500mm from joints, terminals, middle points of elbows or edges of cabinets, panels, tables, boxes or boards of the metal cable containment. The maximum distance between conduit clips in the middle straight-line segment shall be in accordance with those specified Table 4.2.8.

**Table 4.2.8 Maximum distance between conduit clips in straight line segment**

Laying method	Conduit type	Circular conduit diameter $\phi$ (mm)					Square conduit width $W$ (mm)	
		$15 \leq \phi < 25$	$25 \leq \phi < 32$	$32 \leq \phi < 50$	$50 \leq \phi \leq 65$	$\phi > 65$	$50 \leq W \leq 150$	$W > 150$
		Maximum distance between conduit clips(m)						
Concealed work	Rigid steel conduit with wall thickness $t > 2\text{mm}$	1.5	2.0	2.5	2.5	3.5	3.0	2.0
	Rigid steel conduit with wall thickness $t \leq 2\text{mm}$	1.0	1.5	2.0	-	-	-	-
	Rigid insulated conduit	1.0	1.5	1.5	2.0	2.0	-	-

Inspection scope: sampling 10%.

Inspection method: visual inspection, measurement and check of in-situ check records.

**4.2.9** A branching box shall be provided when the bending angle of the cable containment is less than 135°. The distance between the branching boxes provided on the cable containment shall be in accordance with the following requirements:

1 When there is no curve between two branching boxes, the distance shall be less than 30m.

- 2 When there is one curve between two branching boxes, the distance shall be less than 20m.
- 3 When there are two curves between two branching boxes, the distance shall be less than 15m.
- 4 When there are three curves between two branching boxes, the distance shall be less than 8m.

Inspection scope:sampling 10%.

Inspection method:visual inspection, measurement and check of in-situ check records.

**4.2.10** Special connectors shall be used for the connection between flexible conduits and cable containment or electrical equipment and appliances.The flexible conduit connectors shall be well sealed and the water-proof coating layer shall be intact.The maximum allowable length of flexible conduit shall not be longer than 2m when connecting with cable containment or electrical equipment and appliances.Flexible conduits shall not be used as the connecting conductor for earthing.

Inspection scope:sampling 10%.

Inspection method:visual inspection, measurement and check of in-situ check records.

**4.2.11** The flexible conduit shall be protected with steel casing when passing through expansion joints or settlement joints of the building.

Inspection scope:100%.

Inspection method:visual inspection and check of in-situ check records.

### **4.3 Connector and end of cable containment**

#### **I Main items**

**4.3.1** The connector of the cable containment, including the junction box and branching box, shall be tight and firm, and shall not be loosened due to subsequent construction activities.

Inspection scope:sampling 10%.

Inspection method:visual inspection, measurement and check of in-situ check records.

**4.3.2** The cable containment end shall be sealed.

Inspection scope:100%.

Inspection method:in-situ check and check of in-situ check records.

#### **II General items**

**4.3.3** The connections of cable containment, junction boxes and branching boxes shall be smooth and burr-free, the metal containment shall be free from rust, the burrs shall be cleaned after cutting the containment, and the end surface of the galvanized metal containment shall be treated with anti-corrosion after cutting.

Inspection scope:sampling 10%.

Inspection method:in-situ check and check of in-situ check records.

**4.3.4** When cable containment, junction boxes and branching boxes are led out of the ground surface, they shall be in accordance with the following requirements:

- 1 The containment end that enters floor-type cabinets, panels, tables, boxes or board shall be firmly connected to its bottom.

- 2 The outlet of the cable containment shall be at least 10mm above the finished surface of station decoration.

- 3 The cable containment end shall be smooth, burr-free and crack-free.

Inspection scope:100%.

Inspection method:measurement, in-situ check and check of in-situ check records.

## 4.4 Cable tray installation

### I Main items

**4.4.1** The installation quality inspection of cable trays shall be in accordance with the following requirements:

- 1 The specifications, models, quality and quantity of cable trays shall meet the design requirements.
- 2 The metal cable trays and metal conduits led in or out shall be grounded continuously and reliably.
- 3 The connection between the metal cable tray and the earthing bus shall not be less than two locations.

4 The earthing of the connecting plate between metal cable trays shall be connected reliably, with not less than two locations connected with the earthing (PE) bus. Both ends of the connecting plate between metal cable trays shall be connected with copper core earthing wire, with the minimum allowable cross section of not less than 4mm<sup>2</sup>.

5 The cable tray laid in the cable shaft and/or across different fire zones shall be equipped with fire-proof sealing, and shall meet the requirements of current national standard GB 50303 *Code for Acceptance of Construction Quality of Building Electrical Engineering*.

Inspection scope: 100%.

Inspection method: visual inspection.

**4.4.2** The expansion flexible connectors shall be provided when the cable tray passes through expansion joints or settlement joints, or when the straight-line length of the cable tray exceeds 30m.

Inspection scope: 100%.

Inspection method: visual inspection.

### II General items

**4.4.3** The installation quality of cable trays shall meet the requirements of Article 4.3.1 of this standard, and be in accordance with the following requirements:

1 The spacing between the brackets for horizontal and vertical installation of cable trays shall not be larger than 2m, cable trays shall be installed neatly with the same bending angle, and the deviation of the cable tray level shall not exceed 2mm/m.

2 Bolts between the cable tray and the bracket, and those between connecting plates of the cable tray shall be tightened securely, and nuts shall be placed on the outside of the cable tray.

3 The cable tray shall be laid below the flammable and explosive gas pipeline and thermal pipeline. When there are no design requirements, the minimum clearance between the cable bridge, tray and pipeline should be in accordance with those specified in Table 4.4.3.

**Table 4.4.3 Minimum spacing between cable bridge, tray and pipeline(m)**

Pipe type		Parallel spacing	Cross spacing
General process pipe		0.2	0.2
Flammable and explosive gas pipe		0.5	0.5
Thermal pipe	With thermal insulation layer	0.5	0.3
	Without thermal insulation layer	0.5	0.5

Inspection scope: sampling 10%.

Inspection method: visual inspection and measurement.

## 5 Cable laying and testing

### 5.1 General requirements

**5.1.1** The model, specification, quantity, quality, routing, installation method and spacing of data cables, power cables and control cables shall meet the design requirements.

**5.1.2** The cable shall not be damaged, dampened, twisted or wrinkled.

**5.1.3** The personnel carrying out the connection and testing of optical fiber cables and power cables shall be trained, qualified and certified.

### 5.2 Cable laying

#### I Main items

**5.2.1** The data cable, control cable and/or power cable shall be laid in separate conduits and ducts. The cable ends shall be sealed and shall meet the requirements of the current national standard GB/T 50312 *Code for Engineering Acceptance of Generic Cabling System*.

Inspection scope: 100%.

Inspection method: visual inspection.

**5.2.2** The power cabling shall be in accordance with the following requirements:

**1** AC power cables and DC power cables shall be laid separately and shall not be tied in the same harness.

**2** The power cable shall be continuous, cable jointing shall not be allowed, and the wiring shall not be subject to squeeze or damage by external forces.

**3** Cables of different voltage ratings shall be arranged in different categories, laid in separate ducts or conduits, and shall be insulated by bulkhead if laid in the same duct.

**4** The crossings of power cables and data cables should be at right angles. When laying in parallel, the spacing between the power cable and the data cable shall meet the design requirements.

Inspection scope: 100%.

Inspection method: visual inspection.

**5.2.3** For insulation resistance value of wire-wire and wire-earthing of wiring between cabinet, screen, table, box or panel shall be higher than  $0.5M\Omega$ , and the insulation resistance value of the secondary circuit shall be higher than  $1M\Omega$ .

Inspection scope: 100%.

Inspection method: visual inspection and measurement with insulation resistance tester.

#### II General items

**5.2.4** The quality of data cables, control cables and power cables laid in the cable containment shall be in accordance with the following requirements:

**1** Cables laid in the cable containment shall be plain and straight, without signs of twisting, looping, scratching on the outer sheath and breaking. There shall not be any joint in the cable containment.

**2** The utilization rate of the cross-section of containment shall meet the requirements of the

current national standard GB 50382 *Code for Construction Quality Acceptance of Urban Rail Transit Communication Engineering*.

**3** Cables shall have reserved allowance, and it shall meet the requirements of the current national standard GB/T 50312 *Code for Engineering Acceptance of Generic Cabling System*.

**4** For the exposed ducts, cables laid in horizontal ducts should be tied and fixed at 3m–5m intervals, and cables laid in vertical ducts should be tied and fixed at 2m intervals.

**5** All cables shall be provided with identification markers and labels at each end of the cable and at each position where cables pass through the junction box. The starting and end positions of cables shall be marked. The identification markers and labels shall be complete, clear, accurate and firmly fixed, and shall be made of water-proof, scratch-resistant and tear-resistant materials.

Inspection scope: 100%.

Inspection method: visual inspection.

**5.2.5** The height of the indoor cabling of AFC system equipment shall be consistent. When cables cross with other cables or pass-through walls or floors, all openings shall be sealed off with fire-proof material after completion of cabling.

Inspection scope: sampling 10%.

Inspection method: visual inspection.

### **5.3 Cable entry**

#### **I Main items**

**5.3.1** The model, specification and quantity of the introduced cables shall meet the design requirements. The wiring equipment shall meet the requirements of the current national standard GB/T 50312 *Code for Engineering Acceptance of Generic Cabling System*.

Inspection scope: 100%.

Inspection method: check against the design document and measurement with insulation resistance tester.

#### **II General items**

**5.3.2** The quality of the cable entry and connected wiring terminal shall be in accordance with the following requirements:

**1** Protective measures of cable entry shall be taken at the inlet.

**2** Wiring terminal jumpers shall be arranged orderly and straightly, and the bottom hole of the wire distribution box shall be blocked after introducing the cable.

Inspection scope: sampling 10%.

Inspection method: visual inspection.

**5.3.3** A Cable shall be labeled with its model, length, starting point, endpoint and purpose.

Inspection scope: 100%.

Inspection method: visual inspection.

### **5.4 Cable connection**

#### **I Main items**

**5.4.1** The connection of optical fiber cable shall be in accordance with the following requirements:

**1** The fiber core shall be connected according to the sequence of fiber chromatography, fiber



joints shall be protected by the heat shrinkable reinforced tube, and the reinforced tube shall shrink uniformly and without bubbles.

2 The installation of the optical fiber cable connector box shall be fixed firmly and well-sealed.

3 The metal outer sheath and the reinforced core of optical fiber cable shall be fastened in the connector box, shall be electrically connected on the same side, and shall be insulated on both sides.

4 The bending radius of the optical fiber cable when positioned inside the optical cable distribution box shall be in accordance with the following requirements:

1) The bending radius of optical fiber cable shall not be less than 40mm.

2) The bending radius at the fiber joint shall not be less than 20 times the outer diameter of the sheath.

Inspection scope: 100%.

Inspection method: visual inspection and measurement.

**5.4.2** The data cable termination shall meet the requirements of the current national standard GB/T 50312 *Code for Engineering Acceptance of Generic Cabling System*, as well as be in accordance with the following requirements:

1 No cable joint shall be allowed for data cable.

2 The cable termination shall be fixed firmly and electrically connected.

Inspection scope: sampling 30%.

Inspection method: visual inspection and measurement with a multimeter.

**5.4.3** The connection of power cable shall be in accordance with the following requirements:

1 The connection of power cable shall be distinguished by color, without wrong connection or short circuit.

2 The connection between the power cable core and the electrical equipment shall be in accordance with the following requirements:

1) For single-stranded copper core with cross-sectional area of  $10\text{mm}^2$  and below, they shall be directly connected to terminal lugs of the equipment.

2) For multi-strand copper core with cross-sectional area of  $2.5\text{mm}^2$  and below, they shall be tightened and tinned, or be pinched by means of terminal lugs before connected to terminal lugs of the equipment.

3) For multi-strand copper core with cross-sectional area of larger than  $2.5\text{mm}^2$ , they shall be welded or pinched by means of terminal lugs before connecting with the terminal lugs of the equipment, except for plug-in terminal lugs in the equipment. Before the multi-strand copper core is connected with the plug-in terminal, the end part shall be tightened and tinned.

3 Each terminal lug of equipment shall not be wired with more than two power cables.

4 The core wire connecting conduit of power cable and the terminal lug specifications shall be compatible with the cable core specifications, and open terminal lugs shall not be used.

Inspection scope: sampling 30%.

Inspection method: visual inspection and measurement with a multimeter.

## II General items

**5.4.4** In the same project, the color of cable insulation layer shall be the same.

Inspection scope: sampling 30%.

Inspection method: visual inspection.

## 5.5 Testing of cable characteristics

### I Main items

**5.5.1** The insulation resistance value among control cables, and between cables and earthing system shall be higher than 0.5MΩ.

Inspection scope: 100%.

Inspection method: measurement with insulation resistance tester.

**5.5.2** The characteristic indices of optical fiber cable shall be in accordance with the following requirements:

**1** The average loss of each optical fiber connection shall be in accordance with the following requirements:

1) The value range of single-mode fiber shall be  $\bar{\alpha} \leq 0.1\text{dB}$ .

2) The value range of multimode fiber shall be  $\bar{\alpha} \leq 0.2\text{dB}$ .

**2** The average loss of each fiber splice in optical fiber segment shall be in accordance with the following requirements:

1) The value range of single-mode fiber shall be  $\bar{\alpha} \leq 0.08\text{dB}$ .

2) The value range of multimode fiber shall be  $\bar{\alpha} \leq 0.2\text{dB}$ .

**3** The average loss of each optical fiber connector shall be in accordance with the following requirements:

1) The value range of single-mode fiber shall be  $\alpha_c \leq 0.7\text{dB}$ .

2) The value range of multimode fiber shall be  $\alpha_c \leq 1.0\text{dB}$ .

**4** The test value of optical fiber cable attenuation shall be less than its calculated value, which shall be calculated as follows:

$$\alpha_1 = \alpha_0 L + \bar{\alpha} n + \alpha_c m \quad (5.5.2)$$

Where:  $\alpha_1$ —Calculated value of optical fiber cable attenuation(dB).

$\alpha_0$ —Nominal value of optical fiber cable attenuation(dB/km).

$L$ —Length of optical fiber cable segment(km).

$\bar{\alpha}$ —Average loss of each fiber splice in optical fiber cable segment(dB).

$n$ —Number of splices per optical fiber in optical cable segment.

$\alpha_c$ —Average loss of optical fiber movable connector(dB).

$m$ —Number of movable connectors per optical fiber in optical cable segment.

**5** The attenuation of the optical fiber cable route link at the specified transmission window shall be in accordance with those specified in Table 5.5.2-1.

**Table 5.5.2-1 Attenuation of optical fiber cable route link**

Routes	Link length (m)	Attenuation $\alpha_1$ (dB)			
		Single-mode fiber		Multimode fiber	
		1 310nm	1 550nm	850nm	1 300nm
Horizontal	100	$\leq 2.2$	$\leq 2.2$	$\leq 2.5$	$\leq 2.5$
Horizontal cabling subsystem	500	$\leq 2.7$	$\leq 2.7$	$\leq 3.9$	$\leq 2.6$
Vertical trunk subsystem	1 500	$\leq 3.6$	$\leq 3.6$	$\leq 7.4$	$\leq 3.6$

6 The minimum optical return loss of optical fiber cable routes link shall be in accordance with those specified in Table 5.5.2-2.

**Table 5.5.2-2 Minimum optical return loss of optical fiber cable route link**

Type	Single-mode fiber		Multimode fiber	
Wave length(nm)	1 310	1 550	850	1 300
Optical return loss(dB)	≥26	≥26	≥20	≥20

Inspection scope:100%.

Inspection method: measurement by attenuation, wave length and return loss with network analyzer.

## II General items

**5.5.3** The characteristic index of data cable shall meet the requirements of the current national standard GB/T 50312 *Code for Engineering Acceptance of Generic Cabling System*.

Inspection scope:100%.

Inspection method: measurement with ethernet cable tester.

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## **6 Equipment installation and wiring**

### **6.1 General requirements**

**6.1.1** The acceptance of equipment installation and wiring shall include the inspection of the installation of Station Terminal Equipment, machine room equipment and emergency button, equipment wiring, and all types of booking offices and customer service centers used to install terminal equipment.

**6.1.2** The specifications and installation locations of all types of booking offices and customer service centers shall meet the design requirements.

**6.1.3** The floors of all types of booking offices and customer service centers shall be flat and firm.

**6.1.4** The doors, windows, and locks of all types of booking offices and customer service centers shall be intact.

### **6.2 Station Terminal Equipment installation**

#### **I Main items**

**6.2.1** The entry prerequisite of the Station Terminal Equipment shall be in accordance with the following requirements:

**1** Before installation, the Station Terminal Equipment shall be unpacked and inspected to ensure that the equipment and accessories are intact and the associated information is complete.

**2** The model, specification and quantity of the Station Terminal Equipment shall meet the design requirements.

**3** The overall dimensions of the Station Terminal Equipment, the models and specifications of the various components and the wiring ports in the equipment shall meet the design requirements.

**4** The connection of Station Terminal Equipment components shall be tight and secured.

Inspection scope: 100%.

Inspection method: visual inspection.

**6.2.2** The earthing joint and earthing connection of the Station Terminal Equipment shall be reliable and firm.

Inspection scope: 100%.

Inspection method: visual inspection and measurement.

#### **II General items**

**6.2.3** The installation quality of Station Terminal Equipment shall be in accordance with the following requirements:

**1** The installation location of Station Terminal Equipment shall meet the design requirements.

**2** The aisle width installed for the automatic gate shall meet the design requirements.

**3** Space for operation and maintenance shall be reserved around Station Terminal Equipment according to design requirements.

**4** The installation of the equipment and the base shall be firm. Water-proof treatment shall be provided between the base and the floor. The vertical and horizontal deviation of the equipment installation shall not exceed 3‰, and the horizontal space deviation between the Automatic Gate

Machine shall not exceed 5‰.

Inspection scope: sampling 30%.

Inspection method: visual inspection and measurement.

**6.2.4** The guide display installed above the Automatic Gate Machine shall be firm, and the installation position shall meet the design requirements.

Inspection scope: 100%.

Inspection method: visual inspection.

**6.2.5** The Station Terminal Equipment shall be provided with an equipment identification plate after installation.

Inspection scope: 100%.

Inspection method: visual inspection.

### **6.3 Machine room equipment installation**

#### I Main items

**6.3.1** The machine room equipment shall include servers, workstations, network equipment, storage equipment, power supply equipment, printers and Encode Sorters, etc. The model, specification, quality and quantity of machine room equipment shall meet the design requirements.

Inspection scope: 100%.

Inspection method: visual inspection.

**6.3.2** The plug-in cabinet connectors shall be securely fastened.

Inspection scope: 100%.

Inspection method: visual inspection.

#### II General items

**6.3.3** The installation of machine room equipment shall be stable and firm.

Inspection scope: 100%.

Inspection method: visual inspection.

**6.3.4** The installation quality of cabinets shall be in accordance with the following requirements:

**1** The cabinet shall be fixed firmly, and the vertical and horizontal deviation of the cabinet installation shall not exceed 3‰.

**2** The front side of the same row of cabinets shall be aligned in the same plane, and the allowable deviation shall not exceed 5‰.

**3** The cabinet shall be firmly attached to an earthing wire with cross-section of not less than 6mm<sup>2</sup>.

Inspection scope: 100%.

Inspection method: visual inspection and measurement.

**6.3.5** The accessories and spare parts of equipment shall be complete.

Inspection scope: 100%.

Inspection method: visual inspection.

**6.3.6** The equipment cabinet shall be intact, and it shall show no sign of deformation, paint fall-off or corrosion.

Inspection scope: 100%.

Inspection method: visual inspection.

**6.3.7** The machine room equipment shall be provided with an equipment identification plate indicating the equipment name and number in an eye-catching location after the installation.

Inspection scope:100%.

Inspection method:visual inspection.

## **6.4 Equipment wiring**

### **I Main items**

**6.4.1** The specifications and models of the equipment wiring cables shall meet the design requirements.

Inspection scope:sampling 10%.

Inspection method:visual inspection.

**6.4.2** The wiring of the power cable connected to the ground socket box, wall socket box or multi-purpose socket board, and the location of the power cable led out from the equipment shall meet the design requirements.

Inspection scope:100%.

Inspection method:visual inspection.

**6.4.3** The identification on both ends of the power cable shall be complete. The connection points of power terminals and power cables shall be securely connected.

Inspection scope:100%.

Inspection method:visual inspection.

### **II General items**

**6.4.4** The equipment wiring cable shall be free from signs of damage, damp, twist or wrinkle, and the bending radius of the wiring turn shall not be less than 5 times the diameter of the cable. The cables at the entry, exit of the equipment and bending position shall be firmly fixed.

Inspection scope:sampling 10%.

Inspection method:visual inspection and measurement.

**6.4.5** There shall be no joint in the middle of the equipment wiring cable.

Inspection scope:sampling 10%.

Inspection method:visual inspection.

**6.4.6** The cable layout of the equipment shall be straight and tidy, and the binding shall be firm.

Inspection scope:sampling 10%.

Inspection method:visual inspection.

**6.4.7** The internal and external wiring of the equipment shall be firmly connected, without exposed conductive parts.

Inspection scope:sampling 10%.

Inspection method:visual inspection.

## 7 Ticket and Ticket Reader-Writer

### 7.1 General requirements

**7.1.1** The basic requirements of tickets shall meet the requirements of the current national standard GB/T 20907 *Technical Requirements for Automatic Fare Collection System of Urban Rail Transportation*.

**7.1.2** During acceptance procedure of the ticket, its quantity, model, specification, material, printing, appearance and packaging shall meet the design requirements.

**7.1.3** Appearance of the external structure, climatic environment adaptability and mechanical environment adaptability of the Ticket Reader-Writer shall meet the design requirements.

**7.1.4** During acceptance procedure of tickets and Ticket Reader-Writer, the following documents shall be provided:

1 Products conformity certificate.

2 Factory test reports of tickets and Ticket Reader-Writer.

3 Products subjected to national regulations such as production license and China Compulsory Certification(CCC), shall provide production license and China Compulsory Certification(CCC).

**7.1.5** During the acceptance, the qualification of tickets and Ticket Reader-Writer shall be in accordance with the following requirements:

1 When the pass rate of ticket and Ticket Reader-Writer sampling inspection meets the design requirements, it shall be declared as qualified.

2 When the pass rate of ticket and Ticket Reader-Writer sampling inspection does not meet the design requirements, a second inspection shall be conducted. If the pass rates of both inspections do not meet the design requirements, this batch of products shall be declared as failed.

**7.1.6** Power source adaptability, electromagnetic compatibility and motor electrical safety of Ticket Reader-Writer shall meet the design requirements.

### 7.2 Testing of ticket and Ticket Reader-Writer

#### I Main items

**7.2.1** Type, dimensions, packaging material and workmanship of ticket shall meet the design requirements.

Inspection scope: sampling 1‰.

Inspection method: visual inspection and measurement.

**7.2.2** Physical properties, electrical properties, application documents and safety mechanism of ticket shall meet the requirements of the current national standard GB/T 20907 *Technical Requirements for Automatic Fare Collection System of Urban Rail Transportation*.

Inspection scope: sampling 1‰.

Inspection method: visual inspection and measurement.

**7.2.3** Ticket application test shall meet the requirements of the current professional standard CJJ/T 162 *Technical Specification for Test Technology of Urban Rail Transit Automatic Fare*

*Collection System.*

Inspection scope:sampling 1‰.

Inspection method:test in accordance with the current professional standard CJJ/T 162 *Technical Specification for Test Technology of Urban Rail Transit Automatic Fare Collection System.*

**7.2.4** Ticket Reader-Writer application test shall meet the requirements of the current professional standard CJJ/T 162 *Technical Specification for Test Technology of Urban Rail Transit Automatic Fare Collection System.*

Inspection scope:sampling 10‰.

Inspection method:test in accordance with the current professional standard CJJ/T 162 *Technical Specification for Test Technology of Urban Rail Transit Automatic Fare Collection System.*

## II General items

**7.2.5** Appearance inspection of tickets shall be in accordance with the following requirements:

1 Ticket surface shall be glossy and smooth with no signs of visible scratch marks, unevenness, abrasive marks or burry edges.

2 Graphic and text on ticket surface shall be clearly printed.

3 Encapsulated materials such as wire and chip shall not be visible on tickets.

Inspection scope:sampling 1‰.

Inspection method:visual inspection.

**7.2.6** Ticket packaging inspection shall be in accordance with the following requirements:

1 Ticket packaging shall be intact with no damage.

2 Specification and model shall meet design requirements.

3 Ticket packaging shall include serial number, batch number and contract number.

4 Ticket packaging shall include manufacturing date.

5 Ticket packaging shall include packing list, product conformity certificate, and factory test report.

Inspection scope:100‰.

Inspection method:visual inspection.

**7.2.7** Inspection of ticket transportation and storage shall be in accordance with the following requirements:

1 Ticket transportation shall be waterproof and fireproof, and it shall not suffer from strong impacts, rain or sun exposure.

2 Tickets shall be stored in warehouse with ambient temperature between 0℃ to 40℃, relative humidity shall not be larger than 60%, and no corrosive chemicals shall be stored in the same warehouse.

**7.2.8** Inspection of exterior and structure of Ticket Reader-Writer shall be in accordance with the following requirements:

1 Exterior of Ticket Reader-Writer shall not present obviously visible dents, scratches, cracks, deformations, and contamination, etc. The surface coating shall be uniform with no bubbles, cracking, shedding, or abrasion. The metallic parts shall be rust-free and without mechanical damage.

2 Components and parts of Ticket Reader-Writer shall be securely fastened without any loosening.

3 The label, identification plate and functional characters and symbols of Ticket Reader-Writer



shall be concise and clear. Name of product, trademark, place of production, model, manufacturer, and machine serial number shall be labeled on identification plate.

Inspection scope: sampling 10%.

Inspection method: visual inspection.

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## 8 Station Terminal Equipment

### 8.1 General requirements

**8.1.1** The Station Terminal Equipment should include Automatic Gate Machine, Automatic Ticket Vending Machine, Booking Office Machine, Automatic Value-adding Machine, Automatic Ticket Checking Machine and Portable Ticket Checking Machine.

**8.1.2** The factory technical materials of Station Terminal Equipment shall include the following documents:

- 1 Product conformity certificate.
- 2 Factory inspection report.
- 3 Production license.
- 4 Product operation manual and maintenance manual.

### 8.2 Automatic Ticket Vending Machine

#### I Main items

**8.2.1** When the intercommunication between the Automatic Ticket Vending Machine and the Station Computer System is normal, the transaction record of the Automatic Ticket Vending Machine shall be uploaded and displayed on the Station Computer System in real time.

Inspection scope: 100%.

Inspection method: testing inspection by vending on the Automatic Ticket Vending Machine.

**8.2.2** The Automatic Ticket Vending Machine shall have multiple operation modes.

Inspection scope: 100%.

Inspection method: testing inspection by each operation mode.

**8.2.3** The basic functions of Automatic Ticket Vending Machine shall be in accordance with the following requirements:

- 1 It shall be able to issue valid tickets.
- 2 It shall be able to automatically receive one or more payment methods, such as coins, banknotes, Stored Value Tickets, third-party payment and bank cards.
- 3 It shall support the automatic money change function when cash is used as the payment method.
- 4 It shall be able to check the key security.
- 5 It shall be able to upload data such as ticket processing transaction and equipment operating status to the Station Computer System, receive parameter data such as orders, fare tables and Blacklist records issued by the Station Computer System or the Central Computer System, and perform automatic validation processing for version control parameters.
- 6 When the communication with the Central Computer System or Station Computer System is interrupted, it shall be able to work in offline mode, and the time period for saving data shall meet the design requirements. When the communication resumes, it shall be able to automatically upload data previously not transmitted.

- 7 The information displayed on the man-machine interface should have the function of selecting

Chinese and English, and the default language shall be Chinese.

**8** It shall have the function of time synchronization with the Station Computer System.

Inspection scope: 100%.

Inspection method: testing inspection by each of the functional requirements.

**8.2.4** The money change function of the Automatic Ticket Vending Machine shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by the money change function.

**8.2.5** The ticket vending operation functions shall be in accordance with the following requirements:

**1** After selecting the destination and number of tickets or the fare value and number of tickets, the passenger information display shall display the charge amount.

**2** The passenger information display shall display the amount paid or required to be paid by the passenger in real time. When the amount paid exceeds or equals the required amount, it shall issue the ticket and give change.

**3** The passenger information display shall display the operation prompts for coins and banknotes inserted.

**4** Invalid operation shall be prompted by different sound or message displayed on the passenger information display.

**5** When there are tickets, coins or banknotes at the Outlet/Tray, there should be conspicuous sound prompt and indicator light.

Inspection scope: 100%.

Inspection method: testing inspection by the functional requirements of ticket vending.

**8.2.6** The functions of the ticket vending module shall be in accordance with the following requirements:

**1** The ticket vending module shall be able to sell one or more tickets at one time.

**2** The time taken to perform the sales of a single ticket shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by the functional requirements of ticket vending item by item.

**8.2.7** The functions of the coin handling module shall be in accordance with the following requirements:

**1** The types of acceptable coins shall be able to be set by adjusting the parameters.

**2** The quantity of acceptable coin types shall meet the design requirements.

**3** The acceptance rate of real coins and the rejection rate of counterfeit coins shall meet the design requirements, and the unrecognizable coins shall be returned.

**4** The types and the stock amount of each kind of coin shall meet the design requirements.

**5** The capacity of the coin escrow and coin changer shall meet the design requirements.

**6** The coin slot shall be closed when the Automatic Ticket Vending Machine is suspended or closed.

Inspection scope: check one set for each type of coin handling module.

Inspection method: testing inspection by the functional requirements of coin handling module item by item.

**8.2.8** The functions of the banknote acceptance module shall be in accordance with the following requirements:

- 1 The types of acceptable banknotes shall be able to be set by adjusting the parameters.
- 2 The quantity of acceptable banknotes types shall meet the design requirements.
- 3 The acceptance rate of real banknotes and the rejection rate of counterfeit banknotes shall meet the design requirements, and the unrecognizable banknotes shall be returned.
- 4 It shall have banknote escrow function, and the banknote escrow capacity and counterfeit identification method shall meet the design requirements.
- 5 The banknote slot shall be closed when the Automatic Ticket Vending Machine is suspended receiving banknotes, suspended service or closed.
- 6 It shall have the function of real-time monitoring whether the cash box is installed in place.
- 7 It shall monitor the status of cash box in real time.
- 8 The capacity of cash box shall meet the design requirements.

Inspection scope: check one set for each type of banknote acceptance module.

Inspection method: testing inspection by the functional requirements of banknote acceptance module item by item.

**8.2.9** The functions of the banknote change module shall be in accordance with the following requirements:

- 1 The change speed of banknotes, the capacity of the change box and the types of changeable banknotes shall meet the design requirements.
- 2 It shall monitor the storage status of the change box.
- 3 The change box shall be equipped with a safety lock device.
- 4 It shall have the function of real-time monitoring whether the change box is installed in place.
- 5 It shall have the function of banknote recovery.
- 6 The capacity of cash box for banknote recovery shall meet the design requirements.

Inspection scope: check one set for each type according to the type of banknote change module.

Inspection method: testing inspection by the functional requirements of banknote change module item by item.

**8.2.10** The functions of the banknote recycling module shall be in accordance with the following requirements:

- 1 The types of acceptable banknotes shall be able to be set by adjusting the parameters.
- 2 The quantity of acceptable banknotes types shall meet the design requirements.
- 3 The counterfeit banknote identification method, detection accuracy rate of real banknotes and the rejection rate of counterfeit banknotes shall meet the design requirements, and the unrecognizable banknotes shall be returned.
- 4 It shall have the function of loading banknote automatically, and the loaded banknotes shall pass the counterfeit identification.
- 5 The banknote slot shall be closed when the Automatic Ticket Vending Machine is suspended receiving banknotes, suspended service or closed.
- 6 The capacity of banknote escrow, loader cassette, recycler and cash box shall meet the design requirements.
- 7 The recycler and cash box shall be equipped with safety lock device.
- 8 It shall monitor the status of recycler and cash box in real time.
- 9 It shall have the function of real-time monitoring whether the recycler or the cash box is

installed in place.

Inspection scope: check one set for each type of banknote recycling module.

Inspection method: testing inspection by the functional requirements of banknote recycling module item by item.

**8.2.11** The Automatic Ticket Vending Machine shall carry out security identification and detection when the door is opened. It shall have a time limit for inputting the identification code and operation password, and there shall be a timeout alarm. The inputted identification code and the login time shall be uploaded to the Station Computer System in real time.

Inspection scope: 100%.

Inspection method: testing inspection by door opening, identification code and password verification.

**8.2.12** The equipment shall be able to accomplish the last transaction processing in case of electricity interruption, and ensure that the transaction record is not lost.

Inspection scope: 100%.

Inspection method: testing inspection by cutting off the power.

**8.2.13** When purchasing tickets, if the operation does not meet the requirements, the system shall be able to automatically give prompt and the prompt content shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by abnormal purchasing operation.

**8.2.14** All metal housing or body of the Automatic Ticket Vending Machine shall be reliably earthed, and the protective earthing conductor and the protective connecting conductor shall meet the requirements of the current national standard GB 4943.1 *Information Technology Equipment - Safety - Part 1: General Requirements*.

Inspection scope: 100%.

Inspection method: visual inspection.

## II General items

**8.2.15** The materials of nonmetallic parts of the Automatic Ticket Vending Machine shall be flame-retardant, non-toxic and halogen-free.

Inspection scope: 100%.

Inspection method: visual inspection.

**8.2.16** Functions and performance of the Reader-Writer installed on the Automatic Ticket Vending Machine shall meet the design requirements.

Inspection scope: 100%.

Inspection method: visual inspection.

## 8.3 Booking Office Machine

### I Main items

**8.3.1** The intercommunication between the Booking Office Machine and the Station Computer System shall be normal, the transaction data of the Booking Office Machine shall be uploaded and be displayed on the Station Computer System in real time.

Inspection scope: 100%.

Inspection method: operation on the Booking Office Machine with tickets and checking the

transaction record on the Station Computer.

**8.3.2** The basic functions of the Booking Office Machine shall be in accordance with the following requirements:

1 It shall have the authorized login function and be able to automatically generate shift reports.

2 It shall be able to print tickets and cash handling receipts.

3 The operation monitor shall display the system and equipment status information. When a ticket is processed, the operation monitor shall display the ticket processing and analysis information, and it shall display the instruction information of the next operation. When cash is handled, it shall display cash handling information.

4 The passenger information display shall display the ticket analysis, processing and cash information. Before logging in or when the Booking Office Machine malfunctions, the passenger information display shall display the information of service suspension. After the equipment is logged in normally, the passenger information display shall display the information of normal service.

5 When the communication with the Central Computer System or the Station Computer System is interrupted, it shall be able to work in offline mode, and the time of data saving in this mode shall meet the design requirements. When the communication resumes, it shall be able to automatically upload data previously not transmitted.

6 It shall have the function of time synchronization with the Station Computer System.

Inspection scope: 100%.

Inspection method: testing inspection by the basic functional requirements of the Booking Office Machine.

**8.3.3** The Booking Office Machine shall be able to check the ticket information.

Inspection scope: 100%.

Inspection method: testing inspection on the Booking Office Machine by ticket.

**8.3.4** When selling tickets, the monitor of the Booking Office Machine shall display the following contents:

1 Before assignment, the operation display shall display the ticket type to be sold and the amount information to be assigned. The passenger information display shall display the amount of ticket to be sold.

2 After assignment, the operation and passenger information displays shall display the assigned amount of the ticket to be sold.

3 If assignment fails, the operation display shall display the failure information.

Inspection scope: 100%.

Inspection method: testing inspection by the display function of the Booking Office Machine when selling tickets.

**8.3.5** The processing time of single ticket by the Booking Office Machine shall meet the requirements of the current national standard GB/T 20907 *Technical Requirements for Automatic Fare Collection System of Urban Rail Transportation*. If the machine has the automatic ticket issuance function, the ticket processing time shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by the ticket processing speed of the Booking Office Machine.

**8.3.6** When recharging a ticket, the information displayed on the monitor of the Booking Office Machine shall be in accordance with the following requirements:

1 Before recharging, the operation and passenger information displays shall display the residual value information of the ticket.

2 After recharging, the operation and passenger information displays shall display the updated residual value information of the ticket.

3 If recharging fails, the operation display shall display the failure information.

Inspection scope: 100%.

Inspection method: testing inspection by ticket recharging on the Booking Office Machine.

**8.3.7** The ticket update shall be in accordance with the following requirements:

1 The ticket update information on the Booking Office Machine shall include the Entry/Exit status, time, fare update sign and other coding information.

2 When there are two or more items on the ticket that need to be updated at the same time, each update processing shall be confirmed.

3 When the ticket is updated, there shall be a record of the ticket update activity.

4 The number of updatable times of ticket shall meet the design requirements.

5 Blacklisted or uninitialized invalid tickets shall not be updated.

6 The operation monitor shall display the ticket analysis results, historical transaction data and ticket status.

7 The passenger information display shall display the analysis results and residual value of tickets.

Inspection scope: 100%.

Inspection method: testing inspection by the ticket update function of the Booking Office Machine.

**8.3.8** During the payment processing, the payment information shall be displayed on the operation monitor and passenger information display.

Inspection scope: 100%.

Inspection method: testing inspection by the display function of the Booking Office Machine during payment processing.

**8.3.9** All metal housing or body of the Booking Office Machine shall be reliably earthed, and the protective earthing conductor and the protective connecting conductor shall meet the requirements of the current national standard GB 4943.1 *Information Technology Equipment - Safety - Part 1: General Requirements*.

Inspection scope: 100%.

Inspection method: visual inspection.

## II General items

**8.3.10** The materials of nonmetallic parts of the Booking Office Machine shall be flame-retardant, non-toxic and halogen-free.

Inspection scope: 100%.

Inspection method: visual inspection.

**8.3.11** The functions and performance of the Reader-Writer installed on the Booking Office Machine shall meet the design requirements.

Inspection scope: 100%.

Inspection method: visual inspection.

## 8.4 Automatic Gate Machine

### I Main items

**8.4.1** The Automatic Gate Machine shall be able to communicate with the Station Computer System, upload the transaction data to and display it on the Station Computer System in real time.

Inspection scope: 100%.

Inspection method: testing inspection by passing through the automatic gate with tickets and checking the transaction record on the station computer.

**8.4.2** The main performance of the Automatic Gate Machine shall meet the requirements of the current national standard GB/T 20907 *Technical Requirements for Automatic Fare Collection System of Urban Rail Transportation*.

Inspection scope: 100%.

Inspection method: testing inspection by multiple people and tickets quickly passing through the automatic gate, and checking the display information, gate status and the performance of the machine.

**8.4.3** The read-write sensing distance and the response time of the Reader-Writer installed on the Automatic Gate Machine with various tickets shall meet the design requirements.

Inspection scope: 100%.

Inspection method: using various tickets on the Automatic Gate Machine to detect the sensing distance and response time between the Reader-Writer and the ticket.

**8.4.4** The basic functions of the Automatic Gate Machine shall be in accordance with the following requirements:

- 1 It shall have the function of checking the validity of tickets.
- 2 It shall be able to upload data such as ticket processing transactions and equipment operating status to the Station Computer System, receive parameter data such as orders, fare table and blacklist issued by the Station Computer System or the Central Computer System, and perform automatic validation processing for version control parameters.
- 3 When there are multiple ticket collector boxes, it shall be able to switch between ticket boxes automatically. When the ticket boxes of the equipment have almost reached the system pre-set threshold value, the Automatic Gate Machine shall be able to alert the Station Computer System and display the equipment number. When all boxes are full, it shall be able to reject the recycled tickets and prompt on the passenger information display. Non-recycling tickets shall be able to check through normally.
- 4 When the communication with the Central Computer System or Station Computer System is interrupted, it shall be able to work in offline mode, and the time for saving data in this mode shall meet the design requirements. After the resumption of communication, it shall be able to automatically upload data previously not transmitted.
- 5 The direction indicator of the Automatic Gate Machine shall display an access or no-access sign.
- 6 The passenger information display, direction indicator and ticket collection indicator of the Automatic Gate Machine shall be able to indicate the ticket information, access indication and equipment status information in real time.
- 7 When processing special tickets, it shall give audible and visual indications.
- 8 When the reversible automatic gate is in use at one end, the other end shall automatically suspend its service, and the passenger information display and direction indicator shall indicate the



corresponding prompt.

**9** The blacklist ticket detection function of the Automatic Gate Machine shall be able to set the processing mode of different blacklist tickets in the Automatic Gate Machine according to the parameters. This mode shall implement the processing of blacklisted tickets at different levels through a combination of display, warning lights, buzzers, ticket use restrictions, etc. When the Automatic Gate Machine detects the use of a blacklisted ticket, it shall upload the blacklist information to the Station Computer System.

**10** It shall have the time synchronization function with the Station Computer System.

Inspection scope: 100%.

Inspection method: testing inspection by the basic functions of the Automatic Gate Machine item by item.

**8.4.5** When using a normal ticket, the Automatic Gate Machine shall automatically complete Entry or Exit, and the number of people entering or exiting shall tally with the number of tickets used.

Inspection scope: 100%.

Inspection method: testing inspection by entering or exiting with normal tickets.

**8.4.6** When using an abnormal ticket, the passenger information display of the Automatic Gate Machine shall be able to display the prompt information and give audible and visual alarm signals. The processing of the Automatic Gate Machine shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by entering or exiting with abnormal tickets.

**8.4.7** When the emergency push button or emergency mode on the computer system is triggered, all the automatic gates shall be immediately opened and change to the normally open state, so passengers can quickly exit without tickets. All Automatic Gate Machines shall display no Entry signs and Exit permitted signs according to the principle of Exit only in emergency mode.

Inspection scope: 100%.

Inspection method: testing inspection by the emergency mode of the Automatic Gate Machine.

**8.4.8** When the power of the Automatic Gate Machine is cut off during a transaction, it shall be able to record the last transaction and the automatic gate shall be automatically opened and change to the fail-safe mode as passengers can quickly exit without using the ticket.

Inspection scope: 100%.

Inspection method: testing inspection by cutting off the power of the Automatic Gate Machine during a transaction.

**8.4.9** When a passenger makes a forced Entry or Exit without tickets, the Automatic Gate Machine shall be able to prevent it, and give audible and visual alarm signals.

Inspection scope: 100%.

Inspection method: testing inspections by making a forced Entry or Exit.

**8.4.10** The guide display installed above the Automatic Gate Machine shall have the same display as the direction indicator of the Automatic Gate Machine.

Inspection scope: 100%.

Inspection method: visual inspection.

**8.4.11** When the Automatic Gate Machine detects multiple tickets to be processed simultaneously, it shall process them according to the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by entering or exiting with multiple tickets.

**8.4.12** The content and information displayed on the passenger information display of the Automatic Gate Machine shall meet the design requirements.

Inspection scope: 100%.

Inspection method: visual inspection.

**8.4.13** The safety inspection of the Automatic Gate Machine shall be in accordance with the following requirements:

**1** All metal housing or body of the Automatic Gate Machine shall be reliably earthed, and the protective earthing conductor and the protective connecting conductor shall meet the requirements of the current national standard GB 4943.1 *Information Technology Equipment - Safety - Part 1: General Requirements*.

**2** Passengers shall be able to pass safely through the automatic gate when using it normally.

**3** Passengers shall be able to pass safely through the automatic gate with permitted baggage size.

**4** Special passengers shall be able to pass safely through the automatic gate when using wheelchairs or strollers.

Inspection scope: 100%.

Inspection method: visual inspection.

## II General items

**8.4.14** The materials of nonmetallic parts of the Automatic Gate Machine shall be flame-retardant, non-toxic and halogen-free.

Inspection scope: 100%.

Inspection method: visual inspection.

**8.4.15** The functions and performance of the Reader-Writer installed on the Automatic Gate Machine shall meet the design requirements.

Inspection scope: 100%.

Inspection method: visual inspection.

## **8.5 Automatic Value-adding Machine, Automatic Ticket Checking Machine, Portable Ticket Checking Machine**

### I Main items

**8.5.1** When the intercommunication between the Automatic Value-adding Machine and the Station Computer System is normal, the Automatic Value-adding Machine shall upload the relevant data to and display it on the Station Computer System in real time.

Inspection scope: 100%.

Inspection method: testing inspection by the recharging function of the Automatic Value-adding Machine with tickets.

**8.5.2** The basic functions of Automatic Value-adding Machine shall be in accordance with the following requirements:

**1** The types of acceptable money shall meet the design requirements, and the unrecognizable banknotes shall be returned.

**2** It shall be able to check the security of key.

3 When the communication with the Central Computer System or Station Computer System is interrupted, it shall be able to work in offline mode, and the time for saving data shall meet the design requirements. When the communication resumes, it shall be able to automatically upload data previously not transmitted.

4 It shall have the operation prompt function to direct passengers to recharge and check tickets. The information displayed on the man-machine interface should have the function of selecting Chinese and English, and the default language shall be Chinese.

5 It shall be able to generate transaction records for summarization and analysis by the station computer.

6 It shall be able to provide communication and interactive functions with the station computer.

7 It shall have the function of time synchronization with the Station Computer System and meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by the automatic recharging function of the Automatic Value-adding Machine.

**8.5.3** The Automatic Value-adding Machine and Automatic Ticket Checking Machine shall be able to display the ticket number, balance, validity period, card status and information of no less than ten latest consumer transactions through the passenger information display.

Inspection scope: 100%.

Inspection method: testing inspection by ticket checking on the Automatic Value-adding Machine and the Automatic Ticket Checking Machine.

**8.5.4** When recharging invalid tickets, the recharging request shall be refused, and a corresponding prompt shall be given.

Inspection scope: 100%.

Inspection method: testing inspection by recharging invalid tickets.

**8.5.5** The function of the banknote acceptance module of the Automatic Value-adding Machine shall be in accordance with the following requirements:

1 The types of acceptable banknotes shall be able to be set by adjusting the parameters.

2 The quantity of acceptable banknote types shall meet the design requirements.

3 The detection accuracy rate of real banknotes and the rejection rate of counterfeit banknotes shall meet the design requirements, and the unrecognizable banknotes shall be returned.

4 The counterfeit banknote identification method shall meet the design requirements.

5 It shall have the function of banknote escrow, and the capacity of banknote escrow shall meet the design requirements.

6 The banknote slot shall be closed when the Automatic Value-adding Machine is suspended receiving banknotes, suspended service or closed.

7 It shall have the function of real-time monitoring whether the cash box is installed in place.

8 It shall monitor the status of cash box in real time.

9 The capacity of cash box shall meet the design requirements.

Inspection scope: check one set for each type of banknote acceptance module.

Inspection method: testing inspection by the functional design requirements of banknote acceptance module item by item.

**8.5.6** When checking or recharging tickets, if the operation does not meet the requirements, the machine shall give a prompt and the prompt content shall meet the design requirements.

Inspection scope:100%.

Inspection method:testing inspection by abnormal operation.

**8.5.7** The Automatic Value-adding Machine shall carry out safety identification and detection when opening the door.It shall have a time limit for inputting the identification code and operation password, and trigger overtime alarm function.The identification code input and the login time shall be uploaded to the Station Computer System in real time.

Inspection scope:100%.

Inspection method:testing inspection by door opening and identification code and password verification.

**8.5.8** The loading and unloading of the cash box shall be verified by the ID password instruction, and the corresponding information shall be recorded and uploaded to the Station Computer System in real time.

Inspection scope:100%.

Inspection method:testing inspection by cash boxes loading and uploading.

**8.5.9** The Portable Ticket Checking Machine shall be able to display ticket type, ticket number, balance, validity period, card status and other information on the display.

Inspection scope:100%.

Inspection method:testing inspection by ticket reading.

**8.5.10** All metal housing or body of the Automatic Value-adding Machine and the automatic Ticket Checking Machine shall be reliably earthed, and the protective earthing conductor and the protective connecting conductor shall meet the requirements of the current national standard GB 4943.1 *Information Technology Equipment - Safety - Part 1:General Requirements*.

Inspection scope:100%.

Inspection method:visual inspection.

## II General items

**8.5.11** The materials of nonmetallic parts of the Automatic Value-adding Machine and the Automatic Ticket Checking Machine shall be flame-retardant, non-toxic and halogen-free.

Inspection scope:100%.

Inspection method:visual inspection.

**8.5.12** The functions and performance of the Reader-Writer installed on the Automatic Value-adding Machine, Automatic Ticket Checking Machine and Portable Ticket Checking Machine shall meet the design requirements.

Inspection scope:100%.

Inspection method:visual inspection.

## 9 Station Computer System

### 9.1 General requirements

- 9.1.1 The local area network(LAN)of the Station Computer System shall be connected.
- 9.1.2 The Station Computer System and the Central Computer System shall support intercommunication.

### 9.2 LAN of the Station Computer System

#### I Main items

9.2.1 The network equipment performance of the Station Computer System shall meet the design requirements.

Inspection scope:100%.

Inspection method:measurement with the network analyzer.

9.2.2 The network capacity, bandwidth, delay, packet loss rate and flow control performance of the LAN of the Station Computer System shall meet the design requirements.

Inspection scope:100%.

Inspection method:measurement with the network analyzer.

#### II General items

9.2.3 The LAN of the Station Computer System shall have network redundancy.

Inspection scope:100%.

Inspection method:testing inspection on the redundancy by simulating network failures.

### 9.3 Testing of the Station Computer System basic function

#### I Main items

9.3.1 The Station Computer System and all Station Terminal Equipment shall support intercommunication.

Inspection scope:100%.

Inspection method:testing inspection by the station computer.

9.3.2 The monitoring function of the Station Terminal Equipment of the Station Computer System shall be in accordance with the following requirements:

1 The layout,number,quantity and types of Station Terminal Equipment shall be consistent with the actual situation ,and the identification of Paid Area and Unpaid Area shall be displayed.

2 The operating status of the station equipment shall be monitored. When the equipment operating status is changed or abnormal,the system shall have audible and/or visual signals,and have the function of distinguishing the event or fault types with different colors and then recording them in a form.

3 After the status of the system ,network ,equipment ,etc.changes,it shall be able to automatically receive its status data ,and give off audible and/or visual alarm signals.

4 It shall be able to check the status data of station equipment.

5 It shall be able to save all equipment status data received.

Inspection scope:100%.

Inspection method: testing inspection by the monitoring function of the Station Computer System.

**9.3.3** The controlling command function of the Station Computer System shall be in accordance with following requirements:

1 It shall be able to control the operation mode of a single piece of, a group of, a type of or all of station equipment, including normal service, close and suspended service modes.

2 It shall be able to set up the pass mode of reversible automatic gate into Entry mode, Exit mode or reversible mode.

3 It shall be able to inquire the status, register data and parameter management information of station equipment.

4 It shall be able to trigger the upload of the various data of equipment.

Inspection scope: 100%.

Inspection method: testing inspection by the control function of the Station Computer System.

**9.3.4** The Station Computer System shall be able to set operation mode of the concerned station, and the response time shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by setting the operation mode on the Station Computer System.

**9.3.5** The parameters management function of the Station Computer System shall be in accordance with the following requirements:

1 It shall be able to inquire the versions and effective time of various parameters used by the Station Computer System and the Station Terminal Equipment, and the response time shall meet the design requirements.

2 It shall have the parameter synchronization function.

Inspection scope: 100%.

Inspection method: testing inspection by the parameters management function of the Station Computer System.

**9.3.6** The software management functions of the Station Computer System and the Station Terminal Equipment shall be in accordance with the following requirements:

1 It shall be able to inquire the software version currently used on the Station Computer System and the Station Terminal Equipment, and the response time shall meet the design requirements.

2 The software distribution function shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by the software management functions of the Station Computer System and the Station Terminal Equipment.

**9.3.7** The passenger flow statistics function shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by purchasing the ticket, and conducting a real-time passenger flow statistics test after ticket processing.

**9.3.8** The day-end processing function and operating report function shall be in accordance with the following requirements:

1 The day-end processing status shall be able to be displayed on the operation interface in real time.

2 The report function and processing timeliness of the day-end processing shall meet the design requirements.

3 It shall be able to inquire the day-end processing conditions of previous operating days, and the inquiry response time shall meet the design requirements.

4 It shall be able to automatically generate and print various operating reports.

5 The types of operating reports shall meet the design requirements.

6 The operating reports shall be consistent with the actual situation.

7 The response time of report inquiry shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by day-end processing and operating reports.

**9.3.9** The backend processing function of the Station Computer System shall be in accordance with the following requirements:

1 It shall be able to collect and upload transactions, registers, events and status data in real time.

2 It shall be able to receive and save various parameters, and distribute various parameters to terminal equipment in real time.

3 It shall have real-time data collection function.

4 The single-day passenger flow processing capacity and peak passenger flow processing capacity of the system shall meet the design requirements.

5 The time that the system requires to save transaction data shall meet the design requirements.

6 When the Station Computer System processes various types of data, it shall perform checks on their integrity, legality and correctness.

7 It shall have the data archiving, data backup and system cleansing functions.

8 It shall have a regularly cleansing function for files and database data.

Inspection scope: 100%.

Inspection method: testing inspection by the backend processing function of the Station Computer System.

**9.3.10** When the communication between the Station Computer System and the Central Computer System is interrupted, it shall be able to work in offline mode, and the time for saving data shall meet the design requirements. When the communication resumes, it shall be able to automatically upload data previously not transmitted. When the communication between the Station Computer System and the Station Terminal Equipment or the Central Computer System is interrupted, the station workstation shall be able to import and export data in offline mode.

Inspection scope: 100%.

Inspection method: testing inspection by simulating communication interruptions.

**9.3.11** The time synchronization function of the Station Computer System shall be in accordance with the following requirements:

1 The time of the Station Computer System shall be synchronized with the time of the Central Computer System.

2 The Station Computer System shall be able to synchronize time with the Central Computer System at specified time synchronization intervals or when it is started.

3 The Station Computer System shall be able to issue time synchronization instructions to station equipment at specified time synchronization intervals or at startup.

4 The Station Computer System shall be able to provide clock source for time synchronization of the Station Terminal Equipment and station computers.

Inspection scope:100%.

Inspection method:testing inspection by the system time synchronization function.

**9.3.12** The revenue management function of the Station Computer System shall be in accordance with the following requirements:

1 It shall have the cash revenue settlement function for the Booking Office Machine, Automatic Ticket Vending Machine and Automatic Value-adding Machine.

2 It shall have the station reserve fund management function.

3 It shall be able to upload cash revenue data.

4 It shall be able to generate revenue reports.

Inspection scope:100%.

Inspection method:testing inspection by the revenue management function.

**9.3.13** The ticket management function of the Station Computer System shall be in accordance with the following requirements:

1 It shall have the ticket transfer function with the Central Computer System or the Central Clearing System.

2 It shall have the ticket allocation function within the station.

3 It shall have the station inventory statistics and stocktaking functions.

4 It shall be able to generate various inventory reports.

Inspection scope:100%.

Inspection method:testing inspection by the ticket management function.

**9.3.14** The log management function of the Station Computer System shall be in accordance with the following requirements:

1 The operation log of the Station Computer System shall include user login/logout, parameters distributions, equipment operation control commands, and issuance of operating modes.

2 All software on the Station Computer System shall record the software operation log.

3 It shall have the log inquiry function.

4 The log storage period shall meet the design requirements.

5 The log data shall not be modified during the valid log storage time.

Inspection scope:100%.

Inspection method:testing inspection by the log function.

## II General items

**9.3.15** The Station Computer System shall have the user management and user authority management functions.

Inspection scope:100%.

Inspection method:testing inspection by the user management and user authority management functions.

## 9.4 Testing of emergency buttons

### I Main items

**9.4.1** When the emergency button is pressed, it shall be able to issue an emergency evacuation



command to station equipment, and be displayed on the station computer and the central computer.

Inspection scope: 100%.

Inspection method: testing inspection by pressing the emergency button.

**9.4.2** After the emergency button is released, all station equipment shall be able to automatically resume normal operation, and the station computer and central computer shall record the restored status of the emergency button.

Inspection scope: 100%.

Inspection method: testing inspection by releasing the emergency button.

## II General items

**9.4.3** The installation position of the emergency button shall meet the design requirements.

Inspection scope: 100%.

Inspection method: visual inspection.

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## 10 Central Computer System

### 10.1 General requirements

**10.1.1** The LAN of the Central Computer System shall be connected.

**10.1.2** The Central Computer System and the Station Computer System shall support intercommunication.

### 10.2 LAN of the Central Computer System

#### I Main items

**10.2.1** The network equipment performance of the Central Computer System shall meet the design requirements.

Inspection scope: 100%.

Inspection method: measurement with the network analyzer.

**10.2.2** The network capacity, bandwidth, delay, packet loss rate and flow control performance of the LAN of the Central Computer System shall meet the design requirements.

Inspection scope: 100%.

Inspection method: measurement with the network analyzer.

#### II General items

**10.2.3** The LAN of the Central Computer System shall have the network redundancy.

Inspection scope: 100%.

Inspection method: testing inspection on the redundancy by simulating network failure.

### 10.3 Testing of the Central Computer System basic function

#### I Main items

**10.3.1** The Central Computer System shall be able to monitor the operating status and the mode of the Station Computer System, and be in accordance with the following requirements:

1 The line station map displayed on the monitor screen shall be correct, and the current operation mode of each station system shall be displayed in real time.

2 The layout diagram of station equipment and operating statuses of equipment shall be displayed on the monitor screen in real time.

3 The pre-set type of the station operation mode shall meet the design requirements.

4 The station operation mode shall be able to be set in real time, and the real-time response time shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by the monitoring function of operation modes.

**10.3.2** The parameter management function of the Central Computer System shall be in accordance with the following requirements:

1 It shall be able to inquire the version of various parameters.

2 It shall be able to edit the draft versions of various line parameters.

3 It shall be able to synchronize various parameters to assigned stations.

4 It shall be able to inquire the parameter version in real time, and the response time shall meet the design requirements.

5 The time interval and the maximum number of transactions to be transferred shall be executed according to the parameters defined.

6 The register data shall be sent at the time intervals defined by the parameters.

Inspection scope: 100%.

Inspection method: testing inspection by the parameter management function.

**10.3.3** The equipment software management function of the Central Computer System shall be in accordance with the following requirements:

1 It shall be able to manage the version of the terminal equipment software packages.

2 It shall be able to inquire the software version currently in use in the equipment.

3 It shall be able to send the terminal equipment software packages saved in the system to assigned stations or equipment.

4 The real-time and response time of the software version inquiry shall meet the design requirements.

5 The software distribution function shall be normal and meet the requirements.

Inspection scope: 100%.

Inspection method: testing inspection by the equipment software management function.

**10.3.4** The real-time passenger flow statistics of the Central Computer System shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by the real-time passenger flow statistics.

**10.3.5** The functions of day-end processing, operating reports generating and transaction data inquiring on the Central Computer System shall be in accordance with the following requirements:

1 The operation interface shall show the status of day-end processing in real time.

2 The timeliness of day-end processing shall meet the design requirements.

3 It shall be able to inquire the day-end processing of previous operating days according to the design requirements.

4 It shall be able to check the consistency of transaction data based on the transaction sending verification mechanism agreed by the Central Clearing System.

5 After the day-end processing is successfully completed, various operating reports shall be automatically generated and possible to be printed, the types of operating reports shall meet the design requirements.

6 The operating reports shall be consistent with the actual operating data.

7 The timeliness of report inquiry shall meet the design requirements.

8 The response time of transaction data inquiry shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by the day-end processing, reports operating and transaction data inquiring.

**10.3.6** The backend processing function of the Central Computer System shall be in accordance with the following requirements:

1 The system shall be able to collect and upload transaction data, register data, event data and

status data timely.

**2** The system shall be able to download and save various parameters, and distribute them to the Station Computer System.

**3** The Central Computer System shall be able to download the parameters from the Central Clearing System.

**4** When the Central Computer System distributes parameters to the Station Computer System, the execution time shall meet the design requirements.

**5** The passenger flow processing capacity of daily and peak hour flows on the system shall meet the design requirements.

**6** The duration time that the system can save the transaction data shall meet the design requirements.

**7** The system log files shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection by the backend processing function of the system.

**10.3.7** The Central Computer System shall have the time synchronization function with the Central Clearing System or with the standard time.

Inspection scope: 100%.

Inspection method: testing inspection by the time synchronization function.

**10.3.8** The ticket management function of the Central Computer System shall be in accordance with the following requirements:

**1** It shall have a dynamic ticket inventory management function.

**2** It shall have ticket query and statistics functions.

**3** It shall be able to monitor the operating status of the Encode Sorter.

Inspection scope: 100%.

Inspection method: testing inspection by the ticket management function.

**10.3.9** The function of issuing and charging off tickets for emergency use shall be in accordance with the following requirements:

**1** The issuance of the preassigned value tickets for emergency use shall meet the design requirements.

**2** The charging off tickets for emergency use shall meet the design requirements.

**3** The inquiry and statistic reports of the assigning value, issuing and charging off shall be generated.

Inspection scope: 100%.

Inspection method: testing inspection by issuing and charging off functions of the tickets for emergency use.

**10.3.10** The maintenance management function of the Central Computer System shall be in accordance with the following requirements:

**1** It shall have the malfunction monitoring function.

**2** It shall have the part management function.

**3** It shall have the maintenance statistics function.

Inspection scope: 100%.

Inspection method: testing inspection by the maintenance management function of the Central Computer System.

## II General items

**10.3.11** The Central Computer System shall have the user management and the user authority management functions.

Inspection scope: 100%.

Inspection method: testing inspection by the user management and user authority management functions.

**10.3.12** The functions of the Encode Sorter of the Central Computer System shall be in accordance with the following requirements:

- 1 It shall have ticket initialization function.
- 2 It shall have ticket value assignment and value pre-assignment functions.
- 3 It shall have ticket cancellation and update functions.
- 4 It shall have ticket sorting function.
- 5 It shall have authorization and authentication management function.
- 6 It shall be able to download parameters information from the Central Computer System.
- 7 It shall be able to upload data information to the Central Computer System.

Inspection scope: 100%.

Inspection method: testing inspection by the functions of the Encode Sorter system.

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## 11 Central Clearing System

### 11.1 General requirements

**11.1.1** The LAN of the Central Clearing System shall be connected.

**11.1.2** The Central Clearing System and Central Computer System shall support intercommunication.

### 11.2 LAN of the Central Clearing System

#### I Main items

**11.2.1** The network equipment performance of the Central Clearing System shall meet the design requirements.

Inspection scope: 100%.

Inspection method: measurement with the network analyzer.

**11.2.2** The network system capacity, bandwidth, delay, packet loss rate and flow control performance of the Central Clearing System shall meet the design requirements.

Inspection scope: 100%.

Inspection method: measurement with the network analyzer.

**11.2.3** The isolation between the LAN of the Central Clearing System and the external network shall meet the design requirements.

Inspection scope: 100%.

Inspection method: check the external network connection point and network configuration method.

#### II General items

**11.2.4** The LAN of the Central Clearing System shall have the network redundancy function.

Inspection scope: 100%.

Inspection method: testing inspection on the redundancy by simulating network failures.

### 11.3 Testing of the Central Clearing System basic function

#### I Main items

**11.3.1** The clearing management function of the Central Clearing System shall be in accordance with the following requirements:

1 It shall have the transaction data processing function.

2 It shall have the function of verifying the validity of transaction data.

3 It shall have the transaction reconciliation function.

4 It shall have the transaction clearing function.

5 It shall have the ticket clearing rules management function.

6 It shall have the deposit management function.

7 It shall have the daily settlement function.

8 It shall have the inquiry function and the function of generating daily, weekly, ten-days, monthly, quarterly, and annual reports.

Inspection scope: 100%.

Inspection method: testing inspection by the ticket clearing management function item by item.

**11.3.2** The ticket management function of the Central Clearing System shall be in accordance with the following requirements:

- 1 It shall have the ticket business management function, including ticket initialization, encoding, issuance, pre-assignment, refund, replacement, loss reporting, and cancellation.
- 2 It shall have the ticket tracking management function.
- 3 It shall have the ticket inventory management and allocation management functions.
- 4 It shall have the blacklist management function.

Inspection scope: 100%.

Inspection method: testing inspection by the ticket management function item by item.

**11.3.3** The operation management function of the Central Clearing System shall be in accordance with the following requirements:

- 1 It shall have ticket clearing parameter management, fare parameter management and blacklist parameter management functions.
- 2 It shall have the operation mode management function.
- 3 It shall have the passenger flow monitoring function.
- 4 The daily passenger flow processing capacity, peak passenger flow processing capacity and report inquiry functions shall meet the system design requirements.
- 5 It shall have the system user management function.

Inspection scope: 100%.

Inspection method: testing inspection by the operation management function item by item.

**11.3.4** The security key management function of the Central Clearing System shall be in accordance with the following requirements:

- 1 It shall have the functions of key generating, distributing, exporting and importing.
- 2 It shall have the SAM management function.
- 3 It shall have the security certification function.

Inspection scope: 100%.

Inspection method: testing inspection by the operation management function item by item.

**11.3.5** The system management function of the Central Clearing System shall be in accordance with the following requirements:

- 1 It shall have data management function.
- 2 It shall have system monitoring function.
- 3 It shall have data backup function.
- 4 It shall have export and import functions for external data.
- 5 It shall have maintenance management function.
- 6 It shall have operation log management function.
- 7 It shall have time synchronization function.
- 8 It shall have network management function.
- 9 It shall have software version management function.
- 10 The storage capacity shall meet the system design requirements.
- 11 It shall have data filing and backup functions.
- 12 It shall have system data recovery function.

**13** It shall have system log management function.

Inspection scope:100%.

Inspection method:testing inspection by the system management function item by item.

**11.3.6** The Central Clearing System shall have the function of data exchange and reconciliation with other clearing systems.

Inspection scope:100%.

Inspection method: testing inspection by the data exchange and clearing functions with other clearing systems.

**11.3.7** The Central Clearing System shall have the time synchronization function with the standard time source.

Inspection scope:100%.

Inspection method:visual inspection.

**11.3.8** The Central Clearing System shall have the functions of accessing to new lines and new stations,and shall be in accordance with the following requirements:

- 1 It shall have the function of adjusting system fare parameters.
- 2 It shall have the function of adjusting system ticket clearing rules.
- 3 It shall have the accessing test function.
- 4 It shall have the accessing switching function.

Inspection scope:100%.

Inspection method:testing inspection by data simulating item by item.

## II General items

**11.3.9** The Central Clearing System shall have the user management and user authority management functions.

Inspection scope:100%.

Inspection method: testing inspection by the user management and user authority management function.

**11.3.10** The function of the Encode Sorter of the Central Clearing System shall be in accordance with the following requirements:

- 1 It shall have the ticket initialization function.
- 2 It shall have the ticket coding function.
- 3 It shall have the ticket pre-assignment function.
- 4 It shall have the ticket sorting function.
- 5 It shall have the ticket update and cancellation functions.
- 6 It shall have the authorization and authentication management function.
- 7 It shall be able to download parameter information from the Central Clearing System.
- 8 It shall be able to upload data information to the Central Clearing System.

Inspection scope:100%.

Inspection method:testing inspection by the functional requirements item by item.

## 11.4 Testing of the disaster tolerance system basic function

### I Main items

**11.4.1** The disaster backup computer system shall be able to communicate with the Central Clearing



System, and it shall be connected through LAN.

Inspection scope: 100%.

Inspection method: testing inspection with the computer on the network equipment connected to the LAN of disaster tolerance system.

**11.4.2** The functions of the disaster tolerance system shall be in accordance with the following requirements:

1 When the data of the Central Clearing System fails, the backup data of the disaster tolerance system shall be enabled.

2 When the application of the Central Clearing System fails, the backup application system of the disaster tolerance system shall be enabled.

Inspection scope: 100%.

Inspection method: testing inspection by the disaster tolerance function item by item.

**11.4.3** The data backup and recovery functions shall be in accordance with the following requirements:

1 The Central Clearing System shall be able to backup local data according to the backup policy.

2 The disaster tolerance system shall be able to back up the data of the Central Clearing System

3 When the Central Clearing System needs to be restored, it shall be able to retrieve the backup data from the local backup data storage or the disaster tolerance system and restore it to the state of the previous backup.

4 The backup principle shall be able to be formulated according to different data characteristics.

5 It shall be able to verify the accuracy and completeness of the backup data.

Inspection scope: 100%.

Inspection method: testing inspection by the data backup and recovery function.

## II General items

**11.4.4** The disaster tolerance system shall have the user management and user authority management functions.

Inspection scope: 100%.

Inspection method: testing inspection by user management and user authority management function.

## 11.5 Testing of the networked interconnectivity

### I Main items

**11.5.1** The Central Clearing System shall be connected by network with the Central Computer System and other clearing systems.

Inspection scope: 100%.

Inspection method: using the computer to test the connectivity between the Central Clearing System and the Central Clearing System and various external operator systems.

**11.5.2** The full functional testing of the interconnected operation shall be in accordance with the following requirements:

1 All parameters issued by external operators shall be accurate.

2 All operating parameters issued from the Central Clearing System to the various Central Computer System shall be accurate.

3 The operating parameters received by the terminal equipment shall be accurate.

4 The Central Clearing System shall have the functions of initializing coding and assignment of various types of tickets of itself.

5 The transaction data received by the Central Clearing System shall be accurate.

6 All transactions amount shall comply with the fare rules specified in the system.

7 The reconciliation process of the Central Clearing System shall meet the design requirements.

8 All the reporting documents from the Station Computer System, Central Computer System and Central Clearing System shall be accurate.

Inspection scope: 100%.

Inspection method: testing inspection by the functional requirements item by item.

## II General items

**11.5.3** The following inspection for the simulated operation of the terminal equipment shall meet the design requirements:

1 Various transaction processing of the terminal equipment.

2 Operating status of the terminal equipment.

3 The terminal equipment accurately executes commands from the system operation mode.

Inspection scope: sampling not less than 10% of various equipment.

Inspection method: testing inspection by operation simulating.

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## 12 Power supply, earthing and lightning protection

### 12.1 General requirements

**12.1.1** The installation flooring of the power distribution cabinet, uninterruptible power supply(UPS) and battery cabinet shall be even.

**12.1.2** The following installation conditions shall be checked before equipment installation and shall meet all the design requirements:

- 1 Uniformly distributed load on the floor.
- 2 Technical conditions for concealed pipelines, reserved holes and embedded parts.
- 3 Power supply conditions for the power supply system.
- 4 The number of earthing terminals of the earthing box and panel.
- 5 Earthing resistance value of the common integrated earthing body of the earthing system.
- 6 Lightning protection equipment and functions of the power supply system.
- 7 The installation environment of the equipment shall meet the parameters of electromagnetic environment, temperature, humidity and cleanliness.

### 12.2 Power supply equipment installation

#### I Main items

**12.2.1** The model, specification and parameters of the power equipment shall be checked after delivery to the site and shall meet the design requirements.

Inspection scope: 100%.

Inspection method: visual inspection.

**12.2.2** The metal frame and base steel of UPS, power distribution cabinet, box and panel shall be reliably earthed, and these equipment shall be equipped with an openable door, the earthing terminal between the door and the frame shall be connected with an earthing wire and shall be marked. All units of the power distribution cabinet shall be well connected, and the electrical contact points shall be reliably and closely connected. The phase line and the neutral line of the input power supply shall not be connected wrongly, and the neutral line shall not be falsely connected or disconnected.

Inspection scope: 100%.

Inspection method: visual inspection.

**12.2.3** The installation of the storage battery shall be neatly arranged, connected correctly, and in good contact, the battery electrodes or connectors shall not be loose or corroded.

Inspection scope: 100%.

Inspection method: visual inspection.

**12.2.4** The installation of the power distribution box shall be in accordance with the following requirements:

- 1 The box exterior shall be free from deformation and the paint shall be intact.
- 2 The threading hole incision on the box housing shall be neat.
- 3 The connection between the piping and the box shall be firm.

4 The power distribution box shall be firmly installed, and the distance between the box bottom and the ground shall meet the design requirements.

5 The components in the distribution box shall be in good conditions and complete.

6 The return circuit number shall be complete and correct, and it shall tally with the code or coding rules required in the design drawings.

7 The neutral line and protective earth wire in the AC power distribution box shall be connected on the bus bar without being twisted and shall be numbered.

Inspection scope: 100%.

Inspection method: visual inspection.

## II General items

**12.2.5** The installation position, sequence, direction and cable inlet/outlet method of the power supply equipment shall meet the design requirements.

Inspection scope: 100%.

Inspection method: visual inspection.

**12.2.6** The installation of the power supply equipment shall be in accordance with the following requirements:

1 The installation base of the UPS cabinet and battery cabinet shall be firmly fixed, and its size, installation hole diameter, hole spacing and position shall meet the design requirements.

2 The permissible perpendicularity deviation of power cabinet installation shall not be larger than 1.5‰.

3 The power cabinet shall be equipped with anti-vibration measures.

4 The power cabinet shall be firmly installed.

5 The surface of the power supply equipment shall be flat, the paint shall be in good condition, and the identification labels shall be complete.

Inspection scope: 100%.

Inspection method: visual inspection and measurement with the ruler.

**12.2.7** The indication of various instruments of the power supply equipment shall be normal.

Inspection scope: 100%.

Inspection method: visual inspection.

**12.2.8** The installation of the storage battery shall be in accordance with the following requirements:

1 The storage battery shall be installed in stable and level manner.

2 The identification of the storage battery shall be correct, clear and complete.

3 The storage battery shall have no leakage and the housing shall have no deformation.

4 The permissible perpendicularity deviation of the battery rack and cabinet installation shall not be larger than 1.5‰.

Inspection scope: 100%.

Inspection method: visual inspection and measurement with ruler.

## 12.3 Earthing and lightning protection

### I Main items

**12.3.1** The lightning protection earthing, working earthing, common earthing, protective earthing and equipment connection shall meet the design requirements.

Inspection scope: 100%.

Inspection method: visual inspection.

**12.3.2** The earthing installation shall be in accordance with the following requirements:

1 The earthing mode, arrangement of equipment earthing terminals, earth wire access and connection shall meet the design requirements.

2 The connection between the earthing copper bar and bolt, and between the earthing wire terminal and indoor earthing connection wire shall be firm.

3 The connection of the earthing device shall be tin-plated, and there shall be no false solder or pseudo solder in the welding, and the solder joints shall be provided with anti-corrosion treatment.

4 The shield earthing requires that the shielding layer of data cable shall be earthed at a single point.

5 The cross-section area of insulated copper core wire for earthing connection shall meet the design requirements.

6 The metal duct and its support as well as the metal conduit inlet or outlet shall be earthed.

7 The concealed earthing works shall have inspection and acceptance record.

8 The earthing protection of power distribution box shall be reliable and marked.

Inspection scope: 100%.

Inspection method: visual inspection.

**12.3.3** The wiring of the earthing connection wire shall have no joints.

Inspection scope: 100%.

Inspection method: visual inspection.

**12.3.4** The selection of lightning protection products shall meet the design requirements, and the factory conformity certificate and the acceptance test report of the selected products shall be checked.

Inspection scope: 100%.

Inspection method: visual inspection.

**12.3.5** The setting position, method and quantity of the lightning protection facilities shall meet the design requirements.

Inspection scope: 100%.

Inspection method: visual inspection.

**12.3.6** The lightning protection earthing, AC power frequency earthing, DC working earthing, and safety protection earthing shall share an integrated earthing body, and the earthing resistance value of earthing device shall meet the design requirements.

Inspection scope: 100%.

Inspection method: measurement.

**12.3.7** The connection between the equipment earthing and integrated earthing shall be firm.

Inspection scope: sampling 10%.

Inspection method: visual inspection.

## II General items

**12.3.8** The lightning protection cable and the earthing cable shall be led out from the common integrated earthing body.

Inspection scope: 100%.

Inspection method: visual inspection.

## 12.4 Testing of power supply equipment

### I Main items

**12.4.1** The testing of the power supply equipment shall be in accordance with the following requirements:

1 The insulation resistance between the live parts of the power supply equipment and metal housing shall be larger than 5MΩ.

2 The indices of the first charge and discharge shall meet the design requirements.

Inspection scope: 100%.

Inspection method: measurement.

**12.4.2** The electric performance test of the power supply equipment shall be in accordance with the following requirements:

1 When the dual power supply system is switched over manually or automatically, the interruption time of the power supply shall meet the design requirements.

2 The fault alarm shall be accurate.

3 The storage battery capacity shall meet the design requirements.

4 When the output voltage and current exceed the limit, the protective circuit shall respond correctly.

5 When the input power fails, it shall be able to automatically switch to battery supply.

6 All levels of the UPS input and output protection systems and technical performance indices shall meet the design requirements.

Inspection scope: 100%.

Inspection method: testing inspection.

**12.4.3** The insulation resistance between the power cable cores, and between the cores and the earth shall be larger than 0.5 MΩ.

Inspection scope: 100%.

Inspection method: measurement with insulation resistance tester.

### II General items

**12.4.4** The power supply monitoring function shall be able to detect the power supply conditions of the main power and backup power.

Inspection scope: 100%.

Inspection method: testing inspection.

## 13 AFC system commissioning and acceptance testing

### 13.1 General requirements

**13.1.1** The AFC system commissioning and acceptance testing shall be carried out after the acceptance of equipment installation, wiring, functions and on-site installation quality for tickets and Ticket Reader-Writer, Station Terminal Equipment, Station Computer System, Central Computer System, Central Clearing System, etc.

**13.1.2** The AFC system commissioning and acceptance testing shall include system performance testing, system network access function testing and external interface function testing.

### 13.2 Acceptance of system commissioning and testing

#### I Main items

**13.2.1** The basic performance testing results of the system shall meet the design requirements, and the testing shall include the following items:

1 Ticket selling speed of the Automatic Ticket Vending Machine and the Booking Office Machine.

2 Money and ticket jam rates of the Automatic Ticket Vending Machine.

3 Passenger flow rates of the Automatic Gate Machine.

4 Ticket jam rates of the Automatic Gate Machine.

Inspection scope: each station shall select not less than two sets of the Automatic Ticket Vending Machine and the Booking Office Machine, and not less than one set of Entry Automatic Gate Machine and one set of Exit Automatic Gate Machine. The ticket selling quantity for each Automatic Ticket Vending Machine or Booking Office Machine shall not be less than 500 tickets, and the ticket checking quantity of each Automatic Gate Machine shall not be less than 500 tickets.

Inspection method: configure the use ratio of Single Journey Ticket and Stored Value Ticket according to the line passenger flow forecast. Simulating the peak time of passenger flow, testers buy Single Journey Tickets from Automatic Ticket Vending Machines and Booking Office Machines, and pass through the automatic gates with various tickets. By counting the number of tickets sold and checked in a unit time, it is extrapolated into the handling capacity of passenger flow of station equipment in peak hours. By counting the incidents of coin and ticket jam, it is extrapolated into the coin and ticket jam rate of the equipment.

**13.2.2** The new AFC system shall be able to access the pre-existing AFC system on network to operate, and shall be able to process tickets and generate transactions in accordance with the ticketing rules.

Inspection scope: not less than one set of Automatic Gate Machine, Booking Office Machine and Automatic Ticket Vending Machine for each station.

Inspection method: use the existing parameters of the network, randomly select at least one set of Booking Office Machine and Automatic Ticket Vending Machine at the new station for actual ticket purchasing operation, and the number of tickets for each equipment shall not be less than 10. Use these

tickets to do Entry and Exit operations on the Automatic Gate Machine at the new station.

**13.2.3** The new Automatic Gate Machine shall be able to process various tickets in the urban rail transit network and generate transactions in accordance with the ticketing rules.

Inspection scope: not less than one Entry gate and one Exit gate for each station.

Inspection method: use the existing parameters of the network and combine with the operated equipment for inspection. After checking that the parameters are downloaded correctly, use various tickets to enter the new station and exit from any operational station within the urban rail transit network, or use various tickets to enter from any operational station within the urban rail transit network and exit from the new station.

**13.2.4** The new Booking Office Machine shall be able to process various tickets from any station in the network and generate transactions in accordance with the ticketing rules.

Inspection scope: not less than one set for each station.

Inspection method: after using various tickets to enter from other station within the network, generate overtime, overtravel or other circumstances listed in the ticketing rules deliberately, and use the new Booking Office Machine to analyze and process the tickets.

**13.2.5** The Single Journey Tickets sold in the new Automatic Ticket Vending Machine and Booking Office Machine in accordance with the ticketing rules shall be able to enter or exit any station within the network according to the design requirements.

Inspection scope: not less than one set of Automatic Ticket Vending Machine and Booking Office Machine for each station.

Inspection method: use the existing parameters of the network and combine with the operating equipment for inspection. After checking that the parameters are downloaded properly, purchase Single Journey Tickets from the new Automatic Ticket Vending Machine and Booking Office Machine, use the tickets to enter from the new station and exit normally/abnormally from other stations within the urban rail transit network.

## II General items

**13.2.6** The testing results of interface between the AFC system and external system shall meet the design requirements, and the test shall include the following items:

- 1 Interface with the communication system.
- 2 Interface with the fire alarm system.
- 3 Interface with the integrated supervisory control system.
- 4 Interface with other clearing or payment systems.
- 5 Interface with power, lighting and decoration projects.

Inspection scope: 100%.

Inspection method: testing inspection.



## 14 Quality of External Appearance\* of project

### 14.1 General requirements

**14.1.1** The evaluation and acceptance of Quality of External Appearance of project site shall be accepted and recorded according to the inspection and acceptance requirements in Table C.0.4 in Appendix C of this standard.

**14.1.2** When the evaluation items of Quality of External Appearance are deemed unacceptable, they shall be rectified or reworked for re-acceptance.

### 14.2 Quality of External Appearance of cable containment

#### I Main items

**14.2.1** The Quality of External Appearance of optical and power cable containment shall be in accordance with the following requirements:

**1** After the optical and power cable containment is covered with a lid, the floor shall be flat without unevenness.

**2** The cables laid in the optical and power cable containment shall be neat and straight, without any crossing.

**3** There shall be no water leakage in the containment.

**4** After the access holes of the optical and power cable containment are covered with a plate, the floor shall be kept flat without unevenness, and shall not cause any conflict with the positions of other equipment. The gap between the movable cover and the surrounding ground level shall not be larger than 1mm.

Inspection scope: 100%.

Inspection method: visual inspection.

#### II General items

**14.2.2** The appearance quality of optical and power cable entry shall be in accordance with the following requirements:

**1** The optical and power cables shall be arranged neatly and tied uniformly.

**2** The end of optical and power cable shall be neat and aesthetically done.

**3** The cable core braiding shall be straight, uniform and aesthetically done.

**4** The fiber pigtail shall be kept neatly and uniformly, and the binding shall not be too loose or too tight.

**5** Cables shall be clearly labeled and the information shall be complete.

Inspection scope: 100%.

Inspection method: visual inspection.

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\*Quality of External Appearance means external quality and functional status of the project which is reflected by observing and necessary testing.

### 14.3 Quality of External Appearance of equipment and wiring

#### I Main items

**14.3.1** The Quality of External Appearance of the machine room equipment arrangement shall be in accordance with the following requirements:

- 1 The machine room equipment shall be arranged neatly.
- 2 The equipment spacing shall meet the design requirements.

Inspection scope: 100%.

Inspection method: visual inspection.

**14.3.2** The appearance quality of cabinet installation shall be in accordance with the following requirements:

- 1 The installation shall be flat, stable and not unbalanced.
- 2 The equipment layout in the cabinet shall be neat and aesthetically done.
- 3 The cabinet surface shall be flat and free of any sundries inside.

Inspection scope: 100%.

Inspection method: visual inspection.

**14.3.3** The Quality of External Appearance of equipment installation shall be in accordance with the following requirements:

- 1 The equipment shall be installed firmly and stably.
- 2 The equipment installation shall be arranged neatly and aesthetically done, and the equipment identification shall be clear.
- 3 The surface of the equipment shall be well painted without obvious damage.
- 4 After the equipment is switched on, the display and button operation on the equipment shall be normal.
- 5 The terminal ID, purpose tag and other identifications shall be complete and written correctly and legibly.

Inspection scope: 100%.

Inspection method: visual inspection.

**14.3.4** The Quality of External Appearance of equipment wiring shall be in accordance with the following requirements:

1 The wiring in the wiring frame, rack and between the racks shall be neat and aesthetically done, and the outlet angle shall be smooth and without crossing.

2 The wiring on the wiring terminal shall be tight and have no loose connections, no fake connections and no pseudo connections. The joint shall be round and aesthetically done.

3 The twist cables, optical cables and other signal cables shall be bundled and tied neatly and aesthetically.

Inspection scope: 100%.

Inspection method: visual inspection.

**14.3.5** The power distribution cabinet, UPS cabinet, battery cabinet, power distribution box and other power supply equipment shall have no obvious damage, and the paint shall be intact. The installation shall be vertical and flat with reasonable layout. The equipment shall be coordinated with other equipment to reserve operating space. The identification plate of the power supply equipment shall be

clear and correct.

Inspection scope: 100%.

Inspection method: visual inspection.

## II General items

**14.3.6** The power cables and earthing wires shall be laid neatly without crossing. the cable binding shall be standardized and the identification shall be complete. and the trunking and protective tubes shall be arranged neatly and aesthetically.

Inspection scope: 100%.

Inspection method: visual inspection.

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## Appendix A Sub-project, component, inspection lot and inspection item

**Table A Sub-project, component, inspection lot and inspection item**

Project	Sub-project	Component	Inspection lot	Refer to inspection item article number of inspection lot	
				Main items	General items
Urban rail transit Automatic Fare Collection system project	Cable containment installation and inspection	Cable containment laying	One station	Articles 4.2.1-4.2.5	Articles 4.2.6-4.2.11
		Connector and end of cable containment	One station	Articles 4.3.1,4.3.2	Articles 4.3.3,4.3.4
		Cable tray installation	One station	Articles 4.4.1,4.4.2	Article 4.4.3
	Cable laying and testing	Cable laying	One station	Articles 5.2.1-5.2.3	Articles 5.2.4,5.2.5
		Cable entry	One station	Article 5.3.1	Articles 5.3.2,5.3.3
		Cable connection	One station	Articles 5.4.1-5.4.3	Article 5.4.4
		Testing of cable characteristics	One station	Articles 5.5.1,5.5.2	Article 5.5.3
	Ticket and Ticket Reader-Writer	Testing of ticket and Ticket Reader-Writer	Sampling check	Articles 7.2.1-7.2.4	Articles 7.2.5-7.2.8
	Station Terminal Equipment	Station Terminal Equipment installation	One station	Articles 6.2.1,6.2.2	Articles 6.2.3-6.2.5
		Equipment wiring	One station	Articles 6.4.1-6.4.3	Articles 6.4.4-6.4.7
		Automatic Ticket Vending Machine	One station	Articles 8.2.1-8.2.14	Articles 8.2.15,8.2.16
		Booking Office Machine	One station	Articles 8.3.1-8.3.9	Articles 8.3.10,8.3.11
		Automatic Gate Machine	One station	Articles 8.4.1-8.4.13	Articles 8.4.14,8.4.15
		Automatic Value-adding Machine, Automatic Ticket Checking Machine, Portable Ticket Checking Machine	One station	Articles 8.5.1-8.5.10	Articles 8.5.11,8.5.12
	Station Computer System	Machine room equipment installation	One station	Articles 6.3.1,6.3.2	Articles 6.3.3-6.3.7
		Equipment installation	One station	Articles 6.4.1-6.4.3	Articles 6.4.4-6.4.7
		LAN of the Station Computer System	One station	Articles 9.2.1,9.2.2	Article 9.2.3
		Testing of the Station Computer System basic function	One station	Articles 9.3.1-9.3.14	Article 9.3.15
		Testing of emergency buttons	One station	Articles 9.4.1,9.4.2	Article 9.4.3
	Central Computer System	Machine room equipment installation	One center	Articles 6.3.1,6.3.2	Articles 6.3.3-6.3.7
		Equipment wiring	One center	Articles 6.4.1-6.4.3	Articles 6.4.4-6.4.7
		LAN of the Central Computer System	One system	Articles 10.2.1,10.2.2	Article 10.2.3
		Testing of the Central Computer System basic function	One system	Articles 10.3.1-10.3.10	Articles 10.3.11,10.3.12

Table A (continued)

Project	Sub-project	Component	Inspection lot	Refer to inspection item article number of inspection lot	
				Main items	General items
Urban rail transit Automatic Fare Collection system project	Central Clearing System	Machine room equipment installation	One center	Articles 6.3.1、6.3.2	Articles 6.3.3-6.3.7
		Equipment installation	One center	Articles 6.4.1-6.4.3	Articles 6.4.4-6.4.7
		LAN of the Central Clearing System	One system	Articles 11.2.1-11.2.3	Article 11.2.4
		Testing of the Central Clearing System basic function	One system	Articles 11.3.1-11.3.8	Articles 11.3.9、11.3.10
		Testing of the disaster tolerance system basic function	One system	Articles 11.4.1-11.4.3	Article 11.4.4
		Testing of the networked interconnectivity	One system	Articles 11.5.1、11.5.2	Article 11.5.3
	Power supply, earthing and lightning protection	Power supply equipment installation	One station	Articles 12.2.1-12.2.4	Articles 12.2.5-12.2.8
		Earthing and lightning protection	One station	Articles 12.3.1-12.3.7	Article 12.3.8
		Testing of power supply equipment	One station	Articles 12.4.1-12.4.3	Article 12.4.4
	AFC system commissioning and acceptance testing	Acceptance of system commissioning and testing	One system	Articles 13.2.1-13.2.5	Article 13.2.6
	Quality of External Appearance of project	Quality of External Appearance of cable containment	One system	Article 14.2.1	Article 14.2.2
		Quality of External Appearance of equipment and wiring	One system	Articles 14.3.1-14.3.5	Article 14.3.6



**B.0.2** The quality acceptance record of the inspection lot shall be filled in according to Table B.0.2.

**Table B.0.2 Quality acceptance record for inspection lot**

Project														
Sub-project														
Component		Acceptance place												
Construction company		Project manager												
Name and number of construction quality acceptance standard														
Requirements of construction quality acceptance standard			Inspection and evaluation records of the construction company								Supervision(client)company acceptance records			
Main items	1													
	2													
	3													
	4													
	5													
	6													
General items	1													
	2													
	3													
	4													
	5													
Inspection and evaluation results of construction company		Project professional quality inspector (mm) (dd), (yyyy)												
Acceptance conclusion of supervision company (client)		Supervision engineer (Project professional technical leader of the client) (mm) (dd), (yyyy)												

**B.0.3** The quality acceptance records of the component shall be filled in according to Table B.0.3.

**Table B.0.3 Quality acceptance record of component**

Project					
Sub-project				Quantity of inspection lot	
Construction company		Project manager		Project technical leader	
SN	Inspection lot area	Inspection and evaluation results of the construction company		Supervision company(client) acceptance conclusion	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
Note:					
Inspection conclusion of construction company		Technical leader of component (mm) (dd), (yyyy)			
Acceptance conclusion of supervision company (client)		Supervision engineer (Project technical leader of the client) (mm) (dd), (yyyy)			



**B.0.4** The quality acceptance records of the sub-project shall be filled in according to Table B.0.4.

**Table B.0.4 Quality acceptance record for sub-project**

Project					
Construction company					
Project manager		Project technical leader		Project quality leader	
SN	Component	Quantity of inspection lot	Inspection and evaluation of construction company	Acceptance comment of supervision company(client)	
1					
2					
3					
4					
5					
6					
7					
8					
9					
Quality control data					
Safety and functional inspection (testing) report					
Acceptance company	Construction company	Project manager (mm) (dd), (yyyy)			
	Design company	Project manager (mm) (dd), (yyyy)			
	Supervision company(client)	Chief supervision engineer (Project professional leader of the client) (mm) (dd), (yyyy)			

## Appendix C Quality acceptance record of project

**C.0.1** The quality acceptance of the project activity shall be inspected and recorded according to Table C.0.1.

**Table C.0.1 Quality acceptance record of project**

Project					
Commencement date		Completion date			
Construction company		Technical director			
Project manager		Project technical leader		Project quality leader	
SN	Item	Acceptance record			
1	Sub-project	(Qty)of (Total)sub-projects checked (Qty)sub-projects meet the standard and design requirements			
2	Quality control data check	(Qty)of (Total)items meet the requirements after review (Qty)items meet the standard requirements after review			
3	Safety and main functions check and sampling check results	(Qty)of (Total)items meet the requirements after check (Qty)of (Total)items meet the requirements after sampling check (Qty)items meet the standard requirements after rework			
4	Quality of External Appearance	(Qty)of (Total)items meet the requirements after check (Qty)items do not meet the requirements			
5	Overall conclusion				
Acceptance company	Client	Supervision company	Construction company	Design company	
	(stamp)	(stamp)	(stamp)	(stamp)	
	Company(project)manager	Chief supervision engineer	Company manager	Company(project)manager	
	(mm)(dd),(yyyy)	(mm)(dd),(yyyy)	(mm)(dd),(yyyy)	(mm)(dd),(yyyy)	

**C.0.2** The quality control data verification of the project shall be inspected and recorded according to Table C.0.2.

**Table C.0.2 Quality control data verification record for project**

Project				
Construction company				
SN	Documents	Copy	Review comment	Checked by
1	Joint review of drawings, design changes, negotiation record			
2	Site survey, position and laying-out record			
3	Factory conformity certificate and inspection (test) report of raw materials			
4	Completion test report			
5	Factory conformity certificate or test report for finished and semi-finished products			
6	Acceptance record of concealed works			
7	Construction record			
8	Engineering quality accident investigation and handling documents			
9	Inspection record of construction site quality management			
10	Quality acceptance record for component and sub-project			
11	Construction record of new material/process			
12				
13				
14				
<p>Conclusion:</p> <p>Project manager of construction company (mm)(dd), (yyyy)</p> <p style="text-align: right;">Chief supervision engineer (Project manager of the client) (mm)(dd), (yyyy)</p>				

**C.0.3** The verification of safety and function inspection data as well as the sampling check acceptance of major functions for project shall be carried out and recorded in accordance with the requirements in Table C.0.3.

**Table C.0.3 Verification record of safety and function inspection data and sampling check record of major functions for project**

Project						
Construction company						
SN	Safety and functional inspection items	Copy	Check comments	Sampling check results	Checked by	
1	Station Terminal Equipment testing record					
2	Station Computer System testing record					
3	Central Computer System testing record					
4	Central Clearing System testing record					
5	Power supply equipment testing record					
6	Earthing testing record					
7	Cable zone performance testing record					
8	Third-party testing record					
9						
10						
11						
12						
<p>Conclusion:</p> <p>Project manager of construction company _____ (mm)(dd),(yyyy)</p> <p>Chief supervision engineer _____ (Project manager of the client) (mm)(dd),(yyyy)</p>						

Note: Other inspection items shall be determined by the acceptance team through negotiation.

**C.0.4** The Quality of External Appearance of the project shall be carried out and recorded according to Table C.0.4.

**Table C.0.4 Quality of External Appearance acceptance record for project**

Project					
Construction company					
SN	Project	Sampling check quality condition	Quality assessment		
			Good	Average	Poor
1	Cable tray installation				
2	Electric cable entry				
3	Optical cable entry				
4	Machine room equipment arrangement				
5	Machine room cabinet installation				
6	Equipment installation				
7	Equipment wiring				
8	Power distribution cabinet installation				
9	UPS installation				
10	Battery cabinet installation				
11	Power distribution box installation				
12	Power cable layout				
13	Earthing cable layout				
Inspection conclusion:					
Project manager of construction company		Chief supervision engineer (Project manager of the client)			
(mm)(dd),(yyyy)		(mm)(dd),(yyyy)			

Note: Items rated as "poor" shall be reworked.

## Explanation of wording in this standard

1 Words used for different degrees of strictness are explained as follows in order to mark the differences in implementing the requirements of this standard.

1) Words denoting a very strict or mandatory requirement:

"Must" is used for affirmation, "must not" for negation.

2) Words denoting a strict requirement under normal conditions:

"Shall" is used for affirmation, "shall not" for negation.

3) Words denoting a permission of a slight choice or an indication of the most suitable choice when conditions permit:

"Should" is used for affirmation, "should not" for negation.

4) "May" is used to express the option available, sometimes with the conditional permit.

2 "Shall meet the requirements of..." or "shall comply with..." is used in this standard to indicate that it is necessary to comply with the requirements stipulated in other relative standards and codes.

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## List of cited standards

- GB 50300 *Unified Standard for Constructional Quality Acceptance of Building Engineering*
- GB 50303 *Code for Acceptance of Construction Quality of Building Electrical Engineering*
- GB/T 50312 *Code for Engineering Acceptance of Generic Cabling System*
- GB 50382 *Code for Construction Quality Acceptance of Urban Rail Transit Communication Engineering*
- GB 4943.1 *Information Technology Equipment-Safety-Part 1:General Requirements*
- GB/T 20907 *Technical Requirements for Automatic Fare Collection System of Urban Rail Transportation*
- CJJ/T 162 *Technical Specification for Test Technology of Urban Rail Transit Automatic Fare Collection System*

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